Vol. 16, No. 6 June 1997

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Monitoring Times™

Vol. 16, No. 6 June 1997

CONTENTS

Cover Story

Lightning: The Global Radio Network

By Finbarr O'Driscoll

Awesome, mysterious, and unpredictable, lightning is the bane of radio operators everywhere, especially during the summertime. We know the "transmissions" of lightning simply as static—but there's nothing simple about it.

This scholarly, yet fascinating look at what we know today about lightning, will also show you how to tune in to natural radio sounds from all around the globe, and touches on the indispensable service lightning provides.

Story starts on page 8.

Reviews:

One of the first two-way radios released by Radio Shack under the new Family Radio Service was the FRS-105. It was also one of the first radios to operate on the "splinter frequencies" using a separation of 12.5 kHz spacing instead of 25 kHz. Steve Donnell WA1YKL finds the radios to be a very reasonable option for families who want short-distance communications without having to obtain an FCC license. See page 88.

If you never got the chance to get your pilot's license, or you're sure anybody could land a plane better than the pilot on your last flight, it's time to try it yourself—from your armchair! John Catalano takes a look at some of the new simulation software, Internet sites that cater to aero buffs, and even a web site that will track the flight plan of commercial flights if you know some minimal information. See page 84.

DEPARTMENTS

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Bearcat intercepts trunked radio

COMMUNICATIONS ELECTRONICS INC.

New...radios available from CEI

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Trunk Tracking

Conventional scanning is a simple concept. You enter a radio frequency into your scanner that is used by someone you want to monitor. For example, the police may broadcast on 155.370 MHz, the fire department on 154.250 MHz, emergency management on 158.760 MHz, etc. So when your scanner stopped on a frequency, you usually knew who it was and, more importantly, you could stop on the frequency and listen to an entire conversation. This type of conventional scanning was easy and fun.

As the demand for public communications increased, many public radio users didn't have enough frequencies to meet their needs, which created a serious problem. Trunking systems solved this problem. Since very few, if any, radio users really broadcast on their frequencies all the time, it was possible to use available public service bands much more efficiently.

In a trunked radio system, which contains between 3 and 29 different frequencies, radio users are assigned to talk groups, each with a specific ID number. When someone in a talk group uses their radio, subaudible identification information is broadcast along with each transmission. The trunking system computer uses this subaudible information to temporarily assign each radio in a talk group to an available frequency. If the group using a frequency stops broadcasting or pauses between replies for a few seconds, they are removed from the frequency so another talk group can use it.

Sharing the available public service frequencies allowed cities, counties, states and other agencies to accommodate hundreds of users with relatively few frequencies. On the other hand, following a conversation on a trunked system became difficult if not impossible because if the conversation you were listening to stopped transmitting long enough, it could be assigned a completely different frequency in the trunking system. This type of scanning was difficult and frustrating.

The Bearcat 235XLT TrunkTracker available from Communications Electronics changes all that. Not only does the Bearcat 235XLT search frequencies like conventional scanners, it can also follow the users of a trunked radio system. Once you know a talk group's ID, you won't miss any of the action. Order today. Call 1-800-USA-SCAN.

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Mfg. suggested list price $429.95/**CEI price $269.95**

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The Bearcat TrunkTracker BC235XLT, is the world's first scanner capable of tracking a selected radio transmission as it moves across a trunked radio system. Now it's easy to monitor fleets and subfleets in analog trunked radio systems. The BC235XLT can also work as a conventional scanner. This 300-channel, programmable handheld scanner provides scanner users with uninterrupted monitoring capabilities of Type I, II, III and hybrid trunking systems. One of the biggest obstacles in the scanner industry has been the increasing use of trunking radio systems in business and public service agencies throughout the United States and Canada. This makes it nearly impossible to track a conversation as it moves within a trunk system from frequency to frequency. According to Ken Ascher, WB8LIT, Chairman & CEO of Communications Electronics, "The Bearcat 235XLT is a revolutionary breakthrough in scanner technology. Now it's easy to continuously monitor conversations even though the message is switching frequencies." The BC235XLT comes with AC adapter, CRX120 battery charger, two rechargeable long life ni-cad battery packs, belt clip, flexible rubber antenna, earphone, owner's manual and one year limited Uniden warranty. Not compatible with ESAS, EDACS and LTR systems. Call 1-800-USA-SCAN to order now.

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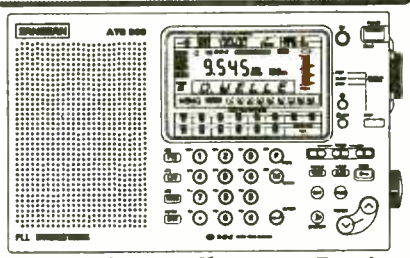
The Bearcat 9000XLT is superb for intercepting communications transmissions with features like TurboSearch™ to search VHF channels at 300 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a selectable attenuator to help eliminate annoying intermodulation from adjacent frequencies in highly populated areas and selectable AM, Wide FM and Narrow FM modes that allow you to change the default receiving mode of the BC9000XLT. Other features include ***Auto Store*** - Automatically stores all active frequencies within the specified bank(s). ***Auto Recording*** - This feature lets you record channel activity from the scanner onto a tape recorder. **Hi-Cut filter** to help eliminate unwanted static noise. You can even get an optional ***CTCSS Tone Board*** (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: **PS001** Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter $14.95; **PS002** DC power cord - enables permanent operation from your vehicle's fuse box $14.95; **MB001** Mobile mounting bracket $14.95; **BC005** CTCSS Tone Board $54.95; **EX711** External speaker with mounting bracket & 10 feet of cable with plug attached $19.95. The BC9000XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty.

Shortwave Radio



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Mfg. suggested list price $399.95/**Special $249.95**

Size: 8-1/4" Wide x 1-1/2" Deep x 5" High

Frequency Coverage: **LW: 153-513 KHz.; MW: 520-1710 KHz.; SW: 1711-29999 KHz.; FM: 87.5-108.0 MHz.**

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Bearcat 760XLT-A base/mobile	$179.95
Bearcat 230XLT-A handheld/SPECIAL	$194.95
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The Bearcat 3000XLT is the ideal handheld radio scanner for communications professionals. This handheld scanner scans at 100 channels per second and searches at a rate up to 300 steps per second. A selectable attenuator eliminates annoying intermodulation from adjacent frequencies in highly populated areas. Selectable AM, Wide FM and Narrow FM modes allow you to change the default receiving mode of the BC3000XLT. For maximum scanning pleasure, order the following optional accessories: **UA502** Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter $14.95; **LC3000** Deluxe swivel leather carrying case $34.95; **BP2500** rechargeable nickel-cadmium battery pack for up to five hours of dependable use $29.95; **ANTMMBNC** Magnetic mount scanner antenna with BNC jack and 12 feet of cable $29.95. **ANTSGBNC** Glass mount scanner antenna with BNC cable $29.95. The BC3000XLT comes with AC adapter, belt clip, flexible rubber antenna, earphone, owner's manual and one year limited Uniden warranty. Order today.

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A Call to Unity: A Call to Action

"Losing two more scanning publications is insidiously dangerous to the hobby, inasmuch as the monitoring community is also an alert community ... Yes, keeping up with technology is important ..., but remember, the French resistance, for example, did not require trunk tracking scanners to stay ahead, they required cohesion. We should not let the passing of USSN and the RCMA's *Scanner Journal* become a passive event ... Let's fill the vacuum left behind by these two great publications with an increase in activism within the monitoring community and maybe an increase in our securing those put-off ham tickets.

"Mr. Grove, you continue to lead; I'll continue to read."

—Paul Forel

"For the last several years there has been a concerted effort ... to abolish private ownership of firearms by law abiding citizens. This group can claim they only want *reasonable* control, but then they admit they want abolishment.

"Now comes a group which includes many of the same people who now want to abolish radio receivers *they* do not approve of. Again they ... say they want *reasonable* control, but again admit their overall agenda is abolishment.

"So those of you who want to keep your scanners and radio receivers will need to organize, contribute money, become involved politically and fight for your rights! ... When and if you choose to do this you will be slandered, made fun of, and accused of being thugs, criminals, unAmerican, rednecks, etc.

"We are living in very dangerous times in this country ... They don't want scanners because they may be held accountable for illegal actions. Now they want to sell the airwaves ...

"We must stop all this. As a wise patriot said, 'We must all hang together or we will all hang separately' ... you'd better protect your ox by protecting all the oxen."

—Terry Jones, Plankinton, SD

"It seems to me Congress is hellbent on destroying the scanner hobby, and in the next five to ten years I expect that the only things we will be able to legally listen to on our scanners will be taxi dispatchers and mall security!

"If this entire situation was brought about by the recent incident of two political spies intercepting and taping a Newt Gingrich phone conversation, it is indeed ironic that a politically inspired eavesdropping resulted in a politically inspired ambush of Bob Grove. By the way, why weren't the people who did this prosecuted?"

—Byron Oring, Mt. Vernon, NY

They've at least been charged: see p. 6. And I'm not so sure about listening to mall security — those are "private" security agencies, after all! Does it matter they're on the air in the clear?

— RB

"Anyone who has been around the radio hobby for over 12 months, knows about scanners and the fact that many can (and are) modified and used to listen in on conversations that are protected under the Electronic Communications Privacy Act (ECPA) of 1986. Now, you can argue that the ECPA is a poorly engineered and totally unenforceable bit of legislation...and you'd be right. You can also argue that the ECPA was concocted by elements of the CTIA using massive disinformation and outright lies to sway unenlightened, non-technical legislators and public officials into passing a bad law...and you'd be right.

"BUT.... it is the law. Like it or not, you are not supposed to listen in on cellular or cordless telephone conversations, either by directly monitoring the frequency or listening to harmonics or images of these frequencies. Doing so opens you up to prosecution under federal criminal codes. Bragging about monitoring cellular or cordless communications is galactically stupid.

[On the other hand], "We owe it to ourselves to monitor police, fire, FBI, DEA, BATF, and any number of other government agencies. I'm not just talking about radio transmissions, I'm also referring to monitoring the way they spend our money and pass and/or enforce legislation that affects our lives and hobbies. ...

"Why should we care about monitoring federal, state and local government agencies? If we don't who will? Any government left to operate in secrecy will ultimately evolve into a tyrannical government. ...

"The ideas fostered by the head of the Cellular Telephone Industry that all scanner listeners are 'electronic stalkers' and that all scanners and scanner activity should be made illegal, are very dangerous. They pave the way for further restrictive federal, state, and local legislation to prohibit the interception of what has always been 'free access' to anything that is transmitted over the air.

"Essentially, the CTIA is hoping the government will do their job for them, saving them the expense of buying millions of dollars in encryption technology just to insure privacy for the roughly 20% of the cellular users who count privacy as a primary concern ...

"Now, if you ham radio operators, CBers, and SW listeners out there who are reading this don't think that this can impact your area of the radio hobby, you'd better wake up! As with gun control, and other highly inflammatory issues, the spin-off from more restrictive scanner legislation can have a profound affect on the rest of our hobby. Once the Bureaucratic Behemoth of Legislators is awakened to a 'cause,' it is difficult, if not impossible, to stop the process ...

"Make no mistake about it, the CTIA and a handful of over zealous, 'do-gooder' legislators (who in all probability received some heavy cash contributions to their campaign coffers from the cellular industry) are the enemy. Once they get a foothold (and they already have once in the ECPA of 1986) they will push and push, using all sorts of disinformation to accomplish their goals.

"Write your legislators. Tell them how you feel, and you aren't going to stand for more government oppression in our hobby. Make your voice heard. For a while, at least, this is still America, with a 'c' not a 'k'.

—Rich Arland, "K.I.S. Radio"

"I am a licensed amateur radio operator. I have also used the airwaves for over fifteen years as a police officer. Many of my hobbies involve electronics and provide me with knowledge and experience on both sides of the law.

"1. The enforcement of prohibiting someone from hearing cellular telephone calls can never be enforced unless we become a communist state and prohibit any type of electronic device capable of radio reception.

"2. To prevent reception by restricting a particular type of radio from being modified is form of discrimination.

"3. Cellular telephone companies should be honest with their customers and tell them that cellular telephones are radios, then explain to them how a radio works.

"4. There is always a way to make a radio transmission difficult or near impossible to understand on the receiving end.

(Continued on page 102)

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Radio technology is about 100 years old.
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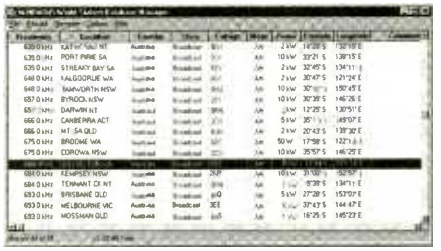

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"The sensitivity seems to be pretty good across the whole range...
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Monitoring Times, October 1996

"...high quality workmanship, good reception and easy usage."
Chip, November 1996

"WiNRADiO has enticing possibilities... The manual is an exciting book not only because of its beautiful cover, high quality paper, and easy instructions, but also because it contains a mix of operating and technical informations about various aspects of radio you might have forgotten or never knew."
World Scanner Report, Volume 6, No. 7

NEW

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Monitor Radio to be Sold

The Christian Science Church announced in April it plans to sell its award winning public radio news operation, Monitor Radio, and it will lease or sell the two powerful shortwave stations it currently owns — WSHB in Cypress Creek, South Carolina, and KHBI on the island of Saipan.

The Christian Science Monitor began producing public radio programs in January 1984, and has grown to be the second largest provider of news broadcasts to the public radio system after National Public Radio (NPR). Monitor Radio broadcasts are distributed in the United States by Public Radio International (one of its potential buyers).

"Any future radio efforts will be on a more modest scale and will have to give promise of being self supporting," Monitor Editor David Cook said. "Our church must balance its desire to serve a radio audience with the need to support its worldwide healing ministry and to strengthen our newspaper."

The Monitor hopes to complete the sale by July 1. When the broadcast news operations are sold, religious programs will be broadcast throughout the week on the Church's shortwave stations until they are leased or sold. Currently, the shortwave stations air Monitor Radio programs on weekdays and religious programs on the weekends.

"Since the fall of the Berlin Wall, international broadcasting has been evolving rapidly with shortwave playing less of a role as commercial broadcasting expanded," Publishing Society Manager Hill said.

"We have seen a decline in our shortwave listenership as have other shortwave broadcasters. Distribution channels are different now from when we went into shortwave 10 years ago. We need to focus more on producing programs than on operating the channels of distribution," Hill said. The Church's first shortwave station went on the air March 30, 1987.

To ensure broad international distribution of its religious programs, the Church said it plans to purchase time on shortwave stations owned by other broadcasters in portions of Africa, South America, and Asia where shortwave radio is widely used.

Comments may be sent by email to *letterbox@csps.com.*

Gingrich Eavesdroppers Charged

When a partial transcript of a cellular telephone call between House Speaker Newt Gingrich and other Republican leaders was published in several newspapers last December, the ensuing furor in Congress has had significant impact on the scanner industry. Hobbyists have been wondering whether the couple who instigated the whole mess by releasing the tape they had made of the conversation would be called to account for what seems a blatant violation of several laws protecting personal communications.

On April 23, John and Alice Martin of Fort White, Fla. were charged and agreed to plead guilty to identical one-count charges and promised to cooperate with the Justice Department's continuing investigation.

According to an Associated Press story by Michael Sniffen, the Justice Department classified the interception and taping as an infraction, because it was a first offense and because the interception was of the radio portion of a cellular call; and because there was no evidence that it was done for commercial or private financial gain or for an illegal purpose such as aiding in blackmail.

The Martins admitted in the agreements that they had intentionally intercepted the telephone conversation. Charles R. Wilson, U.S. attorney, was quoted as saying, "The Martins were charged with the most serious violation possible based on the applicable federal law and the circumstances surrounding the interception of the telephone call."

The maximum sentence is $5,000 fine each, with no prison term. Other possible targets of investigation are the publications which published the transcript, and the congressman in whose possession the tape supposedly was when it was leaked to the press.

Waiting on 220

It took ten years, but the FCC has finally finished work on reallocating the 220-222 MHz amateur radio band. Taken from hams in 1988 and dedicated to the development of spectrally efficient narrowband technology, the 2 MHz of frequencies was channelized into two hundred 5 kHz channel pairs.

Narrowband never really took off and the band was tied up in legalese and lawsuits. The decks have now been cleared and the frequencies will soon be auctioned off. Successful bidders may use either voice or data and obtain either national or regional licenses.

Threat to Civilization

"I tell you, the Internet is a worldwide conspiracy of the American devils. I have posted indisputable proof of this on my new web site at:
www.motherofallmouths.com"

The internet, says Iraqi strongman Saddam Hussein, will be "the end of civilizations, cultures, interests, and ethics." According to an Iraqi newspaper report, the computer network "is one of the American means to enter every house in the world." Americans "want to become the only source for controlling human beings in the new electronic village."

High Tech — It's Heddy Stuff

At the age of 19, she had already come to the attention of Europe for her nude romp through the woods in the Czech film *Ecstasy*. Later, she would go on to star in dozens of films during Hollywood's heyday, such as *Samson and Delilah*.

A sultry, sophisticated brunette, Heddy Lamarr was the racy stuff of dreams for US servicemen marching off to war during the 1940s. Immediately prior to World War II, Lamarr was married to Austrian armament manufacturer Fritz Mandl. During the four years the relationship lasted, she was forced to attend the businessman's meetings. "I was a kind of slave. I couldn't even go swimming without his being there."

Mandl became more and more involved with the Nazis, and Lamarr, trapped in the role of gracious host, learned more and more about the manufacture of German munitions. Eventually, she drugged the maid assigned to guard her and escaped to London. Filled with an abiding hatred of the Nazis — and quite possibly of Mandl — she took the information she learned at all of those business meetings and used them for the Allied war effort.

Prime among her inventions was the fre-

quency-hopping or spread-spectrum technology that now forms the underpinnings of the U.S. government's Milstar satellite defense communications system, wireless internet transmission, as well as many of the newer cellular phones. It was originally designed over half a century ago as a way to circumvent the radio jamming that the Germans used against U.S. radio-controlled missiles. The invention was patented as "Secret Communications System" on August 11, 1942. So advanced was the invention that the military felt it was brilliant — "so brilliant that it was years ahead of its time."

"I always am," said Lamarr in a recent Associated Press interview.

Fifty-five years after her patent (donated to her adopted country), Lamarr was honored with an award for "blazing new trails on the electronic frontier" at the Computers, Freedom, and Privacy Conference in San Francisco. Lamarr, never one to suffer fools gladly, was characteristically blunt when informed of the award. "It's about time."

Scanner Hero Saves Girl

For as long as he could remember, Gary Laird wanted to be a cop. Even at the gas station where he worked, Laird dreamed on, listening to his scanner as officers were dispatched to incidents he could only imagine. One day, Laird heard a report of a kidnapping — a car had been stolen and in the front seat was the owner's 4-year old girl — on the scanner. He copied down the vehicle's license plate number as he always did and maintained his post at the gas station.

Laird quite possibly might never have known that the kidnapper's vehicle was in his parking lot had it not been for the scanner. But when a black 1981 Ford Bronco with a little girl in the front seat pulled up to pump number nine, Laird was able to match the license plate number with the one he heard on the scanner and dial 911. The police arrived two minutes later and arrested Earl Hellyer. The child was reunited with her mother.

Laird, whose friends always tease him about carrying a scanner, says that the radio proved its worth and possibly saved the life of a little girl. "I'll definitely continue to listen to it."

Awards, Radio Style

Broadcasters, says *Chicago Sun Times* columnist Robert Feder, may be the most self-congratulatory bunch in the world. There are so many awards passed around, he says, that the really don't mean much. Take, for

"And the award for the most embarrassing segment of "dead air" goes to ...

example, the Illinois Broadcaster's Association's annual "Best Personality of the Year" award. For 1996, the award went to WBBM-FM's Ed Volkman and Joe Bohannon.

"What made their achievement more than a bit dubious," says Feder, "was the fact that Volkman and Bohannon didn't even start hosting their show until 1997." So how could two DJs who weren't even on the air in 1996 be named "Best Personality of the Year" for 1996?

Todd Cavanah, program director of WBBM, says his personalities won fair and square. The two winning DJs, he says, had run tapes promoting their upcoming return to WBBM during the year 1996. Volkman and Bohannon had been fired from the station in 1994 in the wake of a defamation settlement. Further, says WBBM station manager Don Marion, the controversy wouldn't effect WBBM. Even if Volkman and Bohannon were disqualified, the station's sex-talk show, *Private Lives* was the runner up.

"So you see," says Marion, "we win either way."

"Communications" is edited by Larry Miller with help from Rachel Baughn, Larry Van Horn, and the art department at Grove Enterprises. Among our local staff are the following reporters who look for, clip out, and mail in, items of interest: Anonymous, Albany, NY; Ed Becht, Los Angeles, CA; Malcolm Daly, MI; Leslie Edwards, Doylestown, PA; Maryanne Kehoe, Atlanta, GA; Forest Petrus, Ames, IA; Edward Schwartz, Chicago, IL; Calvert Skuul, Baltimore, MD; Larry Van Horn, Brasstown, NC; and R.C. "Kentucky Colonel" Watts, Louisville, KY. We also consulted the following publications: *National Scanning, Philadelphia Inquirer, W5YI Report.*

LIGHTNING

The Global Radio Network

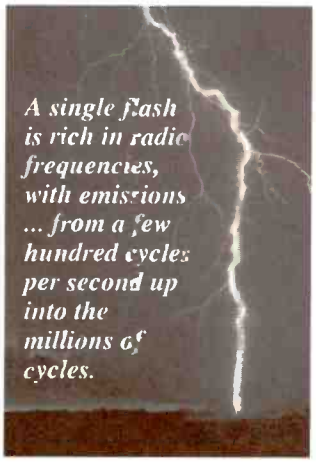
By Finbarr O'Driscoll

I prefer to call them "sferics"—that natural miscellany of snaps, crackles, pops, pings, and brief whistles that emanates from radio receivers and makes people reach for some switch to shut it all out. The term "static" is common parlance, too, but it is generally understood to include as well all those unwanted bursts of noise that come from man's own electrical activities. You know the stuff — household switches, thermostats, spark-plugs, and so on. But "sferics" is a neat, modern, Americanized spelling of "spherics," which in turn is "atmospherics" abbreviated. In plain English, it refers simply to those natural electromagnetic emissions that have their origins in the atmosphere.

When it comes to generating sferics, the daddy of them all among atmospheric phenomena is the lightning bolt. A single flash (let alone a complex hybrid), is rich in radio frequencies, with emissions that simultaneously range from a few hundred cycles per second up into the millions of cycles.

Everyone is familiar with the quick crackle — propagated by groundwave and easily heard on long, medium, and shortwave bands — caused by a nearby electrical storm. Just as familiar are the multitudinous muffled crashes heard from all those storms that are afar off. Those muffled crashes would have been heard as clicks and crackles in the near-field, but multi-path propagation and attenuation over distance modifies them.

Lightning bolts fire off at points around the world right around the clock. Thousands of storms happen every day, mostly in the tropics and subtropics and to a lesser extent in the upper mid-latitudes. There are several thousand flashes per minute all the time, not all of them striking the physical earth. It is estimated that the majority of flashes are either intra-cloud or cloud-to-cloud, but the processes are the same, whatever the final manifestation. Cloud-to-earth bolts are considered to be the greatest radiators of electromagnetic energy.



A single flash is rich in radio frequencies, with emissions ... from a few hundred cycles per second up into the millions of cycles.

Bolts last only a fraction a second, but their narrow ionized channels, just an inch or two wide, reach searing temperatures comparable to the photosphere of the sun. This intense heating to many thousands of degrees Celsius in the ionized channels (which can branch and fork fractally for miles), causes the shock waves that are audible as thunder.

By the way, photographs of lightning often show bolts to have considerable channel width. Don't be fooled. That's just burnout on the photographic film due to its inability to cope with the intense light emitted.

What happens inside a thundercloud to cause a lightning discharge is still not fully understood by physicists, even though over two-and-a-half centuries have elapsed since Benjamin Franklin showed that the great meteorological phenomenon was not fire but electricity. However, sufficient facts to construct a reliable theoretical model of the generality of events involved are known. This century has seen the facts flowing thick and fast following the invention of so many ways of probing the innards of electric storm cells.

Radiosondes, raised aloft by helium balloons to measure changes in such factors as humidity, temperature, precipitation, and wind-speed, have contributed a wealth of information. The invention of radar has allowed even more accurate data about the timing and type of precipitation inside a storm to be gathered. Electric-field meters tell an astonishing tale of the magnitudes and rise-times of voltages within and without the madly turbulent air-masses that spawn lightning.

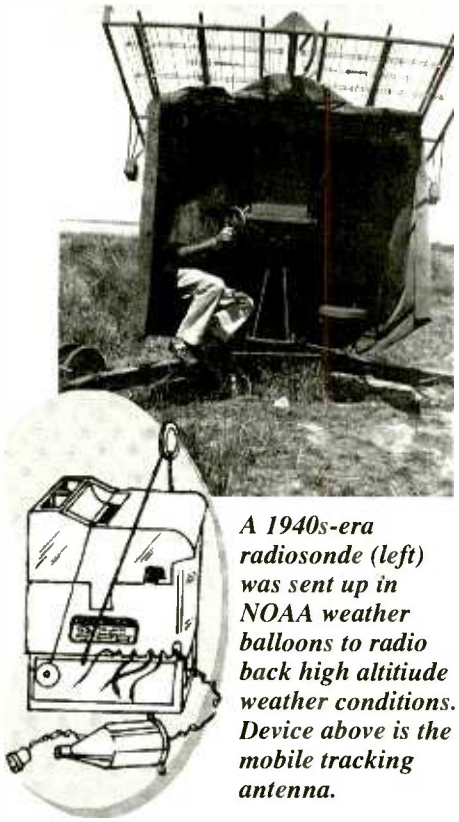
The perfection of techniques by meteorologists in the triggering of lightning on demand by launching small rockets with trailing earth-wires has led to the acquisition of superb photographic evidence of flash-paths and their downwind coronas, as well as highly accurate electrical data. Benjamin Franklin with his kite, wet string, and suspended key would definitely be impressed.

A Recipe for Lightning.....

Water vapor is the fuel that powers the generator in a thundercloud. Massive turbulence of the air, with a chimney-like updraft is also part of the picture. Freezing temperatures at altitude is the third ingredient, since an enormous number of collisions of solid precipitation — hail, graupel (snow-pellets), ice-crystals — must occur.

These factors are necessary to create a large enough charge separation with the consequently high potential gradients. A cumulonimbus cloud with its typical anvil-head poking out of the troposphere into the stratosphere at about twelve miles high is ready to emit lightning if it has a potential difference — positive top to negative base — of the order of tens of thousands of volts. Voltage differences between the base of the cloud and the ground have been measured at much higher orders than that.

A critical voltage difference between oppositely charged zones at a given instant (that criticality depending on the insulative properties of the air at the instant) will allow a discharge of tens of thousands of amperes to take place in a few millionths of a second. The



A 1940s-era radiosonde (left) was sent up in NOAA weather balloons to radio back high altitiude weather conditions. Device above is the mobile tracking antenna.

peak power in a flash can be millions of kilowatts, but because of the extreme brevity of the discharge, this does not end up as a totally catastrophic event.

The way a flash goes from a cloud base to the ground can be understood from the following model. Beneath a thundercloud with a negatively charged underside, the normal fair-weather potential gradient by which electrons leak from earth to air, is replaced by an opposite and very much greater gradient. The negative cloud base repels electrons in the earth beneath, with the consequence that the earth develops a positive charge. Inherent instability, great turbulence, and updrafts continue apace at sub-zero temperatures inside the higher reaches of the thunderhead.

Massive charge separation continues to build in the cloud, increasing the negative charging of its base, in turn causing ever more positive charging in the ground. Upward moving ice-crystals colliding with swirling and falling hail and graupel are generally agreed to be the source of charge separation. The collisions cause stable atmospheric particles to smash apart forming ions and electrons. Ionized air is a good conductor of electricity. When electrons move fast enough they reach a critical speed (estimated at about ninety miles per second) after which a cascade of ionization takes place. A new critical stage is now reached.

An intensely ionized channel (known as a "stepped leader") darts erratically towards the ground, forking along lines of least resistance in the air at speeds of several hundred miles per second. This is not yet a lightning bolt. When it is near to the ground, the attraction of its electric field causes the ground to emit multiple luminous positive filaments ("streamers"). When a stepped leader connects with one streamer the electrical path to the ground is complete, and all remaining streamers become redundant.

An intense current is then released (the "return stroke"). The speed of particles rushing to re-combine along the return stroke is in excess of sixty thousand miles per second. This re-combination of particles in an ionized channel is the source for the emission of photons, visible to the naked eye as the instantaneous blinding flash.

The lowest part of the ionized channel is discharged first, then successively higher parts, and thus the thunderhead itself becomes discharged, though not necessarily totally. Succeeding sub-strokes, in a multiple stroke discharge, are preceded by surges of negative charge along the ionized channels. These surges are "dart leaders." Flashes can recur at intervals of less than a minute if a storm is in full spate. It may take considerable time for the meteorological processes to reach a state of relative equilibrium, perhaps an hour, and hefty thunderstorms are infamous for spawning offspring by generating further turbulence outside themselves with their down-and outward pouring of very cold air.

Lightning Fast Radio.....

Based on research done in the late fifties and early sixties, it is said that in general the stepped leader radiates radio energy at frequencies above thirty kilohertz, the so-called low frequency (LF) part of the spectrum. The return stroke radiates mostly in the very low frequency (VLF) range, defined as three to thirty kilohertz. The ensuing discharges in the upper branches of the lightning bolt are thought to be responsible for signals in the extremely low frequencies (ELF), three hundred hertz to three kilohertz. Frequencies in the megahertz range are linked with streamers and coronas, which produce radiation before, during, and after lightning.

Whatever the frequency, this much is certain: the lightning-tree is its own enormous antenna, pumping out fundamentals, harmonics, and intermodulation products via groundwave and skywave.

In the mid-century, W.O. Schumann published a theoretical paper outlining the exist-

ence of a resonant frequency (about nine hertz) in the earth-ionosphere capacitor. Experimental work done at the time by Konig verified such a frequency in the eight-to-nine hertz range. It was believed that world lightning was involved in exciting the earth-ionosphere circuit to oscillate at this ultra low level. Other slow sinusoidal variations in this basement-band have been detected at fourteen and twenty hertz, to name just two. They are now known as Schumann Resonances. Electric-field strength here is in the order of millivolts per meter, whereas sferics at a few kilohertz have estimated field-strengths up to one volt per meter.

Some years ago American satellites recorded strange brief radio-frequency emissions above thunderstorms. Shuttle missions reported short bursts of high energy particles, later popularly termed "upward lightning." Apparently neither of these phenomena was visible. But for years pilots of aircraft night-flying in the vicinity of active thunderstorms had occasionally reported visible flashes of light above the cloud formations. Mostly these reports were ignored. However, about a decade ago, pictures taken by American airborne laboratories aboard high-flying DC-8 aircraft showed that the flashes of light lasted for about one thirtieth of a second. They appeared red and frequently occurred in clusters of two or more.

A common location for these "red sprites," as they are now called, was the top rear aspect of thunderheads. Studies revealed that the sprites sometimes widened out as much as ten miles as they leaped spectacularly fifty or sixty miles straight up. This astonishing manifestation of energy reached all the way to the lower layers of the ionosphere, to the D-layer or E-layer, depending on conditions. Radio noise that coincided with the sprites sounded like a distinct "pop."

■ Lightning Listening.....

The heavily damped oscillations of a lightning discharge propagate through space like any other radio emissions. Omnidirectional groundwave occurs. The line-of-sight property of this mode may be considerable, bearing in mind the power and antenna-height possessed by the flash itself. Propagation via the ionosphere also happens, subject to both normal absorption and path-forwarding, depending on conditions.

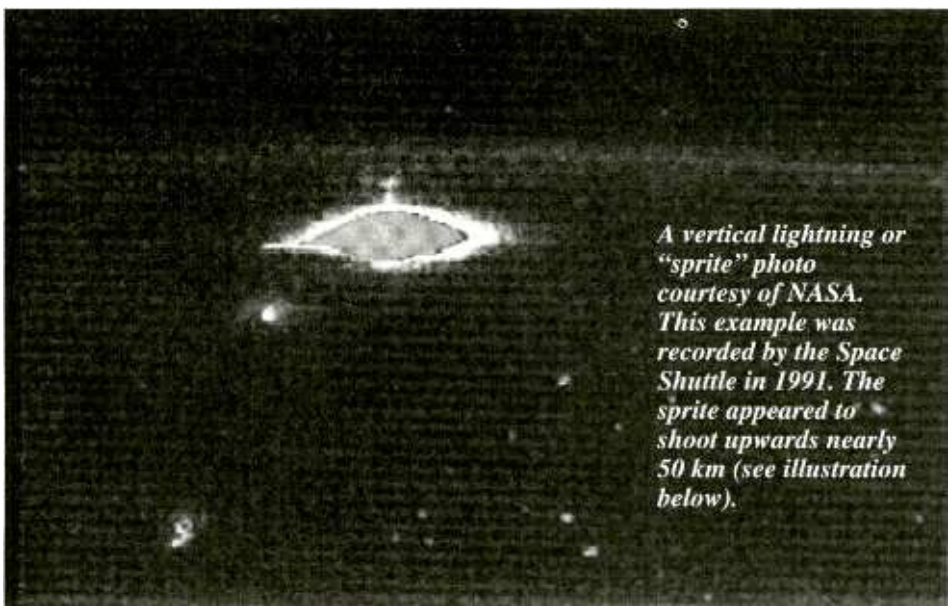
Where propagation does occur in the ionosphere, frequency separation takes place over time and distance, which is normal. The effect of this at a receiving station situated at a great distance from the flash is that the complex discharge of the flash, with its virtually simultaneous emission of a plethora of frequencies, is heard in a modified form. The higher frequencies will travel faster through the ionospheric medium than the lower ones.

The chaotic first crackle received locally may be heard thousands of miles away on a broadband receiver as a very orderly descending tone. These tones can be heard reasonably well (public enemy number one is power-grid hum) on special but very simple receivers capable of being tuned below ten kilohertz, or on a standard shortwave receiver hooked up to a suitable frequency converter.

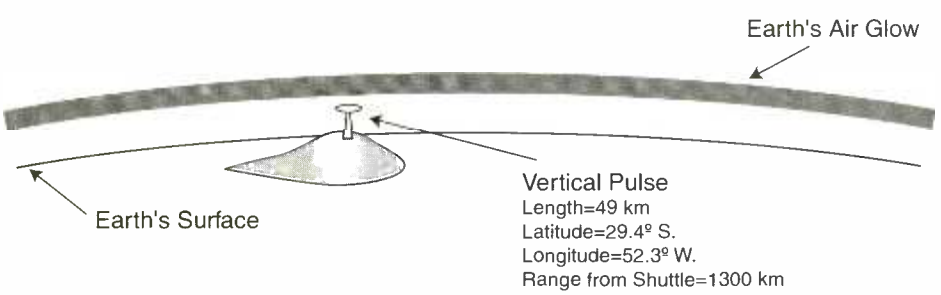
Admittedly, the orderly tones are brief — just a few hundred micro-seconds — but they are audible. The most common ones sound like very short metallic pinging noises, but they vary. Occasionally called "pingers," nowadays they are widely referred to as "tweeks." Don't despair of never hearing these delightful zinging, pinging, and spattering noises from faraway lightning, just because you don't have the proper listening gear. In theory any audio amplifier is capable of registering them, because of their audio-range radio-frequencies.

But you do need an electrically quiet location — one that is removed from man-made trash-static and the aforementioned hum and its harmonics. That can be a tall order. Even those specially built VLF receivers are plagued by power-grid hum when they are used in the wrong locations. A very satisfactory compromise, for a foretaste, is to shell out some bucks on commercially available recordings. (*Ed note: See this month's "What's New" column for one excellent source.*)

Tweeks are often mentioned in the same breath as "whistlers." Whistlers are regarded as the real beauties among all the audible things that can be distilled from the world's lightning network. They are a rarer phenomenon than tweeks, requiring a more subtle set of circumstances in order for them to occur. The radio frequencies that end up as whistlers need to escape from the ionosphere and voyage in a great loop through the magnetosphere, traversing tens, even hundreds, of thousands of miles. This escape of a packet of frequencies is known as "ducting."

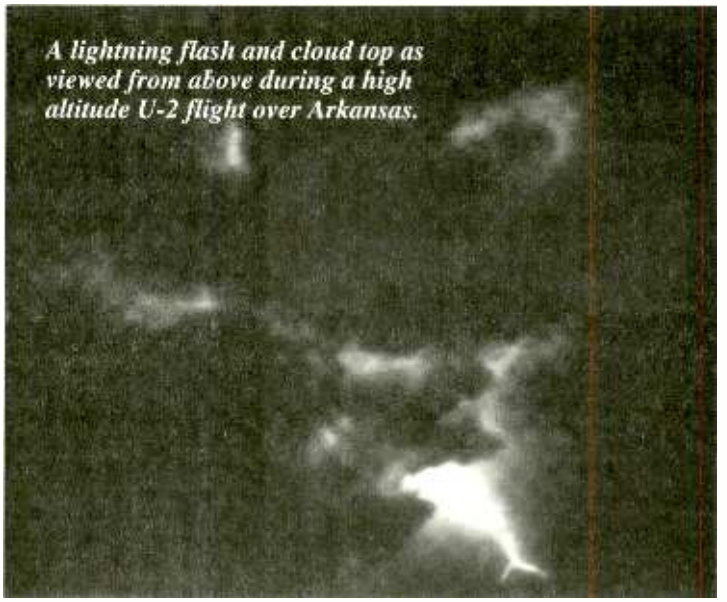


A vertical lightning or "sprite" photo courtesy of NASA. This example was recorded by the Space Shuttle in 1991. The sprite appeared to shoot upwards nearly 50 km (see illustration below).



In recent times there is talk that the giant leap of a red sprite from the top of a thunderhead may be involved in this ducting. (But hold that thought.)

It has also been theorized that the duct may be at some point away from the originating thunderstorm and that frequencies propagating in the ionosphere encounter it and thus escape along lines of force in the magnetosphere. The involvement of the earth's magnetosphere is certain and was proved decades ago by observation and experiment. The long looping journey of the frequency packet through the magnetosphere provides the distance and time required for the frequency dispersion that results in the substantial descending tone that is the whistler. In its best form it is a clear whistle lasting several seconds and ranging from a top pitch of many kilohertz down to a terminal one of a few hundred hertz.



A lightning flash and cloud top as viewed from above during a high altitude U-2 flight over Arkansas.

The role of the magnetosphere is very clearly recognized from the fact that, given the right conditions, a lightning flash in one polar hemisphere of the world will be heard as a short ("one-hop") whistler at a conjugate magnetic point in the opposite polar hemisphere. If a reflection occurs, then a longer ("two-hop") whistler will be heard back in the vicinity of the causal flash, immediately after the initial click of static. The vicinity or footprint can have dimensions of hundreds of miles. Further reflection of the energy packet will result in an "echo-train," with lengthening of the whistler and natural attenuation happening simultaneously.

At least one other category of sferics seems to owe its existence to the lightning bolt. Researchers refer to this category as "discrete emissions," including in it phenomena such as "risers," "hooks," and certain types of "chorus." Risers are very short upward tones, sometimes pure, sometimes hissy. Hooks are also short tones but first they fall in pitch, then suddenly rise and fade out. Chorus is a chaos of tones that always seems to remind listeners of animal or bird life, with its imitations of barks, croaks, chirps. (It must not be confused with "auroral chorus" which is not linked to lightning, but to the Northern and Southern Lights and consequently to ejecta from the sun entering the magnetosphere.)

Discrete emissions are thought to be triggered near the equator by interaction between the radio energy in whistlers and high energy electrons in the magnetosphere. Doppler-shift is believed to account for the tonal ups and downs.

Epilogue.....

Because it is three hundred thousand volts negative with respect to the ionosphere, the surface of the earth leaks electrons constantly to the air. The potential gradient and the facility of a small amount of natural ions in the atmosphere causes the electrons to drift towards the ionosphere. The flow amounts to an estimated eighteen hundred amperes of current globally, or locally to a mere nine millionths of an ampere for every square mile.

Objects everywhere, both natural and manmade, are engaged in this leakage of electrons. The more sharply pointed and higher an object is, the more readily it leaks. It is simply coronal discharge on a minuscule scale. Lightning conductors are designed with a modification of this phenomenon in mind.

About four out of every five lightning strokes that hit the earth cause a net return of electrons. A typical flash delivers billions upon billions. Without this natural restoration of balance, scientists as far back as the thirties reckoned that the entire earth would lose its surface charge in less than an hour. Lightning, it seems, is not only a "global radio network" that makes for engrossing research and fun listening, it is also a serious "World Service."

Super Truckin'

More Super Race Freqs

"Superfreq superfreq Its superfreqy yaaoow!"

By Mike Bryson

I took some liberties with an old song by Rick James, because that's just how I feel about a lesser-known division of NASCAR — the Craftsman Supertruck series.

Found on many of the same short tracks (and some new ones) as its Winston Cup and Busch Grand National series, the Craftsman Supertruck series is another division of NASCAR racing that will light your scanner fire. The Supertruck series was started in 1994 and has increased in popularity ever since.

Like their Winston Cup cousins, these trucks are far from the everyday trucks that are found on the street. These super trucks are really full-blown race cars in truck's clothing. The body dimensions are regulated by NASCAR to be nearly identical to the four models of the full-sized trucks raced in this series. Fans can easily identify with Ford's F150, Chevy's C-1500, and GMC's C-1500. Even Chrysler fans have something to hoot about with the Dodge 1500 racing alongside (and sometimes in front of) the usual Ford, General Motors duo of NASCAR (Chrysler dropped out of Winston Cup and Busch divisions many moons ago).

There is one big difference in the SuperTruck body, however; the truck "bed" is nonfunctional as far as trucks go. There is a covered access panel in its place similar to the rear deck lid of a race car. The only "hauling" you'll do with this truck is — well, you know.

Underneath the truck suit is a race car very similar to the Winston Cup cars. The engine produces about 500 horsepower from its 358 cubic inch V-8. As Mike Bliss, a regular SuperTruck driver, states, "It has been tough trying to remember to call it a race 'truck' rather than a race car."

■ SuperFreqs

It seems that almost every racing site on the Internet has links to the Winston Cup and Busch Grand National frequencies, but I found locating SuperTruck frequencies a bit tricker. Using a search engine like Excite, I asked for any information containing **NASCAR**, **SuperTruck**, and **frequencies**. (The more detailed you make your search, the better.) As always, some of your results will turn up old links — pick the ones that indicate they were updated in 1997! Teams can change drivers like underwear and frequencies only slightly less often.

Fortunately, I knew from previous experience that a great site for finding racing frequencies is from the good folks at Northtex Motorsports. Their web site can be found at "**http:\\www.northtex.com.**" Check to see if there's a SuperTruck race coming near you, 'cause for great entertainment you "*can't touch this*"!

Craftsman Truck Series 1997 Schedule

Date		Venue
June	6	Texas Motor Speedway
	21	Bristol Motor Speedway
	29	Nazareth Speedway
July	5	Milwaukee Mile
	12	Louisville Motor Speedway
	19	Colorado National Speedway
	27	Heartland Park Topeka
	31	Indianapolis Raceway Park
August	9	Flemington Speedway
	16	Nashville Speedway USA
	24	Watkins Glen Intl Raceway
Spetember	4	Richmond Intl Raceway
	27	Martinsville Speedway
October	5	Sears Point Raceway
	12	Mesa Marin Raceway
	18	California Speedway
November	1	Phoenix Intl Raceway
	9	Las Vegas Motor Speedway

Courtesy of Northtex Motorsports, **http://www.northtex.com**

1997 NASCAR Craftsman Truck Series Frequencies

Driver	Primary	2nd	3rd
1 M. Colabucci	465.6375		
2 Mike Bliss	468.3125	469.400	457.9750
3 Mike Skinner	462.1250	466.9250	
4 Tony Stewart	464.9625		
4 Morgan-McClure	451.9625		
5 Darrell Waltrip	469.3125		
5 Terry Labonte	468.2125		
6 Rick Carelli	465.8125		
7 Dave Rezendes	457.3750	463.9750	457.1750
8 John Nemechek	464.7625		
10 Curtis Markham	465.6375		
11 Joe Gaita	461.1125		
11 Mike Hurlburt	469.4125	469.2875	461.0500
12 Dave Smith	465.8625		
14 Butch Gilliland	464.5625	464.5500	
15 B. Gill	467.7000	452.8250	
16 Ron Hornaday	466.5250	469.0125	
17 Bill Sedgwick	469.3125	467.1625	
18 Green/Benson	464.0625		
19 J. Chapman	466.6500		
20 Walker Evans	461.6500		
21 Doug George	469.5625	465.7625	
22 Rusty Wallace	461.3375	461.5875	
23 T.J. Clark	466.8625	467.2125	
24 Jack Sprague	466.3375	468.2120	469.4875
25 Roger Mears	461.1750		
26 MB Racing	469.5125		
28 Ernie Irvan	466.4500		
29 Bob Keselowski	464.6250	466.5750	
30 Jimmy Hensley	467.0000		
31 Bob Brevak	451.9625		
32 Kenny Hendrick	462.7125		
33 Harry Gant	461.1500		
35 Bill Venturini	468.9250		
37 Bob Strait	467.8750		
38 Ernie Cope	469.4750	469.4125	
40 Carlos Serrano	463.8750		
41 A.J. Foyt	461.8375		
42 Robbie Reiser	464.9625		
43 Gordon/Sauter	852.1875		
44 Bryan Reffner	462.1625		
48 Bobby Hamilton	461.6625		
51 TJ Clark	468.8125		
52 Ken Schrader	467.6875		
54 Steve McEarchern	464.1500		
61 Randy Tolsma	461.1125		
64 Michael Dokken	461.4000		
65 Kenny Allen	460.8875	466.6875	
68 Bobby Dotter	462.5625		
71 Ron Newman	461.1125		
72 Kevin Harvick	469.1875		
73 Bob Schact	460.1375		
75 Nathan Buttke	457.8125	460.9125	
	469.6750		
77 Scott Lagasse	463.3750	469.5500	
78 Mike Chase	466.2500		
80 Joe Ruttman	460.9500		
81 Jerry Glanville	466.5750	467.7750	
	468.8250		
83 Steve Portenga	464.1875		
87 Joe Nemechek	460.2375	463.7125	
	464.7625		
88 Terry Cooke	468.6875		
90 Lance Norick	466.4125		
92 C. Cragan	462.3625		
94 Ron Barfield	469.8750	468.6750	
98 Kenny Irwin	463.7125	463.7375	
99 Gary Herrin	469.2500		
01 Billy Ogle	463.8875		
03 Tommy Archer	463.5125	466.5125	
07 Geoff Bodine	463.1750		
NASCAR 1	463.8500		
NASCAR 2	468.8500		
Truck Racing Network	454.0000		

Courtesy of Northtex Motorsports, **http://www.northtex.com**

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- 10 Priority Channels
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- Scan Delay
- Bank Scan
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- Priority Scan with Hierarchy
- Priority
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DXing Canada's Northwest Territories'

MARITIME STATIONS

By Jon Van Allen

In one's quest for a new and different monitoring challenge, sometimes the obvious is overlooked. I don't know about you, but when I think of exotic utility DX, I generally don't think of maritime stations. That is, until I started looking through my ITU (International Telecommunications Union) books for something out of the ordinary.

I discovered something I had nearly forgotten about from earlier exploits—the seasonal maritime stations in Canada's Northwest Territories (NWT). Operated by the Canadian Coast Guard, these stations are spread across the extreme far north of the NWT to assist vessels that venture into the extreme far north.

DXing these outposts on the northern frontier brings back the excitement of exploring Northern Canada as a youngster. The idea of being able to communicate with the most remote outposts stirred my passion to learn more about the world, and there's where my interest in radio began.

Navigation in the far north can be treacherous even in the relatively hospitable summer months because of rapid changes in weather, shifting and melting ice, etc. Ships require the facilities of dedicated stations to keep them in touch with civilization. Above 70 deg. north latitude, ships are too far north to access the Inmarsat satellites which are in

Potential disaster for ships looms as close as the nearest iceberg in the inlets of the Northwest Territory.

geostationary orbit above the equator.

This is where the nitty gritty of using communications for survival can be very important on short notice. Equipment and skills need to be more than just picking up the "bat phone" (as we call the satellite phone aboard ships) and placing a call.

Among the types of traffic handled by the VFA/VFF/VFR stations are AMVER (Automated Mutual-assistance Vessel Rescue system), OBS METEO (weather observations), ICE info (iceberg warnings and visual position) and routing, voice warnings and forecasts, medical advice and information via phone patch.

These stations are indeed seasonal; they are in service when the routes are not iced in, generally from late June through mid-October. Due to their locations, operation only a few months per year, and proximity to Aurora Borealis, monitoring conditions present a real challenge.

Table 1 lists the variety of modes and frequencies in use, there should be something of interest to DXers and beacon hunters alike. Notice the modes include CW (Morse code), voice, and weather fax. Conspicuously absent is SITOR radio telex. Most coastal stations offer SITOR to automatically handle traffic. Perhaps the seasonal nature of the stations vs. the cost of the equipment makes this mode prohibitive.

Let's start with VFR, Resolute Coast Guard Radio. At 74-45 N, 94-58 W, VFR is Canada's northernmost maritime station, even farther north than the magnetic north pole! It serves vessels transiting the Melville Sound and M'Clure Strait.

Further south are the four locations of VFA Coast Guard Radio. At 68-10 N, 133-35 W is VFA Inuvik. Nearby is VFA Parsons Lake at 68-53 N, 133-56 W. Both stations are on the mainland of the NWT. Southeast at 67-49 N, 115-06 W is VFA Coppermine. Finally there is VFA Cambridge Bay on the south shore of Victoria Island at 69-07 N, 105-00 W.

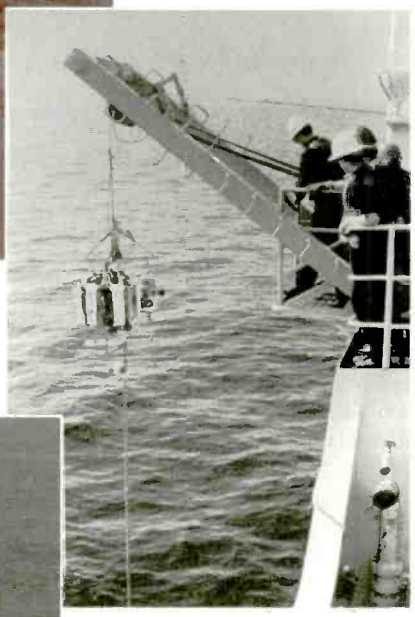
Last stop is VFF, Iqaluit Coast Guard Radio, located 63-43N, 68-33 W., VFF Killinek at 60-25 N, 64-50 W, and VFF Coral Harbour at 64-09 N, 83-22 W, which is remotely controlled by Iqaluit. The number of stations covering over 1 million square miles in proportion to a population less than 50,000 people is amazing. Not many people choose to live this far north.

VFF and VFR provide weather fax to mariners on 3253 and 7710 kHz. (Carrier is 1.9 kHz lower, 3251.1, 7708.1 kHz.) See Table 2 for times, areas, and content of charts, etc.

Note that 500 kHz CW is still in use. The death of Morse code as a viable mode assumes the final implementation of GMDSS, as required by international law. But the system is a long way from being up and running smoothly. Don't count those 500 kHz stations out for awhile.

It's interesting to note that many longwave beacons across the NWT are monitored by DXers stateside. The coastal beacons are used by aeronautical and maritime vessels for navigation. For instance, YEK (329 kHz) at Eskimo Point on Hudson Bay has been heard across North America even though it's listed as having a "normal range" of 150 miles in the ITU publication *Radio-determination and Special Service Stations*. We all know DX doesn't abide by "normal" rules! These beacons and 500 kHz from VFF and VFR should be able to be heard under good conditions during darkness.

Maritime radio in the Northwest Territories involves everything from Coast Guard air and sea operations to commercial shipping.



I have monitored VFA on 12 MHz with a fair signal at my Utah location. Listening to 500 and 2182 kHz in the summer months isn't my idea of ideal DXing, but who said it would be easy? Here's an excellent chance to see just how good that fancy loop you bought really works! Luckily, the HF CW and SSB frequencies will be easier to hear and identify.

It's worth mentioning that VFF Coral Harbour maintains a watch on the distress frequencies from 0000 to 1200 UTC for medical and emergency traffic during closed shipping season.

To make our DXing more enticing, let's toss in some longwave coastal beacons in the NWT. These are:

B	Button Island	312 kHz	64-37 W	60-41 N
YCS	Chesterfield Inlet	341 kHz	90-42 W	63-20 N
ZS	Coral Harbour	362 kHz	83-22 W	64-08 N
RT	Rankin Inlet	284 kHz	92-06 W	62-48 N
YEK	Eskimo Point	329 kHz		

These beacons are used for navigation by aircraft and ships alike. There are other inland beacons, but they may be of more interest to the aero ute crowd. Hopefully, the address I have used in the past will still bring a QSL in these days of budget cuts. Reception reports should go to the following address in the given format:

Inuvik Coast Guard Radio VFA
(or VFF, VFR)
Department of Transport
Ottawa, Ontario K1A 0N7

Good luck in monitoring and QSLing these most interesting stations!

TABLE 1

(Frequencies kHz unless otherwise noted)

Station	Frequency	Mode*	Power kW	Notes
VFA	4292.0	CW	1.0	CW working freq
INUVIK	6351.5	CW	0.2	CW working freq
	8456.0	CW	1.0	CW working freq
	12671.0	CW	0.2	CW working freq
	2182.0	AM	0.28	Calling & distress
	2558.0	USB	1.0	MF SSB working
	4363.0	USB	1.0	ITU channel 403
	5803.0	USB	1.0	Simplex
	6218.6	USB	1.0	Simplex
	6501.0	USB	1.0	ITU channel 601
	8794.0	USB	1.0	ITU channel 826
	13116.0	USB	1.0	ITU channel 1214
	156.8 MHz	FM	0.06	VHF channel 16
	161.9 MHz	FM	0.06	VHF channel 26
VFF	416.0	CW	1.0	CW working freq
IQALUIT	430.0	CW	1.0	CW working freq
	484.0	CW	1.0	CW working freq
	500.0	Modulated CW	1.0	Calling & distress
	4236.5	CW	5.0	CW working freq
	6335.5	CW	5.0	CW working freq
	8443.0	CW	5.0	CW working freq
	12671.0	CW	5.0	CW working freq
	2182.0	AM	1.2	Calling & distress
	2514.0	USB	1.0	MF SSB working
	2582.0	USB	1.0	MF SSB working
	4375.0	USB	1.0	ITU channel 407
	6507.0	USB	5.0	ITU channel 603
	6513.0	USB	1.0	ITU channel 605
	8752.0	USB	5.0	ITU channel 812
	13077.0	USB	5.0	ITU channel 1201
	1256.8 MHz	FM	0.1	VHF channel 16
	161.9 MHz	FM	0.1	VHF channel 26
VFR	474.0	CW	1.0	CW working freq
RESOLUTE	500.0	Modulated CW	1.0	Calling & distress
	4334.0	CW	1.0	CW working freq
	6438.0	CW	1.0	CW working freq
	2182.0	AM	1.2	Calling & distress
	2582.0	USB	5.0	MF SSB working
	4375.0	USB	5.0	ITU channel 407
	8791.0	USB	5.0	ITU channel 825
	156.8 MHz	FM	0.1	VHF channel 16
	161.9 MHz	FM	0.1	VHF channel 26

Weather alerts and beacons for navigation in this region can often be heard throughout North America, even though most are intended for local or regional use.

TABLE 2: Weather Fax Stations VFF and VFR

Station	Frequencies	Emission	Power	Months of Operation
VFR	3253.0 kHz	FAX	1.0 kW	1 July - 15 October
VFR	7710.0 kHz	FAX	3.0 kW	1 July - 15 October

Trans Time	Contents	RPM/IOC	Valid Time	Map Area
0001/----	Aircraft Obs.			
	Ice Chart	120/576	Latest	
----/1430	Ice analysis	120/576	Latest	B
1035/2232	Surface anal.	120/576	06/18	A
1049/2246	18 hr surface prognosis	120/576	06/18	B
----/2304	Ice analysis	120/576	Latest	B

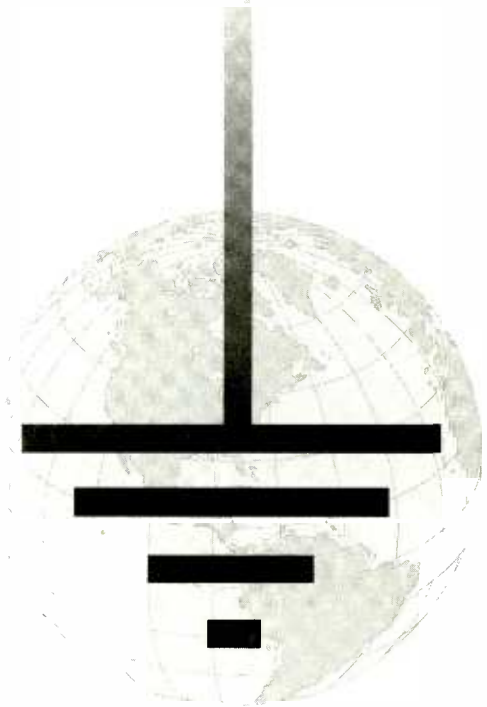
Map Area:
A - Portions of Hudson Bay, Hudson Strait, East Coast of Baffin Island, Lancaster Sound, Queen Elizabeth Islands
B - Baffin Bay, Queen Elizabeth Island Channel, Parry Channel, Beaufort Sea/ Alaskan Coast, Waterway to Spence Bay

Station	Frequencies	Emission	Power	Months of Operation
VFF	3253.0 kHz	F3C	1.0 kW	1 July - 15 October
VFF	7710.0 kHz	F3C	3.0 kW	1 July - 15 October

Trans Time	Contents	RPM/IOC	Valid Time	Map Area
0100/----	Aircraft OBS			
	ice chart	120/576	Latest	
----/2000	Ice analysis	120/576	Latest	A
0952/2155	Surface analysis		120/576	06/18 A
1006/2209	18 hr surface analysis		120/576	06/18 A

Map Area:
A - Labrador Coast, Davis Strait, Baffin Bay, Foxe Bay, Hudson Strait, Hudson Bay

The Lowdown On the Best Earth-Ground To Be Found



By Philip Gebhardt, VA3ACK

Ahhh, life would be so simple in Radio Land, if the Earth provided an electrically perfect ground. In that case, this story would end here. But it's not perfect. That's why, for example, quarter-wave vertical antennas need radials rather than a simple alligator clip connection to the nearest lump of soil.

This imperfection can be an obstacle to easy DXing. But, it can also produce spectacular opportunities for DXers who understand how the Earth interacts with radio signals.

Take mediumwave DXing, for instance. The ground wave radiates from the transmitting antenna and propagates along the surface of the Earth. Some signal penetrates the ground and induces earth currents. Since the Earth is not a perfect conductor, signal power is dissipated as the currents move through the Earth. The process continues with more signal power penetrating the Earth, more current being induced and more power being dissipated. The farther the signal travels, the more signal loss there is and the weaker the signal becomes. Eventually, the signal becomes too weak to be heard.

Not only is the Earth not a perfect conductor, but it is a better conductor in some places than in others.

Table I shows how conductivity changes from one region to another.

Many readers may be more familiar with *resistance* than *conductance*. Resistance (R) is a measure of how much a circuit impedes or resists current flow. Its basic unit is the ohm. (It may also be expressed in kilohms and megohms.) High values of resistance result in high power dissipation; low values result in low power dissipation.

Conductance (G) is the opposite. It is a measure of how easily current can flow in a circuit. Its basic unit is the mho. (Smaller units are the millimho and the micromho.) High values of conductance result in low power dissipation; low values result in high power dissipation. In other words, resistance and conductance are two means for expressing the same thing—the ability of a circuit to pass current.

TABLE I

General Values of Earth Conductivity. The higher the value, the farther a signal will travel. Values are often expressed as a range rather than a single value. Signals travel farthest over salt water as mentioned later in the text.

Type of Terrain	Conductivity (in millimhos per meter)
poor soil	1
moderate soil	3
fair soil	10
average soil	5 to 20
good soil	10 to 30
very good soil	100
fresh water	1 to 10
sea water	3000 to 5000

For example, a resistance of 100 ohms is equivalent to a conductance of 0.01 mhos. (G = 1/R). You can even re-write Ohm's Law, so I = E/R becomes I = E x G. Assume a supply voltage (E) of 200 volts. The current (I) flowing through the 100-ohm resistance is 100/200 or 2 amperes. The current flowing

TABLE II

Using a hypothetical station located over a perfect conductor, you can compare its coverage area over various terrain to the coverage area of real stations with the same transmitter power and antenna. In this table, the hypothetical station has a range of 1000 miles. For DXing stations via groundwave propagation, living by the ocean is a major advantage.

Type of Terrain	Range (in miles)
very dry soil	55
dry soil	150
damp soil	270
wet soil	560
fresh water or very wet soil	700
sea water	920

through the equivalent 0.01-mho conductance is 200 x 0.01 or 2 amperes. (The power formula $P = E^2/R$ can be re-written as $P = E^2 \times G$. Using either formula, you can see that the power dissipated in this circuit is 400 watts.)

All this is a way of saying that we could talk about ground resistivity, but the techie-types talk about ground conductivity, so we'll use that term here. (You may have noticed that sometimes I refer to resistance and conductance while other times I use the terms resistivity and conductivity. See Resistance vs. Resistivity next to this article for an explanation of these terms.)

Mediumwave DXers would like an Earth with high conductivity (that is, low resistivity), so power losses would be low and ground waves could travel farther.

Table II shows how the Earth's conductivity affects coverage area.

You can determine the ground conductivity in your yard very easily. Your first inclination might be to attach two probes to the ground (sort of like attaching two alligator clips to a resistor) and then to apply a dc voltage. By measuring the current flow you could use Ohm's Law (G = I/E) to calculate conductivity.

Not so fast. It's easy, but not quite that easy. There are several problems with this simple approach. The most obvious question is: How far apart should you place the probes? Not so obvious perhaps is that the conductivity of the Earth can change as you go deeper. So, should you measure conductivity at the surface? Below the surface? If so, how far below? The most serious problem, however, may be apparent only to chemists and geologists. When you pass direct current through the ground, the ground becomes polarized at the probes and you obtain false readings.

The solution to the last problem is to use alternating current. As the current changes direction each half cycle, the polarization effect cancels.

The solution to the other two problems is to follow a standard circuit.

The circuit of Figure 2 was developed by M.C. Waltz, W2FNQ, and was described by Jerry Sevick, W2FMI, in his article "Short Ground-Radial Systems for Short Verticals." (*QST*, March 1981, page 38)

Resistor R_1 presents a slight inconvenience. Sevick suggests using a parallel combination of three 68-ohm, 1-watt resistors and two 82-ohm, 1-watt resistors to produce the required 14.6-ohm, 5-watt resistance. I opted for convenience and bought a 15-ohm, 10-watt resistor.

Constructing the circuit is easy. To accommodate the 100-watt lamp (L_1), I mounted a keyless, plastic, ceiling lampholder on the inside wall of a small, plastic pail. Two binding posts on the bottom (which became the top of the inverted pail) allowed me to mount the 15-ohm resistor (R_1) inside the pail and provided a convenient means outside the pail for measuring the voltage across the resistor. The four probes are made of 1/2-inch copper pipe. They are spaced 18 inches apart in a straight line and driven 12 inches into the ground. I placed tube end caps on the top of each probe to prevent rain entering the pipe and soaking

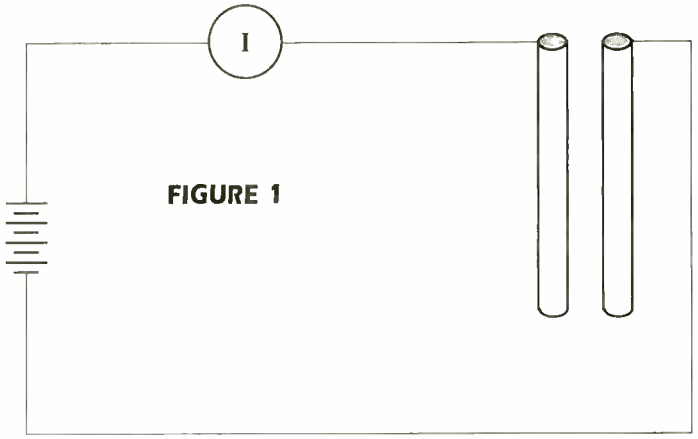


FIGURE 1

A simple dc circuit such as this one will yield inaccurate readings.

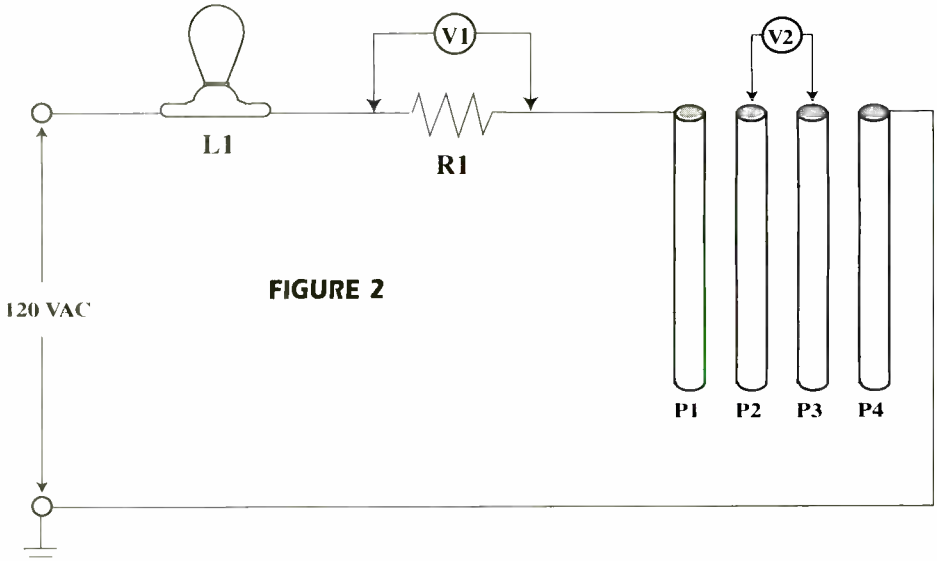
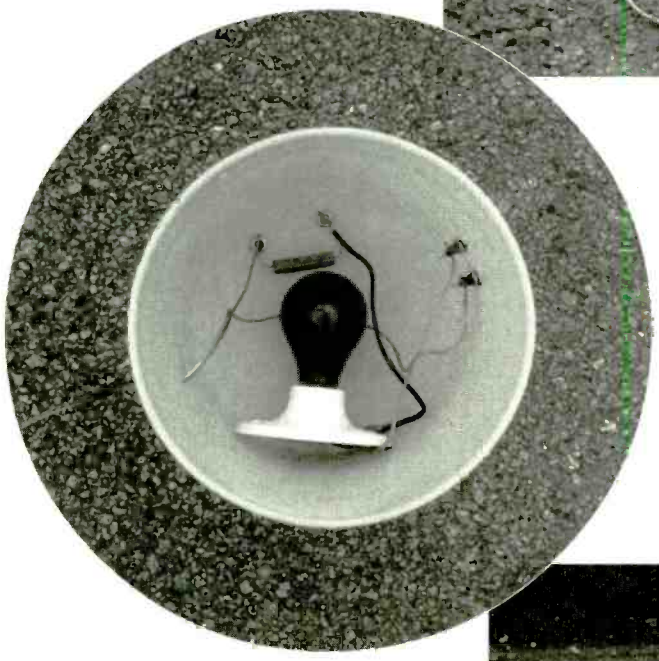


FIGURE 2

This basic circuit (see Figure 2) overcomes the problems associated with the simple dc circuit of Figure 1. In this circuit, the dc source is replaced by 120 VAC house current. It also uses a 4-probe system rather than the 2-probe system of Figure 1. R_1 is discussed in the text. Use a polarized plug to ensure that probe P_4 is connected to the grounded side of the ac power line. The ground symbol in the diagram simply indicates which is the grounded wire from the house supply. Therefore, there is no need for you to ground this point. This circuit provides results accurate enough for hobbyists.

Shown in this photo is the small, plastic pail which houses the basic circuit for the ground conductivity tests. The 120 VAC power line can be seen entering the wall of the pail on the left. The binding posts on the top are connected to resistor R_1 to facilitate measuring the voltage drop across it. The wires connecting probes P_1 and P_4 to the circuit attach to the binding posts seen mounted on the wall of the pail (right side).



Both resistor R1 and the 100-watt lamp (L_1) are housed inside the pail. The lamp screws into a plastic, ceiling lampholder mounted on the wall of the pail. The 15-ohm, 10-watt resistor can be seen just above and slightly to the left of the lamp. The binding posts seen on the right connect to wires leading to probes P_1 and P_4.

into the ground.

All that remained was to run the 120 VAC power cord into the pail, run the two wires for the probes out of the pail and connect the lamp to the resistor. I attached the wires to the outer probes (P_1 and P_4) using ring terminals and self-tapping screws.

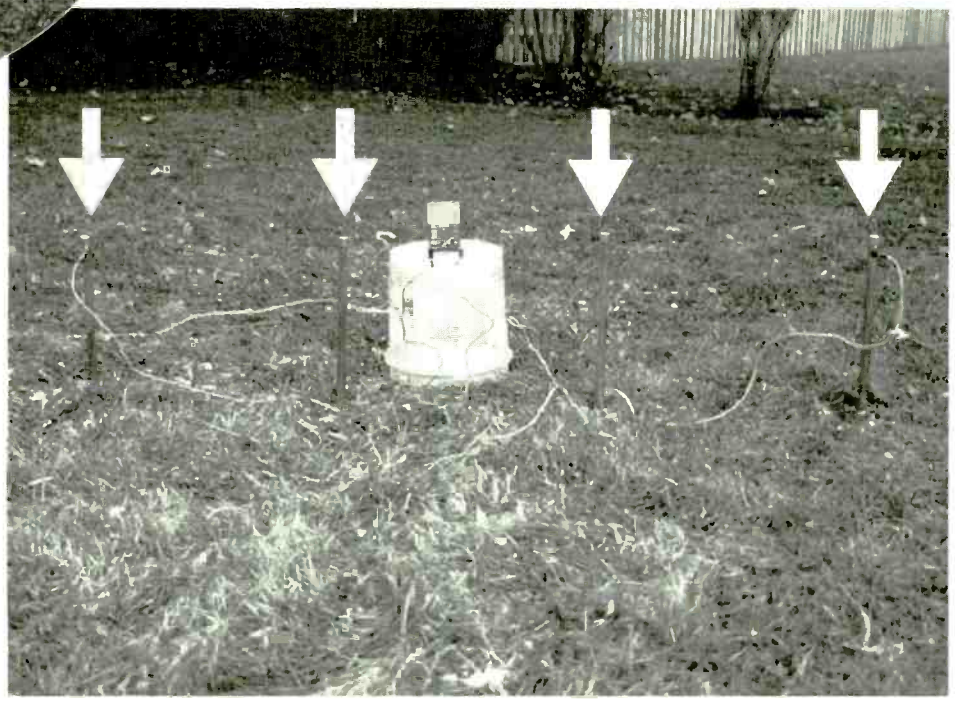
Remember: You are using a 120-volt source and one side of the source is grounded. Since you are standing on the ground, you are also grounded. Therefore, when power is applied, keep your fingers *out* of the pail and *off* the probes.

To determine the conductivity in your yard, you'll need to measure the voltage (V_1) across R_1 and the voltage (V_2) between probes P_2 and P_3. Substitute these values in the equation which follows and you'll be able to calculate the conductivity in millimhos per meter. You can then compare your result to the values in Table 1.

$g = 21 \times V^1/V^2$

I monitored the ground conductivity in my backyard for four months. The results appear in Figure III. Unexpectedly, the values led me to some useful observations.

The conductivity changed with the presence of rain. However, the rain takes time to penetrate the soil in my backyard, so conductivity does not increase immediately. It may not increase at all with small amounts of rain. Rainfall had been steady during July (the month previous to starting the measurements) so the ground conductivity was relatively high.



The complete unit consists of the pail which houses resistor R_1 and lamp L_1, a meter which measures voltage V_1 across resistor R_1 as well as voltage V_2 between probes P_2 and P_3, four 1/2-inch copper-pipe probes (see arrows) driven 12 inches into the ground about 18 inches apart, a connection to 120 VAC and a pair of wires connecting the circuit in the pail to the outer two probes (P_1 and P_4). To avoid a shock, keep your hands off the components in the pail and the probes when power is applied. For the same reason, do not leave the circuit unattended when the power is applied especially if children or animals are nearby.

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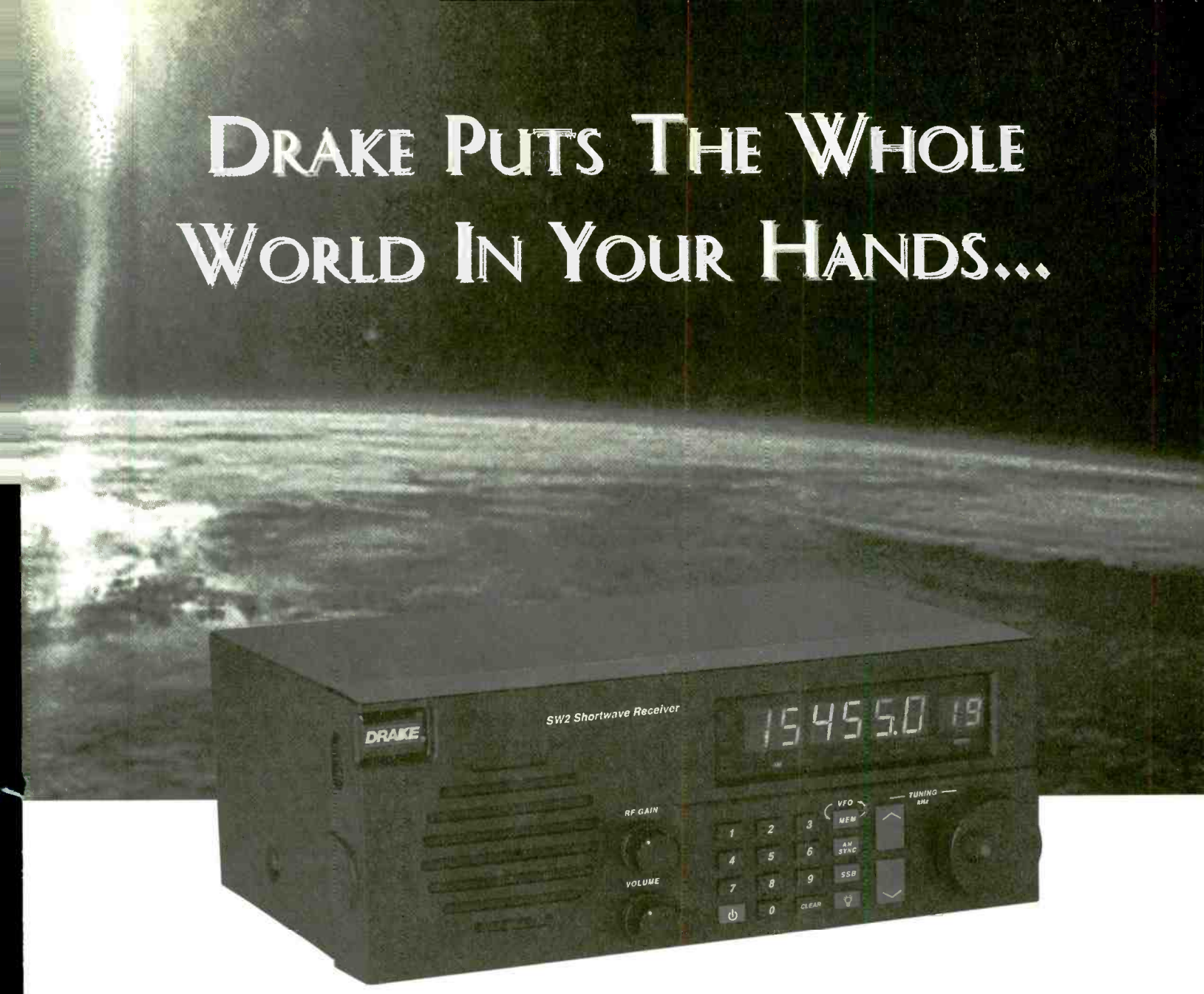

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However, little rainfall was experienced during August and September and the conductivity generally declined.

An occasional increase can be seen due to sporadic rain. In early October, a tropical storm passed through southern Ontario resulting in heavy rainfall for several days. Consequently, the conductivity rose rapidly to a high value. Heavy rains in October and November kept the conductivity high.

What does all this mean? As Table I and Table II show, it would be nice to select your DX listening location. Not all of us can, which is why DXpeditions are organized. I observed just how important ground conductivity is while I was living in Nassau, Bahamas. At noon one day, I was testing a simple mediumwave loop antenna that I planned to use for a demonstration. To my surprise, I heard WBMQ, a 5 kW station on 630 kHz in Savannah, Georgia! Subsequent checks revealed that daytime reception of WBMQ was consistent. However, other more powerful, inland stations could not be heard. The reason? The 540-mile path between Savannah and Nassau is entirely over salt water. Moving inland in Georgia increases the amount of land over which the signal must travel and consequently increases the signal attenuation of the more powerful stations.

I've noticed a similar, but far less pronounced effect in Toronto, Ontario. Signals from MW stations to the south across Lake Ontario are stronger than more powerful stations from the north where signals must travel across land. Signals from stations along the shoreline also improve. I hear CFFX (960 kHz with 10 kW) in Kingston, Ontario, much better than closer, inland stations.

Coastal areas, especially low-lying areas, have a further advantage because ground conductivity increases as the dissolved salt content increases. Salt-laden winds off the ocean, while the bane of gardeners, are a boon for DXers. The salt tends to accumulate in sandy soils. Even better, if the ground contains spongy, organic material, it will also retain moisture and the salt will be readily dissolved.

Since wet land propagates signals more effectively than dry ground, spring rains and melting snow can extend the ground wave signal range. If the path between you and the station changes from dry to wet during the spring, listen for daytime stations you might not normally hear. (Ground conductivity also increases as ground temperature increases.) Also watch for extended periods of heavy rainfall—especially over large areas—at any time of year. For example, hurricanes or tropical storms moving up the east coast can extend your reception area.

The higher the frequency of a signal, the greater the signal attenuation over a given path. Standard graphs used by Peter N. Saveskie, W4LGF, in his *Radio Propagation Handbook* show that the received groundwave signal from a 10 MHz, 1 kW station is about 10 dB weaker than a 550 kHz, 1 kW signal over a 60-mile salt water path. When the signals travel the same distance over good soil, the 10 MHz signal is about 65 dB weaker than the 550 kHz signal.

Signals from longwave stations will travel even farther than mediumwave signals and will be stronger.

Knowing a little bit about groundwave propagation can go a long way toward logging those stations that are normally out of reach. And for your next vacation—head for the coast for some spectacular groundwave DXing.

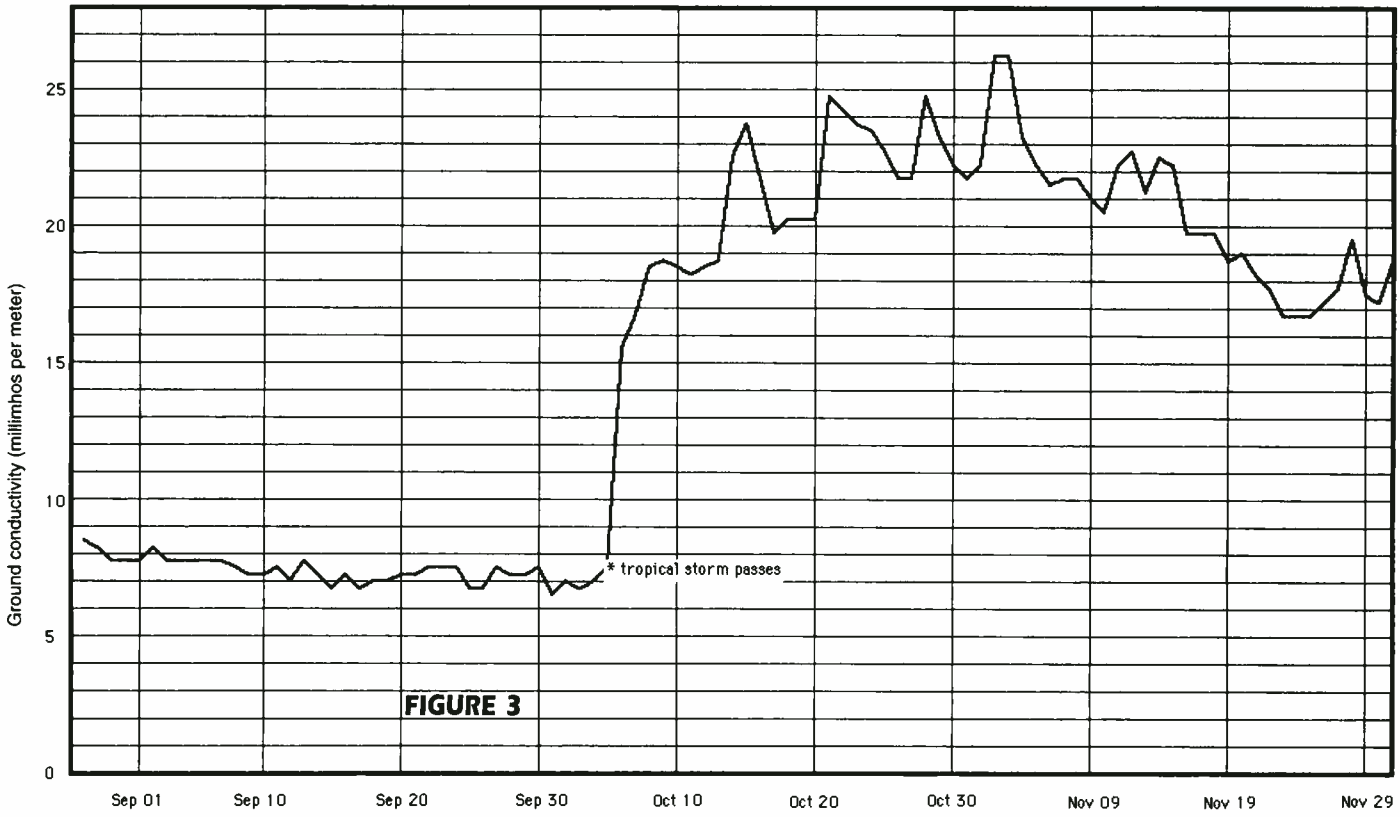


FIGURE 3

Partial results of ground conductivity measurements in my backyard. Notice the abrupt change in early October after the heavy rainfall associated with the tropical storm. Periodic heavy rainfall throughout the following month was responsible for maintaining the ground conductivity at a high level.

Resistance vs. Resistivity

Imagine that you have two wires—one copper, the other silver. Which wire has the lower resistance? The tendency is to say "silver" because we know that silver is a better conductor than copper.

In fact, we don't know which wire has the lower resistance. For example, a 2-yard length of No. 18 silver wire would indeed have a lower resistance than a similar length of copper wire. But, that same piece of silver wire would have a higher resistance than a 1-yard length of No. 18 copper wire.

Wire diameter also affects resistance. Even though silver is a better conductor than copper, that same 2-yard length of No. 18 silver wire would have higher resistance than the same length of No. 12 copper wire.

To make a comparison and establish which metal is the better conductor, we need a standard. The standard for establishing the resistance of metals is a cube with 1-centimeter sides. In this case, the resistance of silver is lower than copper. Similarly, by this standard, the resistance of tin, lead, and nickel is higher than the resistance of copper.

The resistance of this standard cube is known as the resistivity of the metal and it enables you to compare how different metals resist current flow.

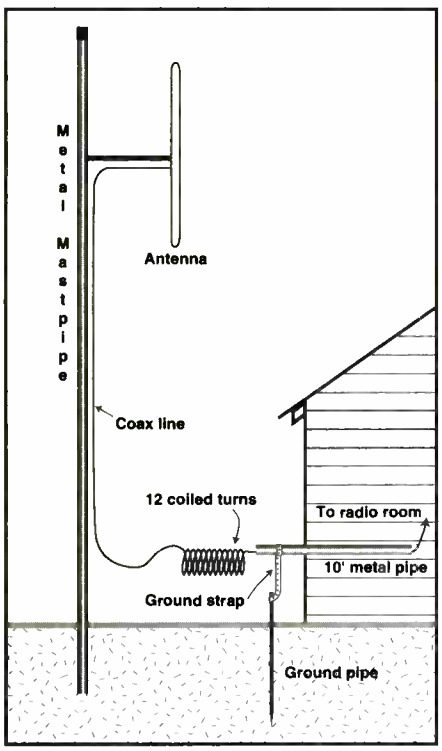
Similarly, when we want to compare the ground conductance in different areas, we need some standard to make sure that we are making a valid comparison. Comparing the conductance of a 2-yard stretch of fair soil is not a fair comparison to the conductance of a 10-yard section of good soil.

The established standard for conductance is known as conductivity. By using standard practices, standard circuits and standard formulas as illustrated in the accompanying article, it is possible to establish the effect the Earth has on radio signals and compare various locations.

Soil Conductivity and Grounding

Adapted from the *Antenna Factbook* by Bob Grove

As the foregoing article indicates, the earth plays an important role in radio signal propagation. However, radio waves only travel through the ground at very close ranges or at low frequencies, so, for signal propagation, the electrical qualities of soil are significant only in reception of low and medium wave stations. At higher frequencies, radio waves are intercepted by the antenna metal, but not by the soil beneath it which absorbs and dissipates the signal as heat.



Still, the same qualities which make the soil a good conductor of low-frequency radio waves also make it a good conductor for grounding your radio equipment. Attaching the chassis of your radio to a buried conductor in moist soil will protect you from electrical shock, drain off static charge buildup, help dissipate nearby lightning-induced spikes, and even reduce electrical noise pickup.

A good electrical ground consists minimally of two eight-food metal rods, at least ten feet apart, connected to the radio equipment by a short length of heavy braid. As indicated in the accompanying article, moist, mineralized soil is best; dry, sandy soil is worst.

■ Lightning Protection

Nothing can withstand a direct lightning hit. The best you can expect from a lightning arrestor or surge protector is to harmlessly short-circuit small voltage spikes resulting from nearby hits.

Old-style, spark-gap, antenna lightning arrestors were satisfactory for high-voltage-tolerant, tube-type equipment, but not for modern, low-voltage, solid-state equipment. Gas-discharge tubes which fire at under 100 volts offer better protection, while allowing full amateur transmitter power to pass unaffected.

During storms or extended periods of non-use, disconnect your antenna line from your radio. You may wish to ground it or, alternatively, hang the connector away from the radio equipment, even hanging it inside a glass tumbler for additional insulation.

Improved lightning protection may be realized by suspending the antenna below the top of a well-grounded metal mast (which then becomes a lightning rod), by coiling the coax for about a dozen turns before it enters the building, and by passing the coax through a ten-foot metal pipe which is well-grounded.

Although electrical power line protection is beyond the scope of this sidebar, highly-effective metal-oxide varistors (MOVs) are available in strip-line extension cords, and even for distribution panels to protect the whole house.

Sounds from the Equator

HCJB

Quito, Ecuador

By Valter Aguiar

Reflecting its historical, cultural, and geographical significance, Quito is sometimes called the light of the Americas and the cultural heritage of mankind. Nearly 1.5 million people live in what is one of the most beautiful capital cities in South America, where historical sites are mingled with modern shopping centers—and all just a few kilometers away from the Equator that marks the middle of the world. Ecuador's capital since 1830, Quito has managed to maintain the old historical buildings while developing to meet the needs of its inhabitants.

The city was, of course, very different in 1931. It was more of a rural village, and the large avenues did not even exist at that time. There was no cable television as there is today (in fact, there was no television at all), and radio was just beginning. In fact, in 1931 only 13 people had radio receivers in Quito—very fortunate people indeed, as they were able to hear the first broadcast of HCJB, the Voice of the Andes, destined to become one of the most popular shortwave stations in the world.

Top photo: HCJB announcers use the studio's facilities to take their message to the whole world. Transmitter control is completely computerized.

Above: Part of HCJB's antenna system in Pifo. These antennas are linked to Quito via microwave.

From Humble Beginnings

Two Americans, Clarence Jones and Reuben Larsen, undertook the task of working out an agreement with the Ecuadorian government, on behalf of the corporation World Radio Missionary Fellowship, to put a station on the air. The first broadcast was made on Christmas Day 1931 with a one-hour program in Spanish and English. The 250-watt transmitter was installed inside a sheep shed and two eucalyptus poles served as antenna towers—very different from the current huge transmitter site in Pifo, some 18 miles east of Quito, with its 32 antennas and twelve transmitters ranging from 50 to 500 kW. HCJB's antenna site also includes a rotating antenna, which can be targeted to any direction.

Although it is lower in altitude than Quito, Pifo was chosen as the transmitter site because of its higher humidity. The transmitters come from the United States, where HCJB maintains a center to develop and manufacture transmitting equipment.

The energy requirements to feed the transmitter site are very high and HCJB was forced to build its own hydroelectric plant on the Papallacta River, on the east side of the Andes. It was put into operation in 1965, with the power to generate 1.8 million watts. The second unit (inaugurated in 1982) increased the power to 6 megawatts. Such power is more than enough to cover the needs of HCJB In fact, during some times of the year the station is even able to sell energy.

A Missionary Station with a Twist

The Voice of the Andes can be heard worldwide, and today receives around 70,000 letters each year. I am proud to say that Brazil is by far the letter-writing champion! Funds for HCJB's activities come from donations from all over the world. The majority come from the USA, where the corporate headquarters of the World Radio Missionary Fellowship are located. The callsign HCJB has become known as "Hoy Cristo Jesús Benedice" in Spanish, or as the English phrase, "Heralding Christ Jesus' Blessings."

Despite being primarily a missionary broadcaster, the type of programming and services rendered make HCJB a somewhat different broadcaster from most such stations. The Voice of the Andes maintains local radio stations in Quito and Guayaquil, which operate like commercial stations. Their programs include music, news, and sports, offering a competitive choice for the Ecuadorian audience of any religion. HCJB also maintains local radio stations in Panama and Mexico, and produces TV programs for distribution to broadcasters in Latin America and other continents.

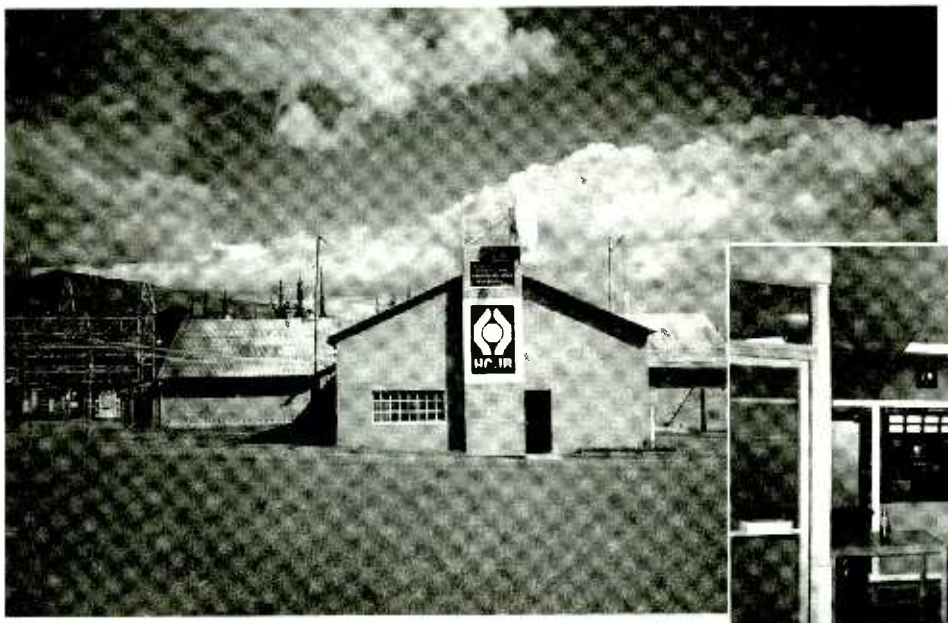
Right: Transmitter control is completely computerized.

Below: Under the shadow of the Andes, these are HCJB's headquarters in Quito.

The Voice of the Andes has 25 offices in various countries, which also produce radio programs for HCJB itself and for rebroadcast by local radio stations. This means that a portion of HCJB programs are, in fact, recorded outside Ecuador. Most programs in Portuguese, for instance, are produced by the HCJB offices in the Brazilian city of Curitiba. They are then sent to Quito on cassette tape to be rebroadcast back to Brazil on shortwave.

Vozandes is also the name of the hospital maintained by HCJB and located next to the station's headquarters in Quito. A second hospital is located in the Ecuadorian town of Shell Mera, in the Amazon Region. Medical services offered include eye treatment and treks to more distant places in the country where no medical treatment is otherwise available. Another service offered by HCJB is the Christian Centre of Communications in Quito, which trains broadcasters from a Christian perspective.

The Voice of the Andes agreed in 1985 to join efforts with other missionary broadcasters, in order to increase their presence worldwide.This project is called "World by 2000." In 1994 HCJB signed an agreement



With the world in its hands, this is HJB's transmitter site in Pifo. Modern transmitters allow HCJB to be heard worldwide.

with Trans World Radio, called the Alas Project. Alas is a satellite network intended to make Christian radio programs available to local Latin American stations, 24 hours a day. Currently, Trans World Radio uses the Alas system twenty hours a day, while the rest comes from HCJB.

■ Diversified Programming

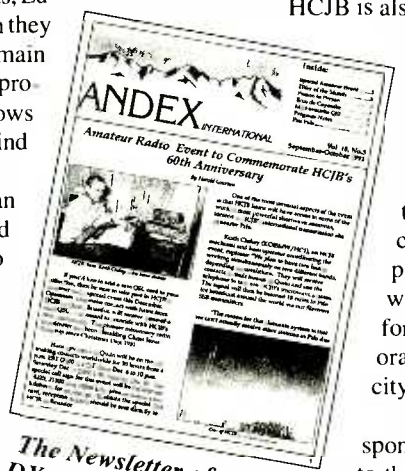
Although it is making use of new technology, shortwave radio still plays a very important part in HCJB's activities. The Voice of the Andes broadcasts in a number of languages and local dialects. Its computerized transmitting room at Pifo, linked to Quito via microwave, allows the station to stay on the air 24 hours a day, broadcasting in several frequencies simultaneously.

HCJB's English language programs are primarily targeted to the Americas, Europe, and South Pacific, although they can be heard worldwide. Their main focus is, of course, on religious programs, but the output also follows HCJB's intention to reach every kind of audience.

Listeners in North America can hear the news daily at 0100 and 0500 UTC, and from Monday to Friday at 1200 UTC. *Musica del Ecuador* (Music from Ecuador) can be heard on Fridays at 0130 and 0530 UTC, while the science program *El Mundo Futuro* (The Future World) is broadcast every Tuesday, at the same times as above. Although names of some programs are in Spanish, their content is in English.

Interested in Ecuadorian food? *What's Cooking in the Andes* will inform you on food recipes every Thursday at 0130 and 0530 UTC. Listeners letters are answered in *Saludos Amigos* (Hello Friends) on Sundays at 0105 and 0505 UTC, just after the news.

If you're a DXer or ham operator, you're in luck. *Ham Radio Today* airs on Wednesdays at 0130 and 0530 UTC, and the famous *DX Partyline* is available every Saturday at 0105 and 0505 UTC. DX editor Richard McVicar (who is also the station's frequency manager) keeps an active HCJB DX club, called Andes DX International, or Andex. Over the years *DX Partyline* has become one of the most respected DX programs worldwide, thanks to Richard.


ANDEX INTERNATIONAL

Amateur Radio Event to Commemorate HCJB's 60th Anniversary

The Newsletter of Andes DXers Intl or Andex

HCJB is also known worldwide for its beautiful QSL cards showing Ecuadorian scenery, people, typical food, etc. For 1996, the Voice of the Andes made a 12-card series—one card per month—which, when put together, formed a complete panorama of the beautiful city of Quito.

People who are responsible and dedicated to their positions and assignments—this is what you will find at HCJB's facilities. The Voice of the Andes is a strong voice from Ecuador and South America, as is evident by their daily programs. HCJB is a real proof that shortwave is alive and well, and that the introduction of satellite technology should be an addition (and not a substitution) to shortwave radio. I invite you to tune in to the Voice of the Andes, and welcome you to South America!

How to contact HCJB:
HCJB - the Voice of the Andes
English Language Service
Casilla 17-17-691
Quito, Ecuador
Phone: +593 2 466-808, ext. 441
Fax: +593 2 447-263
E-mail: english@hcjb.org.ec

HCJB's English Broadcast Schedule

0000-0700	9745am	21455am
0700-1000	5865eu	9645pa
	21455au	
1000-1100	9645pa	21455au
1100-1200	12005am	15115am
	21455au	
1200-1600	12005am	15115am
	21455am	
1900-2200	12015eu	21455am

The author would like to thank Mr. Jonas, Iria Braun, Maria Aparecida, and the staff of HCJB's Portuguese section for their help in the preparation of this article.

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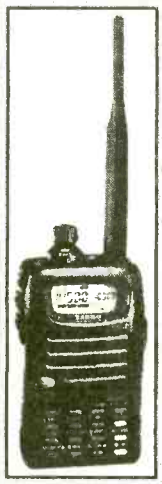

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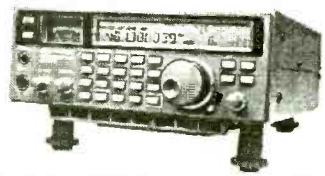

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The Politics of Encryption

It has been well known, although not widely reported until the beginning of this year, that analog cellular telephones are vulnerable to eavesdropping. In the past there were brief public episodes of intercepted phone calls, such as former Virginia governor Douglas Wilder making derogatory statements about political rivals or transcripts of cell phone calls made by members of the Royal family making the rounds in various tabloids, but it wasn't until this past December that politicians woke up to reality when several of their own were intercepted and recorded by Democratic activists John and Alice Martin in Florida (see the April issue of *Monitoring Times* for details).

The Cellular Telephone Industry Association (CTIA), a Washington, D.C.-based trade group and self-proclaimed representative of the wireless communications industry, had long downplayed the security weaknesses of analog cellular telephones and had lobbied successfully at the Federal level to make such interceptions unlawful. Their legislative success was ineffective, however, since there was little desire on the part of law enforcement to locate and apprehend violators.

Soon a new story emerged from the industry. Digital systems would save the day and make privacy possible for cellular telephone users. "Electronic stalkers" and other scapegoats would no longer be able to eavesdrop on calls made using these new radio systems. Not only would the digital nature of the new systems protect privacy, but conversations would also be encrypted. Forgotten, apparently, was the fact that the wireless industry had the capability to incorporate encryption into their analog systems, but chose not to.

Nonetheless, new encoding techniques had been perfected over the past couple of decades, and military-strength encryption was not only possible, but was being used by thousands of people on the Internet through such software programs as Pretty Good Privacy (PGP). Here was a chance for cellular telephone users to have real security from both the casual eavesdropper and rogue government snoops.

■ Cryptography as Munitions

What is not well known in this country is that cryptographic algorithms — the procedures that describe how to scramble messages — are considered weapons of war and subject to export restrictions under the same arms trafficking laws that control bombs and guided missiles. Responsibility for those laws, termed International Traffic in Arms Regulations (ITAR), was recently transferred from the Department of State to the Department of Commerce, but any cryptographic method that is sufficiently strong to completely protect information is still denied an export permit. Systems that can easily be broken, however, are free from such restrictions. The software program Pretty Good Privacy is strong enough that the author, Phil Zimmermann, was under Federal Grand Jury investigation for violating ITAR by making PGP available on the Internet.

Despite the widespread availability of equally strong, sometimes identical cryptographic systems in other countries, elements of the United States government as well as the Clinton Administration continue to insist that effective, secure systems not be exported. Their stated reason is protection of national security, but the policy has had a chilling effect on computer software and hardware manufacturers, who cannot afford to develop two products — one for export and one for domestic use — and have been forced to produce only the weaker, exportable version. Several bills in Congress this session are designed to loosen ITAR, but similar efforts in past years have been defeated by a coalition of domestic law enforcement and national security agencies.

When the Telecommunications Industry Association (TIA), an independent standards-setting body, set up a subcommittee to develop and propose an industry-wide standard for using encryption in digital cellular systems, they were warned by the National Security Agency (NSA) that if they came up with something that was too effective in protecting cellular voice traffic they would be barred from exporting it. Since equipment manufacturers are no more willing to develop two products — one for domestic use and one for export — than are computer companies, the TIA subcommittee settled on a set of weak algorithms that would pass NSA review. There is still debate as to whether the NSA actually proposed the system or merely approved it, but the end result is that the official, industry-wide encryption standard was seriously weakened, ostensibly because of arms regulations.

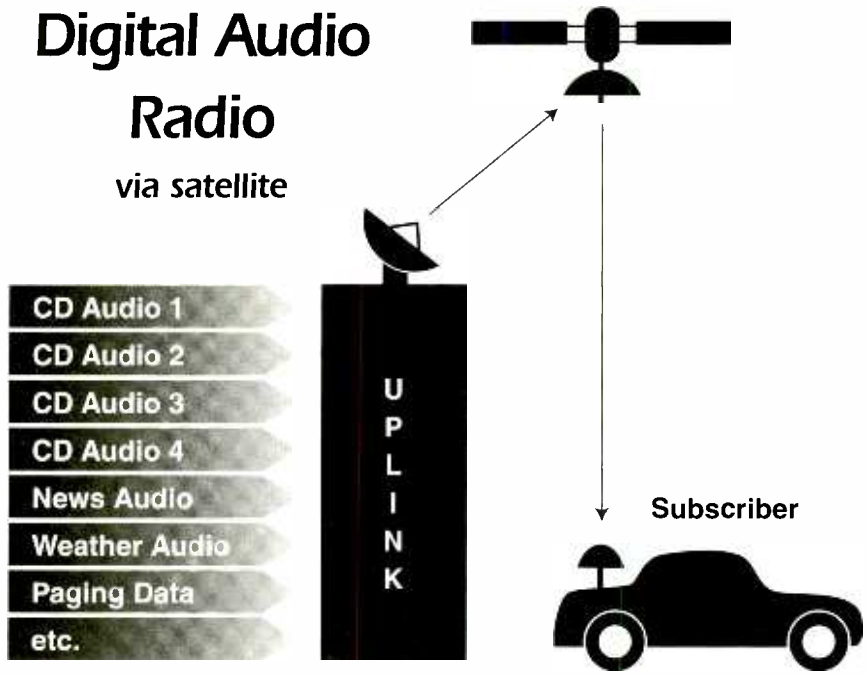
■ Cellular Authentication And Voice Encryption

What the subcommittee finally released, with no public review and stringent ITAR and copyright warnings, is a set of algorithms they termed Cellular Authentication and Voice Encryption (CAVE). As released, CAVE performs three main functions. The first, authentication, assures the cellular system that a phone requesting service is, in fact, a legal subscriber. As described in a previous column (see *PCS Front Line*, January 1997), older analog systems are vulnerable to fraud from "cloned" phones using stolen ESNs and MINs. The new system issues challenge numbers to phones requesting service, which are transformed using the CAVE algorithm and verified by the mobile switching center (MSC). Due to strong industry interest in reducing high fraud loss rates and a lack of interest from the NSA, this portion of the standard is relatively secure.

The second use of CAVE is to generate a set of code numbers used to protect control channel information, including dialed keypad digits. Any numbers entered on the phone's keypad are encrypted using the Cellular Message Encryption Algorithm (CMEA) with code numbers from CAVE. This encompasses all telephone numbers, Personal Identification Number (PIN) codes, credit card, and other numbers the user may enter.

The third application generates two sets of numbers that are used to "mask" the digitized forward and reverse voice channels. As early

as 1992 this method was known to be cryptographically weak and could be compromised with commercially available computing equipment and custom code-breaking software. As one cryptographer has put it, "Any county sheriff with the right PC-based black box will be able to monitor your cellular conversations."



CAVE is Broken

The inevitable finally happened. On March 20th of this year, Counterpane Systems — a consulting company run by cryptographer and author of the popular book *Applied Cryptography* Bruce Schneier, and University of California at Berkeley graduate student David Wagner — announced they had cracked the Cellular Message Encryption Algorithm (CMEA). In their draft report *Cryptanalysis of the Cellular Message Encryption Algorithm*, they revealed several weaknesses and proposed an attack that can be carried out on currently-available computers in a matter of minutes, or at most, hours. Using their methods an eavesdropper could easily record all the keypad entries from a targeted cell phone user and crack the messages at some later time.

Rather than calling for stronger encryption or a change in the export regulations, the CTIA downplayed the break and called for yet more laws to make it "illegal to manufacture or modify a device which is designed to perpetrate the illegal interception of PCS calls." What they don't seem to understand is that more laws will not stop eavesdroppers, but strong cryptography will.

PCS Financial Difficulties

Things are not going so well for the FCC, either. After issuing press release after press release about how much money their auctions were generating, at the end of March they temporarily suspended the collection of installment payments on broadband PCS licenses auctioned off last year.

Under the auction rules, the highest bidder for each license was required to make an initial downpayment of 10 percent and pay the rest in installments over time. Several PCS winners are experiencing financial difficulties and are unable to make payments, and at least one winner, Pocket Communications, Inc., of Washington, D.C., has filed for Chapter 11 bankruptcy. Pocket owes the FCC about $1 billion for their PCS licenses, and has additional liabilities of more than half a billion dollars, but has assets of only $1 billion.

As more PCS auction winners face the costs of building out their networks and paying for their licenses, the FCC may find it difficult to collect all they expect.

Digital Audio Radio Service

Anyone who has driven long distances and likes to listen to the radio is familiar with the problem of finding a decent radio station in each town they pass. A service that may help alleviate that problem passed another hurdle on April 2 when the FCC completed the auction for two digital audio radio service by satellite (satellite DARS) licenses, raising more than $173 million after 25 rounds. Envisioned as a nationwide, CD-quality audio service, satellite DARS promises to provide a variety of music and news programming for long distance motorists and residents of remote areas.

DARS SATELLITE WINNERS

LICENSE	WINNER	FREQUENCY RANGE
EBN001	Satellite CD Radio, Inc.	2320 MHz to 2332.5 MHz
EBN002	American Mobile Radio Corp.	2332.5 MHz to 2345 MHz

The FCC had originally planned to auction 50 MHz of space between 2310 and 2360 MHz (S-Band) for DARS, but legislation from Congress required the FCC to auction much of that space under what has been termed Wireless Communication Services (WCS). Twenty-five MHz of space remained, and was split into two licenses, EBN001 at 2320 to 2332.5 and EBN002 at 2332.5 to 2345. Each 12.5 MHz-wide license is expected to carry anywhere from 19 to more than 40 digital channels, each of which could carry CD-quality sound, news, emergency information, or even voicemail and alphanumeric paging messages.

Satellite CD Radio, Inc., bid more than $83 million for one license and American Mobile Radio Corporation has promised to pay almost $90 million for the other. The FCC report and order defining the service gives each licensee a year to build their satellites, four years to launch, and six years to put their systems into operation. Each license is good for eight years, and starts from the time the system begins providing service.

As has become standard policy, the FCC has declined to specify a particular modulation scheme or channel structure, preferring instead to let private industry develop standards independently. Market forces are expected to drive the two licensees to reach a common format, allowing equipment manufacturers to build consumer equipment that works with either service provider.

That's all for this month, and as usual more information is available on the World Wide Web at **http://www.grove.net/~dan**, and I'm reachable via e-mail at dan@decode.com. Until next month, happy monitoring!

Richard Barnett
ScanMaster@aol.com

Scanning on the Road

With the summer season upon us, it's time to review some basics about mobile scanning equipment options. While many of us have scanners permanently mounted in our cars or trucks and mobile scan all year long, others only take their scanner out of their home in the summer months in advance of a long drive.

For years, the mobile scanner of choice for the "professional hobbyist" has been the Bearcat 760. The '760, which is still available, is a low-profile unit at approximately 1.5 inch high by 6 inches wide, making it perfect for mobile installations. (The only thing better would be a model with a remote "head" like you find on some professional two-way and amateur radio gear. The '760 is approximately 7 inches deep.) Another important benefit of the radio is in its simple user-interface, so important in a mobile environment. There is something much more special about this radio, though.

The BC-760 was the first scanner to provide continuous tone coded squelch system (CTCSS) tone-decoding capability. This was a monumental breakthrough. Even though the '760 was a double-conversion receiver, this ability meant a user could greatly reduce a variety of interference by programming a frequency along with a CTCSS tone. We don't want to get into a full-blown discussion of how CTCSS works, but the feature also allows different nearby agencies to share a radio frequency without hearing one another, by operating with unique tones. Thus, hobbyists, besides being able to limit interference with the tone board, could also make a distinction of which agency they monitored on a particular frequency.

From a historical perspective, we have the folks at Scanner World in Albany, New York, to thank for the design of the optional CTCSS tone boards. The original boards were made for the Bearcat BC-600XLT—a Scanner World "OEM" (original equipment manufacturer) product from Uniden—in 1985 or '86. Uniden actually did not have their own CTCSS capable radio for several years after that. The boards were then offered through Scanner World in the 950XLT and later the 590XLT (both '760 look-alikes). Finally, the Bearcat 760XLTs were produced with the tone-board sockets and sold through all Uniden distributors.

The '760 unquestionably remains a desirable radio, although it has become a bit dated. Trunktracking, computer-download capability, alpha-numeric displays, the digital version of CTCSS (DCS), and other valuable features must now become part of the mobile scanning lexicon. RELM displayed a mock-up of a mobile scanner at the January '97 Consumer Electronics Show in Las Vegas which contained some of the aforementioned features. (At the time of this writing, the radio was not yet on the market). Radio Shack has offered variants of the '760, but they have yet to offer a mobile world-beater, either.

While the Uniden BearTracker BCT-7 has been one of the most popular mobile scanners ever, it does cater more to the general motoring public and trucking professionals than to the most serious hobbyists who desire a straightforward keypad for frequency entry. (The BCT-7 requires the user to select a "band" and then scroll up or down to home in on a frequency.) For those traveling from one state into another who would rather not continuously reprogram a radio, the pre-programmed BCT-7 is a worthwhile choice.

Another mobile scanner of note was the Uniden MR-8100 which was originally designed for use by the California Highway Patrol. This scanner represented a significant advancement with the advent of perhaps the first alpha-numeric display and one of the first computer-interfaces. The radio, now out of production for many years, is highly prized for its uniqueness. The scanner suffered terribly from intermod. Had it offered CTCSS capability, it might still be on the market.

Regency had some interesting base/mobile scanners some 10-15 years ago, all of which had excellent sensitivity. Those units, of course, are long gone.

Getting back to what this author has called the "professional hobbyist" — the scanner aficionado who truly understands and

The Uniden Bearcat BC-760, for years a choice mobile scanner.

The Bearcat BCT-7, pre-programmed and popular.

appreciates the equipment — there is one other avenue down which many of us have traveled: two-way radio. This trend is also becoming more prevalent among the news media.

Photographers and videographers, who are out all day and night in search of stories, have relied on scanners since their inception. It is through scanner monitoring that many important stories are originally discovered and told. With the immense proliferation in radio communications of all forms — two-way, paging, cellular, and the like — interference, especially in a downtown area, has become an insidious beast. Therefore, professional two-way radio equipment or ham radio gear with wide-band receivers is becoming an attractive option for news-gathering operations, even when operated in the receive-only mode.

This equipment offers CTCSS and DCS capability, alphanumeric displays, and more, although the commercial equipment generally can only be programmed by a computer and there is no direct keypad frequency control. This communications gear generally is VHF (high-band) or UHF only, but that has been changing over the last few years, most noticeably on the amateur side. Finally, these radios, while still expensive, have been coming down in price.

If you do consider purchasing such equipment, remember that you cannot transmit unless you hold a valid license. To keep you from ever being tempted, or from accidental transmission, you may want to have transmit disabled, or at least remove the microphone from the radio.

Still, don't give up on scanners just yet. Manufacturers are now designing some intriguing new models that should swing the pendulum boldly back in their favor. In response to one of our recent columns, we've received many terrific ideas for features our readers would like to see in future scanners. Please send in your thoughts on what the ultimate mobile scanner would look like and we'll see if these manufacturers ultimately satisfy our on-the-road monitoring desires.

Now, for a complete 180, let's switch back from summer to winter for a moment....

■ Winter Scanning Wrap-up

We thought we already covered end-of-winter monitoring and the check-up that is essential for post-snow and ice build-up on your outside antennas, but alas, winter provided us with a late-season nasty surprise here in the northeast. In an arc from western New Jersey through southern New England, an April Fool's day blizzard was certainly no joke. Between two and three feet of snow fell in the Boston area, which had had a relatively snow-free winter up until that point.

We're not here to provide you with a winter weather report, though, particulary when you're probably reading this in 85-degree heat. What is important to remember is that winter scanning is a potential any time from October through April in the northern half of the nation. Here are some scanning lessons this author took away from the most recent storm:

A) Ice and snow build-up on antennas, particularly beams, is deadly for monitoring. Just at the time I wanted most to listen to Boston's Logan Airport on their 800 MHz system, the characteristics of my 800 MHz yagi's performance were knocked completely out-of-whack by the ice. This same effect is felt by hams whose SWR is thrown for a loop at 20 meters — or actually on any band. Does anyone have any thoughts on how to rectify this situation, short of waiting for a thaw? Perhaps a tower-mounted heating system?!

B) Be prepared! At all times have a list of your favorite/most interesting frequencies on-hand for storm monitoring. So often we kick ourselves a day after a storm for not remembering to monitor the local ham repeater or, perhaps, the state emergency management agency. A computer-based list of channels for storm scanning is a great way to go, particularly if you can annotate your list with comments for future storms.

For those lucky enough to have a computer-controllable scanner, these computer-based lists should be ready to instantly download as soon as the first flakes of snow are about to fly (or outer-bands of showers hit from an oncoming tropical storm). Also, do not forget to have your standard scanner channel plan ready to re-enter once conditions are back to normal.

C) In a storm of any magnitude, particularly a blizzard, conditions may actually not be back to normal for quite some time. Snow removal can go on for days. As this article is being written, the midwest is still suffering from the effects of a nasty winter followed by spring thaw which have resulted in dangerous flooding. National Guard channels are especially interesting at these times.

D) Whatever you do, don't forget to monitor the local highway departments during a storm. Not only are these folks informative (they usually have better information on street conditions than the police), they are usually a riot to listen to.

The other group that provides fascinating monitoring is the local electric power company. Details on power line repairs and arcing wires really offer great — even educational — listening. How many of you know where your "underslung" is?

Frequency Updates

We've been a bit lax lately on publishing frequency lists. We actually haven't received all that many, but here's an interesting list from Kenneth Payne of Georgia that will hopefully spark further reader submissions:

"Of all the eleven monthly magazines I receive, yours is my very favorite. The only thing that I wish you'd add is more frequencies — in both the Scanning Report and Federal Files. Georgia is also overlooked quite a bit, so I have gone to the trouble of getting you almost every Northeast Georgia Public Safety frequency and would really appreciate it if you could get them published. Even the new changes to police frequencies have been included.

"I visit Blairsville quite often, since I have just qualified to seek the Georgia State Senate's 50th District seat, which covers Stephens, Habersham, Rabun, Towns, Union, Dawson, Lumpkin and White counties, and the next time I'm in the area, I am coming on up to visit Brasstown. Keep up the good job."

Those of you who have meant to send in active frequencies from your area, but haven't — you know who you are! Let's hear from you next time.

Northeast Georgia Monitoring

Agency	RX	TX	Tone
Stephens Co. Sheriff's repeater	158.850	156.090	127.3
Stephens Co. Sheriff talkaround	155.790	155.790	
Stephens Co. Sheriff MRD	155.520	155.520	
State car-to-car	154.905	154.905	
State car-to-base	154.905	154.935	
Toccoa Police Dept. - repeater	154.755	155.970	127.3
Toccoa Police talkaround	155.475	155.475	
Stephens County Ambulance	155.400	155.400	127.3
Stephens Co. Emerg. Mgmnt. Agency	155.940	153.920	85.4
Mutual Aid	154.280	154.280	
Georgia State Patrol - Toccoa	154.800	154.800	
Georgia State Patrol - Metro	155.910	155.910	
GA Dept. of Nat. Res./Game Warden	31.100	31.100	
Georgia Forestry - Toccoa	159.120	151.370	131.8
Georgia Forestry - air-to-ground	159.285	159.285	
Georgia Bureau of Investigation	151.205		
GBI - Tac 1	155.505		
GBI - Tac 2	155.550		
FBI - GA - Tac 1	163.600		
FBI - GA - Tac 2	166.5375		
FBI - GA - Tac 3	172.800		
Habersham Co. Sheriff	155.190		
Habersham Co. Sheriff - 2	155.790		
Habersham MRD	155.595		
Banks Co. Sheriff	151.130		
Franklin Co. Sheriff	154.995		
Hart Co. Sheriff	156.210		
Barrow Co. Sheriff	155.430		
Dawson Co. Sheriff	158.790		
Hall Co. Sheriff	154.725		
Madison Co. Sheriff	155.430		
Elbert Co. Sheriff	158.730		
Jackson Co. Sheriff	155.670		
Jackson Co. Sheriff	155.490		
Rabun Co. Sheriff	155.130		
Banks Co. Sheriff - repeater	151.130		
Banks Co. E.M.S.	155.400		
Franklin Co. Sheriff - repeater	154.995		
Franklin Co. - old MRD	155.520		
Franklin Co. Fire	154.370		
Lavonia Police - Fire	155.145		
Royston Police Dept.	158.730		
Old police department	155.700		
Royston Fire	158.805		
Hart Co. Sheriff - repeater	156.210		
Hartwell Police Dept.	159.635		
Hartwell City - utilities	155.100		
Hartwell City - Fire	154.415		
Hart Co. E.M.S.	155.340		
Elbert Co. Sheriff - repeater	158.730		
Anderson, SC - Sheriff	155.415		
Hart Co. - jail	158.400		
Corp of Engineers	163.4375		
Franklin Co. E.M.S.	156.180		
Georgia Forestry Commission	159.390		
Madison Co. Sheriff	155.430		
Barrow Co. Sheriff	155.010		
Hall Co. Sheriff	154.725		
Athens - Clarke Co. Police Dept.	154.830		
Jackson Co. Sheriff	155.670		
Jackson Co. E.M.S.	155.295		
Jackson Co. Fire	154.220		
Cornelia Police Dept.	156.105		
Baldwin Police Dept.	153.860		
State Prison	153.740		
Civil Air Patrol	148.150		
George Forestry Airplane	159.285		

Agency	RX	TX	Tone
U.S. Forest Service	168.775		
Towns - Union Co. Sheriff	154.815		
Habersham E.M.A.	155.265		
Clarkesville Fire Dept.	156.165		
Baldwin Fire Dept.	154.385		
Habersham E.M.A.	155.310		
Cornelia - local government	153.755		
Habersham Co. Sheriff	155.595		
Banks Co. Fire	154.325		
Clarkesville Police Dept.	155.070		
Baldwin Police Dept.	153.860		
Jefferson Police Dept.	159.615		
Jackson Community repeater	153.605		
Oglethorpe Co. Sheriff	155.685		
Jackson Co. - Special Operations	154.600		
Jackson Co. - tactical 1	155.460		
Jackson Co. - tactical 2	156.000		
Jackson Co. - tactical 3	156.030		
Jackson Co. - tactical 4	156.250		
Jackson Co. - Body Bug	156.075		
Jackson Co. - K-9 dogs	154.570		
Jackson Co. - Corrections Inst.	151.625		
GBI - 2 (Georgia Bureau of Investigation)	155.505		
GBI - 7	154.815		
GBI - NE Georgia	151.205		
GBI - red bug	154.695		
GBI - white bug	167.200		
GBI - ATL - Court Int. Div.?	158.970		
State Prison	153.740		
GA Air National Guard	148.800		
GA Air National Guard	149.775		
Barron Fire 400	154.430		
Barron - Tac 1	154.175		
Barron - Tac 2	154.415		
Barron - Tac 4	155.325		
Barron Bug	155.370		
Corp. RBR	163.4375	164.200	
RBR Main	163.415	163.415	
U.S. Forest	168.775	168.175	
U.S. FS LE	169.900		
U.S. FS 4	168.200		
U.S. FS 5th	166.675	164.825	
National Park	166.300	166.900	
FBI - Braselton	163.600		
FBI - Braselton	166.5375		
FBI - Braselton	172.800		
White Co. Fire	155.715		
White Co. Fire Command	155.835		
State Fire - Mutual Aid	154.280		
White Co. MRD	155.595		
White Co. E.M.S.	155.265		
White Co. - Search and Rescue	154.295		
Lumpkin Co. Fire	154.445		
Hall Co. Fire	154.340		
Habersham Fire	156.165		
Unicoi State Park	155.895		
Arcade Police Dept.	159.615		
Rabun Mountain Patrol	154.515		
Stadam - Winder repeater	153.605		
Stadam - Winder	154.100		
Barrow - communications	151.415		
Barrow - simplex	155.085		
Univ. of GA - police dept.	154.860		
Dawson Co.	154.740		
Hall Co. - repeater	159.150		
Clayton	158.730		

Submitted by Kenneth Payne

Silver Creek, Nebraska (SLFCS ground station)	48.5 kHz
National Airborne Operating Centers (NAOC) aircraft	52.1 kHz
Airborne National Command Post (ABNCP) aircraft	52.9 kHz

The U.S. Army has an interesting station at the Alternate National Military Command Center (ANMCC) at Ft. Richie, Maryland, which operates on 58.7 kHz. This station is also used to communicate with ABNCP aircraft.

TABLE I: US Navy VLF Stations

NAA-Cutler, Maine
NAM-Norfolk, Virginia
NAU-Aguada, Puerto Rico
NLK-Jim Creek, Washington
NPG-Dixon, Califarnia
NPL-San Diega, Califarnia
NPN-Barrigada, Guam
NPM-Lualualei, Hawaii
NSS-Annapolis, Maryland
NUD-Adak, Alaska

Frequencies kHz

14.1	14.7	14.8	15.3	15.5	15.7	16.6	17.8
18.0	18.2	18.4	18.5	18.6	18.8	19.0	19.4
19.8	21.4	22.1	22.3	23.4	24.0	24.8	25.0
25.3	26.1	26.4	26.8	27.5	28.5	30.6	32.9
40.75	47.45	51.6	53.0	53.35	54.0	54.05	55.5
57.9	58.3						

TACAMO (E-6) aircraft

17.0	18.0	21.0	22.0	22.5	22.6	22.7	22.8
22.9	23.0	23.1	24.0	25.0	26.1	27.0	28.0
29.0							

LORAN-C

Tune around 100 kHz and you can't miss the data signals being transmitted by the worldwide LORAN-C navigation network.

Loran-C is a low frequency, pulsed, hyperbolic radio aid to navigation system, which operates in the 90 to 110 kHz frequency band. Although primarily used for navigation, Loran-C transmissions are also used for precise time dissemination and frequency reference purposes.

Loran-C was developed to provide the DOD a radio navigation capability with longer range and much greater accuracy than its predecessor, Loran-A. Loran-C is the federally provided radio navigation system for civil marine use in U.S. coastal waters. The U.S. Coast Guard is responsible for operating the system in the U.S.

The navigation system consists of transmitting stations arranged in groups forming chains. At least three transmitting stations make up a chain. One transmitting station is designated master while all others are called secondaries. Chain coverage is determined by each station's transmitted power, the distance between master and secondary stations, and the geometric arrangement between stations within the chain.

The Loran-C navigation system is currently scheduled for termination in the year 2000 as stated in the 1994 Federal Radio Navigation Plan (FRP). The likely termination date is 31 December 2000.

Time Signals on Lowbands

Most utility enthusiasts are familiar with the constant time ticks from HF radio stations such as WWV-Ft. Collins, Colorado (2.5, 5, 10, 15, and 20 MHz), WWVH-Kehaha, Hawaii (2.5, 5, 10, and 15 MHz), and Canadian time standard station CHU-Ottawa (3.33, 7.335, and 14.670 MHz). But low band ute monitors also have their own stations to monitor.

In the U.S., the National Bureau of Standards and Technology (which runs WWV and WWVH) has a VLF time standard station—WWVB at 60 kHz.

Other VLF time signal stations from around the world include:

OMA	Czech Republic	50 kHz
-------	France	162 kHz
DCF77	Germany	77.5 kHz
HBG	Switzerland	75 kHz
MSF	Great Britain	60 kHz

It has been reported that the Russians have several time standard stations in radio's basement at 20.5, 23.0, 25.0, 25.1, 50.0, and 66.6 kHz.

GWEN

Put yourself at ground zero during a nuclear blast. As the mushroom cloud rises, electromagnetic pulses (EMP) rise up to the ionosphere. It is theorized that this would be enough to completely disrupt high frequency (HF) communications, and render strategic HF communications with major military command centers useless.

To compensate for that eventuality, the Department of Defense (DoD) developed the GWEN (Ground Wave Emergency Network) system. Since the end of the Cold War and quite a bit of unfavorable publicity in the U.S. media, this system has been scaled back a great deal from DoD's original plans.

The GWEN system still exists and provides survivable connectivity to designated U.S. Air Force bomber and tanker bases. Each station typically runs 5-kW into a 299-foot antenna. Each station uses a wideband packet signal with pulses (encrypted) to pass on information to the next relay site. The packet signal has been reported to be a 1200 baud/800 hertz shift signal.

There are supposed to be twenty channels assigned to the system, but channels 2 (151.875) and 12 (164.375) do not appear to have any stations currently assigned.

Table II is the latest list of 18 frequencies and the 57 stations in the GWEN network.

I hope you have enjoyed this brief tour of radio's basement. A complete listing of the activity that is available in the land below 200 kHz is beyond the scope of what can be presented in this column. A more complete list of low band stations can be found in the 8th edition of the *Bob Grove's Shortwave Directory* available from Grove Enterprises.

Now it is time to see what you have been hearing this month in the *Utility World.*

TABLE II: Ground Wave Emergency Network

Freq	Ch.	GWEN sites
150.625	1	Macon, GA; Bobo, MS; Hudsan Falls, NY; Kensington, SC; and Spokane, WA
153.125	3	Norfolk, VA
154.375	4	Hackleburg, AL; Fenner, CA; Iowa City, IA; and Medora, ND
155.625	5	North Amherst, MA; Billings, MT; and Waterford, NJ
156.875	6	Onandaga, MI and Bend, OR
158.125	7	Grady, AL; Denver, CO; Acushnet, MA; and Egg Harbor, NJ
159.375	8	Canton, OK; Gettysburg, PA; and Goldvein, VA
160.625	9	Edinburg, ND; Albuquerque, NM; Elmira, NY; Wenatchee, WA; and Milwaukee, WI
161.875	10	Walnut Grave, CA
163.125	11	Aurara, CO; St. Mary's, IA; Annapolis, MD; Klamath Falls, OR; Erie, PA; and Appleton, WA
165.625	13	Fayetteville, AR; Chico, CA; Pueblo Ordnance Depot, CO; Ainsworth, NE; and Remsen, NY
166.875	14	Bakersfield, CA, and South Brooksville, ME
168.125	15	Manarda, ME
169.375	16	Pueblo, CO; Savannah Beach, GA; and Clark, SD
170.625	17	Baltimore, MD and Devils Lake, ND
171.875	18	Flagstaff, AZ; Great Falls, MT; Hawk Run, PA; and Summerfield, TX
173.125	19	Topeka, KS; Ronan, MT; Beaufort, NC; and Tiverton, RI
174.375	20	Goodland, KS, and Omaha, NE

Utility Loggings

Larry Van Horn

Abbreviations used in this column

Abbreviations used in this column	
AM	Amplitude Modulation
ANDVT	Advanced Narrowband Digital Voice Terminal
ARQ	Synchronous transmission and automatic repetition teleprinter system
ARQ-E	Single channel ARQ teleprinter system
ARQ-E3	Single channel ARQ ITA3 teleprinter system
ARQ-M2	Multiplex ARQ teleprinter system with 2 or 4 data channels
ASECNA	Agence pour la Securite de la Navigation Aerienne en Afrique et a Madagascar
CAR	Caribbean
CEP	Central East Pacific
CW	Continuous Wave (Morse code)
Diplo	Diplomatic
Fax	Facsimile
FEC	Forward Error Correction
FEC-A	One-way traffic FEC teleprinter system
GHFS	Global HF System
HF	High Frequency
ID	Identification
LDOC	Long Distance Operational Control
LSB	Lower Sideband
Meteo	Meteorology
MFA	Ministry of Foreign Affairs
MOD	Ministry of Defense
m/v	Motor Vessel
MWARA	Major World Air Route Area
NAT	North Atlantic
NATO	North Atlantic Treaty Organization
POL-ARQ	Polish diplomatic ARQ teleprinter system
ROU-FEC	Romanian diplomatic FEC teleprinter system
RTTY	Radioteletype
SAM	Special Air Mission
SAR	Search and Rescue
SITOR	Simplex teleprinting over radio system
SITOR-A	Simplex teleprinting over radio system, mode A
SITOR-B	Simplex teleprinting over radio system, mode B
SUBLANT	Submarine Atlantic
SWED-ARQ	Adaptive Swedish diplomatic simplex ARQ teleprinter system
Twinplex	Four-frequency duplex teleprinter system
U.S.	United States
USB	Upper Sideband
VFT	Voice Frequency Telegraphy
wpm	Words per minute

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Time Universal)

285.0 Pipestone Municipal Airport (Pipestone, MN) with automated weather observations at 1527 in AM. (Terry Jones-Plankinton, SD)

355.0 Appleton Municipal Airport (Appleton, MN) with automated weather observations at 1520 in AM. (Jones-SD)

3282.3 CSP20-Portuguese Guarda Police with traffic in SITOR-B at 0000. (Fernand Vaillancourt-St. Pamphile, PQ Canada)

3413.0 New Zealand 15 working San Francisco aeradio at 0454. (Gordon Levine-Anaheim, CA) *Central East Pacific (CEP) MWARA-Larry.*

4020.0 RFFHCFA-French Forces station with practice transmission text in French on the history of French military music using ARQ-E 72 baud at 0050. (Vaillancourt-PQ)

4025.0 3BZ-Plaisance Air, Mauritius, with 48 baud traffic using ARQ-E3 at 0200. (Vaillancourt-PQ)

4214.0 ZSC-Capetown Radio, South Africa, with SITOR-B navigation area warnings (parallel to 12601.0 and 16816.0) at 1705. (Robert Hall-Capetown, RSA)

4222.0 XSN-Ningbo Radio, China, with CQ CW marker at 1144. (Dix-NY)

4226.0 XFM-Manzanillo Radio, Mexico, with CW marker at 0434. (Levine-CA)

4270.0 Unidentified station, female repeating long series of letters phonetically at 2136. Possible Mossad. (Takashi Yamaguchi-Nagasaki, Japan) *PCD2 Mossad has been reported here-Larry.*

4294.0 WNU-Slidell Radio, LA, with CW marker at 0747. (Levine-CA)

4317.0 ZSC-Capetown Radio, South Africa, with CW marker at 0529. (Levine-CA)

4331.0 WCC-Chatham Radio, MA, with CW marker at 0510. (Levine-CA)

4442.0 Air Force One working Nightwatch 01 at 0415. (Anonymous in Omaha)

4480.0 Spanish female 5-digit number station in AM at various times. (Jones-SD)

4483.0 R3C working M3P at 0701. (Anonymous in Omaha)

4491.5 FDE14-Unidentified French Air Force station with V CW marker at 0028. (Dix-NY)

4492.0 Bat 14/21 working Gunpost 8, State Line Ops and Atlas Ops at various times. (Anonymous in Omaha)

4574.9 V-Single letter HF marker with CW V at 0033. (Dix-NY)

4721.0 Air Force One working Andrews at 0234. Some ANDVT. (Anonymous in Omaha)

4731.0 SAM 60204 with a phone patch to Red Apple Base via Andrews on F-249. (Anonymous in Omaha)

4745.0 Andrews calling Spar 99 on "4-7-4-5." No contact at 0759. (Anonymous in Omaha)

4880.0 Unidentified station, female repeating long series of letters phonetically at 2136. Possible Mossad. (Yamaguchi-Japan) *ULX2 Mossad has been reported here-Larry.*

4980.5 Bravi Sierra working Cato 37 (some secure voice) at 0759. (Anonymous in Omaha)

5161.0 ASECNA Niamey, Niger, with meteo information on both ARQ-M2 96 baud channels at 2345. (Vaillancourt-PQ)

5350.0 FED14-Undentified French Air Force station with V CW marker at 2358. (Dix-NY)

5437.0 Unidentified station, female repeating long series of letters phonetically at 2209. Possible Mossad. (Yamaguchi-Japan)

5450.0 Royal Air Force Volmet with aviation weather at 0131. (Anonymous in Omaha)

5547.0 Northwest 928 working Honolulu aeradio at 0628. (Levine-CA) *Another CEP MWARA family frequency-Larry.*

5550.0 Europa 144 working New York aeradio at 0528 and KLM 744 working New York at 0638. (Levine-CA) *This is a Caribbean MWARA family frequency (CAR-A)-Larry.*

5600.5 6PXJ-Unidentified CW station repeating "V ABYZ DE 6PXJ" at 1014, also noted on 3440/6785. (Yamaguchi-Japan)

5629.0 SYN2-Israeli Mossad number station at 2146. (Yamaguchi-Japan)

5644.0 4XML-Unidentified CW station repeating "V BFR7 DE 4XML" at 2040. Another day this station was heard on 5644.5 at 1046. (Yamaguchi-Japan)

5692.0 U.S. Coast Guard helicopter working SAR involving the sailboat *Allegro* at various times. (George Mihalik-Stamford, CT)

5748.5 FDI8-French Air Force Nice, France, with V CW marker at 2322. (Dix-NY)

6340.0 ZLO-Royal New Zealand Navy Waiouru, with CW marker at 0527. (Levine-CA)

6478.0 KPH-San Francisco Radio, CA, with CW marker at 0720. (Levine-CA)

6628.0 KLM 744 working New York and KLM 789 working Santa Maria aeradios at 0658. (Levine-CA) *This is a NAT-E MWARA frequency-Larry.*

6639.0 November 245 Tango Tango called Cedar Rapids LDOC, answered by Miami LDOC at 0437. (Levine-CA)

6683.0 SAM 60204 with phone patch traffic via Andrews (Mystic Star). Moved to F-807. (Anonymous in Omaha)

6691.0 Steamcar working Boomtown at 1359. Moved to frequency Charlie Bravo. (Anonymous in Omaha)

6713.5 King 81 working Moffett Rescue at 0546. (Anonymous in Omaha)

6727.0 Rescue 252 working Air Force Townsville (Royal Australian Air Force) at 0917. (Anonymous in Omaha)

6730.0 SAM 29000 working Andrews at 0121. Some ANDVT. (Anonymous in Omaha)

6731.0 SAM 56974 with a phone patch to SAM Command via Andrews at 0230. (Anonymous in Omaha)

6736.0 Dragnet Uniform working Big Foot at 1633. (Anonymous in Omaha)

6739.0 SAM 20375 with a phone patch to Andrews via Hickam GHFS at 1015. (Anonymous in Omaha)

6745.0 VLB2-Israeli Mossad number station heard at 2145, also noted on 8641 kHz. (Yamaguchi-Japan) Trenton military weather broadcast at 0135 on wrong frequency. The next hour I heard them back on 6754. (Anonymous in Omaha)

6761.0 Mash 55 working Brickyard at 2340. (Anonymous in Omaha)

6785.0 Spanish female 5-digit number station in AM at 0647. (Jones-SD)

6797.0 Unidentified station transmitting 75 baud RTTY test tape at 2251. (Dix-NY)

6830.0 SAM 56974 working Andrews at 2019. (Anonymous in Omaha)

6952.0 Love Eagle Forward working Love Eagle Rear at 1802-1811. Wild Eagle 01 in comms with Wild Eagle at 0026. "Recon" mentioned, as well as "Rhino". Also asking if Oscar 4 Hotel is available. At 0028 Rhino is departing at this time, "...all issues are complied with." 0029 Range Safety "...says to wait, they have no comms with One Battery." 0031 Wild Eagle 01 advises Wild Eagle that the RSO, a Capt. McCormick(?) has HF capability. Wild Eagle asks if it is a 134 foot loop, Wild Eagle 01 replies that RSO is using a dipole. Several mentions of "Pawhaw (?)" in traffic. (Brad Clark-Lewiston, ID)

6993.0 SAM 60206 with phone patch to SAM Command via Andrews at 0050. (Anonymous in Omaha)

7096.0 Unidentified station repeating "V Z6MJ DE WZ70" in chirpy CW at 1136. (Yamaguchi-Japan)

7319.0 Unidentified station with 5-figure group CW transmissions, using ADGIMNRTUW instead of 0-9 (don't know the exact order, if I did, that would be cheating...heh). Message format was the message number (in cut format) five times, BT three times, text, then AR three times. Fist was good for hand keyed 15 wpm, good clear DC note with a minimum of click. Chinese Diplo (Vancouver BC to ??)? Signal was extremely loud at 0200 to be off-shore. (Clark-ID)

7878.0 4XZ-Unidentified station repeating "VVV de 4XZ" in CW at 1445. (Yamaguchi-Japan) *This is the Israeli naval radio station in Haifa-Larry.*

7890.0 Spanish female number station in AM at 0202. (Steve Clark-Pampa, TX) *How many characters per group Steve-Larry?*

7988.5 U.S. Navy Bravo Whiskey (BW) network link 11 coordination net at 2105. (Vaillancourt-PQ) Bravo Whiskey working Lima Whiskey at 0157. (Anonymous in Omaha)

8026.0 SAM 60403 working Andrews at 1545. Some ANDVT. (Anonymous in Omaha)

8125.0 Female numbers station 5-figiure groups at 0045. (Jesse Finklestein-Wilmington, DE) *What language Jesse-Larry?*

8447.5 L2B/C-Argentina Naval Radio, Buenos Aires, with V CW marker at 1003. (Dix-NY)

8464.0 English female 5-digit Lincolnshire Poacher number station at 1531. (Yamaguchi-Japan)

8465.0 Abnormal transmission of SYN2 Israeli Mossad number station heard at 1513. Repeating only SYN2 phonetically for more than 30 minutes. Another day SYN0K2 heard at 1531 with heavy interference from Lincolnshire Poacher number station (8464 kHz). First time I have encountered such a curious Mossad callsign. Any comments? (Yamaguchi-Japan) *None here-Larry.*

8481.0 VIS-Sydney Radio, Australia, with CQ CW marker at 2123. (Dix-NY)

8514.0 XSQ-Guangzhou Radio, China, with CW marker at 1502. (Levine-CA)

8521.0 VIP-Perth Radio, Australia, with CW marker at 1456. (Levine-CA)

8522.0 CBV-Valparaiso Radio, Chile, with CW marker at 0518. (Levine-CA)

8539.0 VRX-Victoria Harbor Radio, Hong Kong, with CW marker at 1452. (Levine-CA)

8565.0 D3E-Luanda Radio, Angola, with CW marker at 0625. (Levine-CA)

8582.0 CTP-NATO Lisbon, Portugal, with CW marker at 0507. (Levine-CA)

8582.5 KLB-Seattle Radio, WA, with CW marker at 1438. (Levine-CA)

8589.0 HPP-Panama Radio, Panama, with CW marker at 0458. (Levine-CA)

8632.0 XSW-Kaoshiung Radio, taiwan, with CW marker at 1422. (Levine-CA)

8641.0 VLD2-Israeli Mossad station heard at 1545. Also VLB2 at 2148 and ELB2 at 1346. (Yamaguchi-Japan)

8642.0 KPH-San Francisco Radio, CA, with CQ CW marker at 1345. (Yamaguchi-Japan)

8645.0 SYN2-Israeli Mossad number station heard at 1546. (Yamaguchi-Japan)

8680.0 WSC-Tuckerton Radio, NJ, with CW marker at 0424. (Levine-CA)

8743.0 GZTI-Unidentified CW station repeating "SAGJ DE GZTI" at 0916. (Yamaguchi-Japan)

8968.0 S0B working Lajes GHFS, Azores, with a phone patch to SUBLANT (836-1078) for an "Exercise Esteem Highly Alpha" at 0107. (Mr TV-UK) Look 76 with a phone patch to Raymond 21 (Offutt) via Elmendorf GHFS at 0031. (Anonymous in Omaha)

9013.0 Chalice Bravo working CanForce Trenton military at 1615. Navy LL79 with a phone patch to VP-30 duty office via Trenton at 0152. (Anonymous in Omaha)

9126.9 RFTJD-French Forces Libreville with ARQ-E3 traffic in French to unidentifed station at 0501. (Hall-RSA)

9145.0 P7X with 5-letter groups in VW at 2035. (Vaillancourt-PQ)

9320.0 SAM 56974 with a phone patch to SAM Command via Andrews at 0242 in LSB. (Anonymous in Omaha)

10125.0 VLB2-Israeli Mossad number station heard at 1545. (Yamaguchi-Japan)

10248.0 8BY-Unidentified station with V CW marker at 1842. (Dix-NY)

10332.0 Unidentified station transmitting 4-digit groups in CW at 1825. (Dix-NY)

10860.0 YDN-Unidentified CW station repeating "V JPQ DE YDN" at 1049. (Yamaguchi-Japan)

10890.0 GXQ-British military with VFT 48 baud RTTY test tape at 1945. (Roger Parmenter-Hyannis, MA)

10973.0 Unidentified station transmitting 5-letter groups using SITOR-A at 1805. (Dix-NY)

11119.0 Unidentified station sending 75 baud RTTY meteo codes at 1432. (Dix-NY)

11178.0 R2D working unidentified station at 2221. (Anonymous in Omaha)

11220.0 SAM 60204 with a phone patch to SAM Command via Andrews at 1833. (Anonymous in Omaha)

11244.0 Snoop 55 (RC-135 55th SRW, Offutt AFB, NE) working Andrews GHFS, MD, with a phone patch to Banter Control (95 RS command post Mildenhall, England). Requested the status of Quid 68 (USAF KC-135 tanker aerial refueling mission in southern Europe) at 2013. (Mr TV-UK) Look 98 conducting a radio check with Look 99 at 1643. (Anonymous in Omaha)

11322.0 The Mexican fishing fleet is back. Spanish chatter dealing with "alta freqencia" and "...confirmar en numero de canal..." then more leisurely chatter at 1710. Assuming they were checking comms between boats? (Clark-ID)

11345.0 Papa Delta working McGhee at 1713. This was very weak and fading heavily, the only thing I could tell was that papa Delta was airborne, due to one occurrence of a high level of 400Hz hum.

12359.0 Herb with Caribbean weather net at 2122. (Jones-SD)

12808.5 KPH-San Francisco Radio, CA, with V CW marker at 0940. (Eddy Waters-Australia)

12835.0 Unidentified station sending 75 baud RTTY meteo codes at 2103. (Dix-NY)

12844.5 KFS-San Francisco Radio, CA, with CQ CW marker at 0945. (Waters-Australia)

12864.0 XSW-Kaoshiung Radio, Taiwan, with CQ CW marker at 1054. (Waters-Australia)

12906.0 DZJ-Bulacan Radio, Philippines, with CW CQ marker at 1353. (Dix-NY)

12930.5 JYO-Aqaba Radio, Jordan, with CQ CW marker at 1200. (Dix-NY)

12942.5 RKLM-Arkhangelsk Radio, Russia, calling 4LY in CW at 2113. (Dix-NY)

12952.5 VIP-Perth Radio, Australia, with CQ CW markers at 1050. (Yamaguchi-Japan)

13020.4 VRX60-Victoria Harbor Radio, Hong Kong, with CQ CW marker at 1259. (Dix-NY)

13069.5 JOS-Nagasaki Radio, Japan, with V CW marker at 0927. (Waters-Australia)

13242.0 Grassfox working MacDill GHFS, for data check at 2054. Face Card working McClellan GHFS for data check at 1722. (Anonymous in Omaha)

13247.0 SAM 60204 working Andrews at 1540. (Anonymous in Omaha)

13440.0 SAM 56974 with a phone patch to SAM Command via Andrews at 1912. (Anonymous in Omaha)

13528.0 S-Single letter HF marker with CW S at 1534. (Dix-NY)

13533.0 EZI-Israeli Mossad number station heard at 1532. (Yamaguchi-Japan)

13597.0 JMH4-Tokyo Meteo, Japan, with 120/576 fax weather charts at 0934. (Waters-Australia)

13953.0 P6Z-MFA Paris, France, with FEC-A 5-letter groups to Islamabad at 1141. (Waters-Australia)

14365.0 Male English 5-digit number station in AM at 1448. (Dix-NY)

15016.0 Navy 49676 with a phone patch to Andrews via MacDill GHFS at 2116. (Anonymous in Omaha)

16261.7 RFTJD-French Forces Libreville with ARQ-E3 traffic consisting of 5-letter groups at 1113. (Hall-RSA)

16332.0 C-Single letter HF marker with CW C at 1521. (Dix-NY)

16335.5 FZS63-St, Denis Meteo, Reunion, with 120/576 fax Indian Ocean weather charts at 1135. Superb charts! (Hall-RSA)

16386.7 MFA Islamabad, Pakistan, with encrypted Twinplex (115/170/515) text at 1130. At 1131 caught 5-letter groups being sent using SITOR-A (100/170). (Waters-Australia)

16432.0 Zanzibar Radio calling 3EIMC-m/v Pina at 0830. (Hall-RSA)

16866.0 English female 5-digit Lincolnshire Poacher numbers station at 1332. (Yamaguchi-Japan)

16909.7 USO-Izmail Radio, Ukraine, calling 4KI in CW at 1534. (Dix-NY)

16930.0 UVA-Gelendzhik Radio, Ukraine, with CQ CW marker at 1501. (Dix-NY)

16933.2 JOS-Nagasaki Radio, Japan, with V CW marker at 0911. (Waters-Australia)

17055.2 MGJ-Royal Navy Faslane with the usual 75 baud RTTY tes tape at 0726. (Hall-RSA)

17416.3 SAM-MFA Stockholm, Sweden, with 5-letter groups using SWED-ARQ at 1520. (Hall-RSA)

17428.6 SAM-MFA Stockholm, Sweden, with 5-letter groups using SWED-ARQ at 1155. Also traffic to Swede ambassador Kampala at 1203 and the ambassador at Rabat at 1025. (Hall-RSA)

17976.0 Reach 609B (C-141) working McClellan GHFS with phone patch traffic at 2105. (Anonymous in Omaha)

18064.0 MFA Warsaw, Poland with news in Polish at 1130 using POL-ARQ. (Hall-RSA)

18077.9 RFFA-MOD Paris, France, with 5-letter groups to unidentified station using ARQ-E3 at 1644. (Hall-RSA)

18343.7 MFA Lisobon, Portugal, with 5-letter groups in SITOR-A to unidentified station (probably Kinshasha) at 1500. (Hall-RSA)

18376.5 RPFN-Lisbon Naval radio, Portugal, with test tapes using 75 baud RTTY at 1300. (Hall-RSA)

18552.0 V5G-MFA Bucharest, Romania, using ROU-FEC at 1151 sending "circulara." (Hall-RSA)

18560.0 BMF-Taipei Meteo, Taiwan, with 120/576 fax weather map at 0916. (Waters-Australia)

18940.0 BDF2-Shanghai Meteo, China, with 120/576 fax weather map at 0920. (Waters-Australia)

19692.6 ZSC-Capetown Radio, South Africa, with CW ID/SITOR idler at 1054 on new frequency. (Hall-RSA)

19776.6 MFA Jarkarta, Indonesia, with SITOR-A Indonesian traffic to Cairo Consul about a passport problem at 1019. (Hall-RSA)

19853.1 V5G-MFA Bucharest, Romania, with Romanian news using ROU-FEC at 1140. (Hall-RSA)

22565.0 XSW-Kaoshiung Radio, Taiwan, with CQ CW marker at 1058. (Waters-Australia)

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Monitoradio, WRMI Give Up On Shortwave

On April 15, Monitoradio International included a one-minute item in its broadcasts that The Church had decided to sell the Monitoradio news operation, and sell or lease separately the shortwave outlets WSHB and KHBI. The radio news operation had been a financial drain. Prospective buyers had already been contacted, and one possibility was Public Radio International, for which MRI had already been the news source. Deadline is June 30, after which the SW stations, if not under new ownership brokered by George Jacobs, will expand religion to seven days a week. Interviewed on *Media Network*, David Cook, *Monitor* editor, said Monitoradio had been costing $9 million a year, the SW stations $6 million.

At the last Grove Expo, Jeff White was heard joking about selling off WRMI, subsequently denied. But now he's serious. Just days after the MR story broke, George Thurman learned that George Jacobs was also brokering the sale of WRMI: asking price $1 million including the not-yet-operational North American antenna. So it seems Jeff and his partners would rather have a megabuck than a SW station. Will these facilities will fall into the hands of the extreme religious/right, further skewing America's image abroad?

That's what's in store at Macon, Georgia, where a new mom-and-pop SW station is under construction along the lines of WGTG, but supposedly non-political. From the FCC website via Tracy Wood we learn that the CP expires in August 1998 for Charles C. Josey to build a 50 kW transmitter, yagi antenna with 10 dB gain rotatable from 330 to 0 to 30°. Ludo Maes of the *Transmitter Documentation Project* adds: it will be primarily religious, on air only at night from 7 p.m. to 7 a.m. Interviewed on *DX Partyline*, Joanne Josey said it would avoid broadcasting in daytime because of interference it would cause from its downtown location. Call sign is yet to be decided; should be on the air by January, primarily serving Canada and China (a favorite target, even if propagationally nonsensical). The organization is Oil and Wine Ministries.

Even though it fought tooth and nail to avoid paying a cent to operate RCI, the CBC has the power to appoint its management. CBC CEO Perrin Beatty issued a press release, forwarded by Bill Westenhaver, that he was replacing Terry Hargreaves, RCI Executive Director during five turbulent years, with Bob O'Reilly on an interim basis. A further shakeup in RCI management, staff, and programming was expected; among those who have already retired is André Courey, replaced on the *Mailbag* by Mark Montgomery.

Radio Australia's fate was the subject of almost daily newspaper stories, via Mike Cooper. ABC threatened drastic cuts in domestic programming if it could not close down RA. BBC, VOA, and DW expressed interest in using the RA transmitters instead. At one point it was proposed to keep RA going on a much reduced budget, only in English and only on satellite. Opposition grew, based on RA's diplomatic and image value, especially in neighboring countries and Asia. At presstime it appears RA will be preserved on shortwave but its budget cut 2/3 to $7 million and at the expense of the Asian languages. The Darwin station would be closed.

AFGHANISTAN R. Afghanistan, the anti-Taleban outlet from CIS, heard on 7082v at *1330-1430* while the Taleban station is on 7200 from *1330 (Sarath Weerakoon, Sri Lanka, UADX via *BC-DX*)

ALASKA KNLS website: **www.montara.com/WCB/dxeraaaa.htm**(BBCM)

ALBANIA R. Tirana English: 1845-1900 on 9570, 7270; 2100-2130 on 7110, 9515; 0145-0200 on 6115, 7160; 0230-0300 on 6140, 7160 (B. Cooley, BC; Roger Chambers, NY; Benno Klink, Germany and Terry Krüger, FL, *DXW* via *BC-DX*) Has a series of 13 QSL cards on folk music instruments, donated by the R. Tirana Listener Club in Munich (Dr. Hansjoerg Biener, *BC-DX*)


Radio Tirana

If you hear QRM to RFPI on 7385, TWR's Shjijak site is Z-97 registered on that frequency only, daily at 1500-1530, daily exc Thu at 0515-0530, non-daily 0830-0900, 1030-1100, 1535-1605, 1700-1715 in East European languages (via TWR)

ALGERIA RAI changed sked again; English 1600-1700 on 11715, announced but not heard on 15160; 2000-2100 on 11715, 252 longwave (Dave Kenny, BDXC)

ANTARCTICA In response to a proposal I made to R. Nacional Arcángel San Gabriel last year, Mayor Victor Hugo Figueroa, Chief of Esperanza Base agreed to start a mailbag program, but only once a month on the last Friday, as they get airmail only once a month, if they're lucky, 1900-2100 on LRA36, 15476 (Rubén Guillermo Margenet, Argentina via Gustavo Fernando Durán, *World of Radio*) Such as May 30, June 27, July 25, maybe including some English (gh) Had English segment on another Friday at 2045 (Michael Schnitzer, Germany, *DX Partyline*) Europeans are hearing this a lot better than Americans (gh)

AUSTRALIA Revised RA sked grouped weekday talk features on science, arts, at 0031 repeated at 0931, 1431, 2131; music features at 0531, 1731 (RA website)

Australian Defence Broadcasting, huge signal on 6418.50 LSB at 1112 with pre-recorded messages from family members to sailors on *HMAS Melbourne*, *HMAS Adelaide*, etc.; announcer played humorous fake news and sports stories in between until 1200* on a Thursday (Jay Novello, Cape Hatteras)

VNG timesignal station, now operated by National Standards Commission, has to pay Airservices Australia A$81K instead of A$46K. People using the service are asked to contribute; if the difference can not be made up, VNG will have to close down (John Birch, NSC, P.O. Box 282, North Ryde, NSW 2113; fax +61 2 9888 3033; via *Electronic DX Press*)

AUSTRIA ORF Z-97 English to NAm: 1230 on 13730; 0030, 0230 on 9655 (LAm 0230 also on 9870, 13730); 0530 on 6015 via Canada; 0630 has been replaced by French including DX/mailbag *Flash des Ondes* dimanches, 2:30 am in Québec. In German, *Kurzwellenpanorama* which already dealt with satellite and Internet info has been renamed *Intermedia*, to us harder to hear on new sked Sat 0105, 1105. Separate 5-minute *DX-Telegramm* with lots of off-air taped illustrations, Sun 0525, 1225, Mon 0025, 0225 among others (ORF and via Sandy Wayne Wilson) Has new URL: **http://www.orf.at/rai/**(Wilson)

BOUGAINVILLE R. Free Bougainville reactivated on 3850 at 0900-1600 (Sam Voron, Bougainville via Hans Johnson, *DXing with Cumbre*)

BULGARIA R. Varna, 9775v, Fri only in Bulgarian at 2115-2300 (*Panlview*)

BURMA [non] Democratic Voice of Burma tested two new sites in CIS at 1230-1300, planned to keep the better one in addition to Norway: 7330 Vladivostok, 11820 Tashkent (Jeff Cohen, WRN)

CAMEROON CRTV Yaoundé QSL received for 6-year-old report with no follow-up, signed by Eyebe Tanga, Tech. Dir., B.P. 1634; fax 237-20-43-40.

CANADA RCI made usual one UT-hour earlier programming shift for DST, and mostly same Sackville frequencies as last summer, such as: 1200-1300 daily and 1300-1400 M-F on 9640, 11855, 13650; *Sunday Morning* 1300-1600 on 11855, 13650 only. 1330-1400 Mon-Sat 17820. No more English until 2000-2100 on

All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel program-ming; + = continuing but not monitored; 2 x freq = 2nd harmonic; J-97=May-Sept; Z-97=Summer season; W-97=Winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there.

17870, 17820, 15325, 15150, 13670, 13650, 11690; 2100-2130 on 17820, 15325, 15150, 13670, 13650, 11690. 2200-2400 13670 added to 9755, 5960. 0200-0300 back on 6120 along with 9755, 13670 (RCI via Bill Westenhaver) Look for CBC programs to be cancelled at end of June, such as *Now the Details*, Sun 2231, Mon 0231 (gh)

CFVP, 6030, Calgary presumably carries new nightly show for Hong Kong immigrants in Chinese *Apple Radio* at 0400-0600 as publicized for its AM 1060 outlet (Fisher, *NU* via *OzDX*)

CHINA CRI English section now has E-mail: <crieng@public.bta.net.cn> (*BC-DX*) As abruptly as it went to 9790, CRI via French Guiana returned after a few weeks to 9730 at 0400 (gh, OK)

COLOMBIA R. Mira reactivated after a sesquiyear, 6014.45 at *1047 (Dave Valko, PA, *OzDX*)

COSTA RICA On RFPI, *Micro-Radio in the US* has been renamed *Rebel Radio*, alternating with *Food Not Bombs Radio Network*, Mon 2130 on 15050, Tue 0530 on 7385, 6205-usb (RFPI)

CUBA Our 1996 Tenth Anniversary QSL showing Malena Negrín and me at the mikes, is still available this year for reports on our monthly appearence on RHC's *En Contacto*; send to me at ICRT, 23 No. 258, Vedado, Ciudad Habana 4 (Manolo de la Rosa) *That's last Sundays at 1335 on 9550. 11760; 2150/2155 on European frequencies; UT Mon 0135 - gh*

Rebelde DX confirmed at summer time of Sat 0438-0442 on 5025; varies a lot as early as 0425, nominally at 0430 (gh) RHC's tinored E-mail address crashed for weeks at a time, so added this other one: <radiohc@mail.infocom.etecsa.cu> (Arnie Coro, *DXers Unlimited*)

DOMINICAN REPUBLIC HIMI, R. Cristal Int'l, 5010, sent very nice full-data QSL card after follow-ups; asks for photos of listeners for their album (Jerry Berg, MA, DSWCI *DX Window*) 5013v, had *Caribe DX* mailbag at 0024 on a UT Sun (Henrik Klemetz, *ibid.*)

Onda Musical loud and clear on 4776.66, not 4780, at 2329 lottery info (Jay Novello, NC)

ECUADOR HCJB English to Europe at 1900-2200 started Z-97 on new 11990 ex-11960, oblivious of Kuwait's long presence here, and also RFE Bulgarian in first hour! Soon shifted to 12015, and asked for prayers to avoid such mistakes in future (gh)

FRANCE Fortunately, last month's lead story was not entirely correct, as RFI continued to be heard in English at 1200-1300 on 13625 via French Guiana. Although a number of transmissions to NAm were in fact cancelled including English direct from France at 1200 on 15530, this one actually for Central America remained (Jacques d'Avignon, Ont.) Such a technicality, always with huge signal here in CNAm if not in ENAm (gh) RFI is available via RealAudio in French, Spanish, English at **http://www.francelink.com**(Brad Bellaver, Cyberia)

GEORGIA V. of Hope sent great oversized card for this site, worth having, from Hereford UK address (Jerry Berg, MA, *OzDX*) For Z-97 shifted to 1800-2000 on 9310 (Edwin Southwell, England) Then on 9315 (BBCM)

GERMANY DW has new show *What's New?* UT Fridays around 0130, 0330, 0530 with rotating features: *Headcrash, Science and Technology, MediaMag, Made in Germany*; also Mondays at 2130 to Africa on 15135 (DW *tune in* via Jim Moats)

GREECE As predicted last month, VOG has gained access to a second VOA-Kavala 250 kW transmitter, so now up to four frequencies at once: Z-97 NAm 0000-0350 6260, 7450, 9420, 9935 including news in English at 0130-0140, 0340-0350; 1200-1350 including English 1335-1345 9375, 15175, 15630. Macedonia Radio Z-97: 0500-2205 9935, 11595, 1400-2100 6245 (John Babbis, MD)

ICELAND RUV Z-97: Eu 1215-1300 11402, 13860; 1855-1930 7735, 9275; NAm 1410-1440 11402, 13860; 1935-2010 11492[*sic*], 13860; 2300-2335 9275, 11402 (RUV via *EDXP*)

INDONESIA RPD Halmahera Tengah, 3125v, 1312-1433* with phone talk, poor (Juichi Yamada, Japan, *Jembatan DX*) VOI English at 2000-2100 quite readable, in the clear on 9525 (Jay Novello, NC)

INTERNATIONAL VACUUM *WORLD OF RADIO* on World Radio Network for Z-97: NAm Sat 0530, 1600; Eu Sat 0330, 1600, Sun 1030; As/Pac/Af/ME Sat 1600, Sun 1700. Now available much earlier on Sound Store, Sat 1645; go to **www.wrn.org** (WRN)

IRAN VOIRI English schedule announced for Z-97: 0030-0130 on 6050, 9022, 9685; 1100-1230 on 7115, 9555, 11875, 15260; 1530-1630 on 7215, 9550; 1930-2030 on 7260, 9022; 2130-2230 on 6165, 6175 (*OzDX*)

[non] V. of Southern Azerbaijan made one-hour time switch on the same odd DST date Israel did, Mar 21, to 0515-0614 on 11935 (*Panlview*)

IRAQ Republic of Iraq Radio, all SW frequencies irregular: 0255-2415 main program on 9715v, 7150v, 4615v; Kurdish 0315-2130 on 6560; Mother of Battles Radio 1700-2200 3935, unconfirmed on 9750v (BBC Monitoring) *Maybe one hour earlier now- gh*

IRELAND [non] West Coast Radio Ireland, via Deutsche Telekom, Z-97 NAm UT Thu 0100-0200 changing to 9875; Af 1900-2000 on 15625; Eu Sat 1500-1600 on 6175 (via Steven Cline; Dave Kenny, BDXC) NAm planned to change to 9470 (*Panlview*)

ISRAËL Kol Israël English corrections to last month: 1400-1430 on 12080, 15650; 1900-1925 on 7465, 9435, 11605, 15640. They still need mail, the only way to show people are listening against budget cut threats. Send to: Raphael Kochanowski, Kol Israel Radio, P.O. Box 1082, Jerusalem (Doni Rosenzweig, *rec.radio.shortwave*)

ITALY RAI has new website: **www.mix.it**/(Benno Klink, *BC-DX*)

JAPAN Not only *Media Roundup* but most other familiar shows have been cancelled; still existing is *Hello from Tokyo* UT Sun at 0110, 0510, 0710, 1210, 1510, 2110; and at the same times on Sat, *Asian Weekly* (NHK website)

JORDAN R. Jordan waited until NAm date April 6 to make DST shift: English at 1000-1630 on 11690 (Eugene Gebruers, RVI *Radio World*)

KOREA NORTH Young Soldier's Broadcasting Station is back on 2625 with usual war drama in Northern dialect, better than other two frequencies 1615 and 3025 kHz. Different programs of same format are aired simultaneously around 1400-1900 or 2000—from a country that can't even afford to light up the streets (Sunny Ashimori, Japan, *hard-core dx*)

LIBERIA [non] "Radio ELWA" program heard on TWR via South Africa, 9510, Hausa until 2030 English ID (Craig Seager, *Australian DX News*)

LIECHTENSTEIN [non] The Investment Channel dropped all broadcasts to Africa in mid-April, remained with these to Mideast: 0200-0355 6160, 0300-0425 7190, 0330-0555 9525, 0430-0555 11820, 15225, 0600-1155 15165, 0600-1455 21745, 0600-1725 17665, 1200-1755 15170, 1630-1725 11870, 1800-2155 9475, 1830-1955 11870, 1900-2155 7225 (Kathy Otto, SENTECH, South Africa, via Dave Kenny, BDXC) They lambasted greedy financial advisers giving poor advice (as opposed to the Investment Channel), advertised Supermarket Fund of America, a Movie Production Fund, Technology Fund, info from their Liechtenstein offices. Doubtless any investor would wish to check what protection he would have in channeling investments through a Liechtenstein-based company (Mike Barraclough, World DX Club *Contact*) It's P.O. Box 1250, FL 9490 Vaduz; fax 4175-232-3882 (Ed Rausch, NJ) Hope they're not stealing people's life savings, à la Albania (Willliam McClintock, MN)

LITHUANIA [non] R. Vilnius, English to NAm at 0030 Z-97 on 5910 (Bob Thomas, CT) Via Jülich, Germany. Now if somebody would get rid of that terrible utility that plagues the frequency, it would give listeners without a notch filter a chance to hear RV without all the racket (Sandy Wayne Wilson, IN)

MALTA [non] A schedule dated March from V. of Mediterranean said Japanese Sat 2300-2330 on 9800; Sun 0200-0330 English, 0330-0500 Maltese to Philippines, Au/NZ on 17570, 15550. Sun 0400-0500 English, 0500-0600 Maltese, 0600-0630 German, 0630-0700 Japanese on 7300 to WNAm; same languages at 0600-0900 Sun on 13600 to C/ENAm. Says Mon-Sat programs are called Voice of Malta; Sundays in Maltese, Japanese as R. Melita; Sunday evening Valetta Calling.

None of these have been heard and are questionable. The European service VOM via Russia is on 12060 and 9765 ex-7440, English 2000-2100 exc Fri, Sun only 2100-2130 French, 2130-2200 German (Eugene Gebruers, Belgium, RVI *Radio World*) V. of Mediterranean testing new site from end of April to May 11 at 1800-1900 on 5890, 9765 (Dr Hansjoerg Biener, Germany, *BC-DX*) *Looks like Germany - gh*

MEXICO XERMX-OC, R. México Internacional, 9705, and in mornings and afternoons also 5985, time-shifted schedule for DST to 1200-1600, 1800-0500 (UT Sun, Mon -0400). *Mail Box* with new host Alejandro Joseph, Tue 1500, Wed 0400, Thu 2000, Sat 1900, Sun 1400; *Estación DX* with new host Yuri Bilbatúa, Thu 0100, Sat 1800, Sun 1200, 2200; *Radio Correo del Aire* Sat 0100, 1200, 2200, Sun 1800. Power increase expected in June from previous 5 kW (via Juan Mort, XERMX) Spanish programs often start 5-10 minutes late; no motivation to start on time, since second halves of hours are music fill (gh)

XERTA update: tested some more in late March, early April on 4800 in the 1800-0400 period with 2.5 kW, to be increased to 5, using audio from FM Globo Estéreo

without any IDs of its own; was audible in Nayarit (Dr. Julián Santiago Diez de Bonilla via Hector García B. *World of Radio*) Still unheard here, blocked afternoons and evenings by RTTY, except on a Sunday when the Guatemalan was heard (gh, OK)

MOLDOVA [non] R. Moldova International, Z-97 English all on 7520: NAm 0330, 0430; Eu 2200, 2230. Has been seven days instead of M-F for a year now (Valeriu Vasilica, Head of RMI) He invites reception reports covering 1 or 2 weeks to fax 3732 723307 (Rubén Guillermo Margenet via Gustavo Fernando Durán) via Romania

MONGOLIA VOM Z-97 English: EAs 0900-0930 15170; Au 1230-1300 12085; SAs 1500-1530 9720, 12085. Has 9 different QSLs, appreciate two IRCs or $1 for postage to CPO Box 365, Ulaanbaatar 13; E-mail: <radiomongolia@magicnet.mn> (D. Batbayar, Mail Editor, English Section, *DX Window* via *EDXP*)

NEPAL [non] No more straining to hear R. Nepal on SW; now audio on website: **http://www.catmando.com/news/radio-nepal/radionp.htm** (gh) Located in Washington, DC (RN*MN*)

NORWAY Gunnar Nygård, pioneer and father of SWBC in Norway, died in Jan at 99; was first leader of RNI (NRK via Bob Thomas)

PAPUA NEW GUINEA Port Moresby 4890 instead of NBC called itself Voice of Papua New Guinea at 1300, discussion instead of music (Hans Johnson, TX, *DXing with Cumbre*)

PARAGUAY More on R. Guairá, 5975: sign-on varies between 1000 and 1200, but much later on Mondays. Asks for SW reports to address: Alejo Garcma y Presidente Franco, Villarrica; phone 2385 and 2130. Called them and found out transmitter is new 1 kW, usually on until 0000 though I often hear until 0100 (Levi Iversen, Paraguay, DSWCI *DX Window*) Station says sked is 0900-0200 (Takayuki Inoue N., Japan)

PERÚ R. Majestad, Huancayo, Junín, 4870.1 at 1152-1230 folk music, claiming national coverage (Pedro F. Arrunátegui, Lima) 4870.09, *1100-1137 with many huaynos, canned IDs, tnx to PFA tip. Has one-year experimental license for 1 kW as OCX4T, SW outlet of Sonorama Radio with transmitter acquired from R. Pampas ex-4854.3 (Takayuki Inoue N., Japan)

R. Selecciones, new on 5956.8 from Arequipa at 1130-1223, needed USB due to QRM from Uno on 5955.1. R. Cadena R. Victoria on 5818.9 at 1110-1136 religion //6018.2. R. Interoceánica, Puno, 6096.4 1140-1230, blocked by WSHB until 1158 (Arrunátegui)

Radio JL heard on 6261.1, *2345-0400*, from a village or shopping mall called Consuelo, near San Pablo, near Saposoa, in the region of San Martín; can't find Consuelo on map; lots of QRM from Greece on 6260 (Henrik Klemetz, *Dateline Bogotá* via *Play-DX*)

R. Cuzco, 6203.73, at 0010-0302*, ads and IDs, weak to fair, not heard very often. Must use LSB to avoid RFPI 6205 (Brian Alexander, PA)

R. Ondas del Río Mayo on new 6797.76, 250 watts in broad daylight at 1149 ID, religion (Jay Novello, NC) Should now be a 1 kW transmitter, different from the one on 6803 (Takayuki Inoue, Japan)

ROMANIA RRI announced Z-97 English to us: 2300 on 9510, 11940, 0200 on 5990, 6155, 0400 on 9510, 9570, 11940, but try European service 9690 at 1900, 2100 (Larry Russell, MI, *rec.radio.shortwave*)

SAIPAN KFBS' single English broadcast is Wed 1830-1900 on 9465 to CAs for Z-97 (Bob Padula, *Electronic DX Press*)

SERBIA R. Yugoslavia, J-97 English to NAm: 0000 exc Sun and 0430 daily on 9580, 11870 (via Benno Klink, *BC-DX*)

SLOVAKIA RSI Z-97 English: Eu 1630, 1830 on 5915, 6055, 7345; S&NAm 0100-0130 5930, 7300, 9440; Au 0830 on 11990, 15460, 17570 (Edwin Southwell, England)

SOLOMON ISLANDS SIBC: 1959-0730 on 9545, 5020; 0730-1130 on 5020 (BBCM)

SOMALIA R. Free Somalia is on 7250 at 1000-1200; may QSY in June (Sam Voron via Hans Johnson, *DXing with Cumbre*)

SOUTH AFRICA Channel Africa Z-97 changed all English to half-hours: 0300, 0400 5955; 0500 9675; 0600 11900; 1600 6120, 9685; 1700 11900 (via Dave Kenny, BDXC) see also LIECHTENSTEIN

SWEDEN R. Sweden Z-97 English to NAm: 1130, 1330 11650 15240; [LAm 0130 7290]; 0230 7135; 0330 9430 (*MediaScan*)

TAIWAN VOFC E-mail: <overseas@bcc.com.tw> (Boogert, *DXW*)

THAILAND R. Thailand, English 1900-2000 on 7210, news 2030-2045 on 9680 ex-9535 (Edwin Southwell, England; Wolfgang Büschel, Germany)

TIBET More to last month's item: As of April 5, V. of Russia was off 7195, and Lhasa PBS back on it again //6110, 4035 and other 5 & 6 MHz frequencies. But at *1400 VOA opens on 7195 in Tibetan! followed by SE Asian languages, obliterating Lhasa. So we have VOA QRMing them on 7195 and 6110. Lhasa is often missing from one of their frequencies. New on this station: long talks, discussions, interviews, new announcers, but don't hear Tibetan chants much these days. Still have English ID at 1500 "and tthe program for overseas listeners"—meaning foreigners living and working in Tibet? (Mike Ryan, Bangkok, *World of Radio*)

TURKEY VOT changed English: 0300 on 7300 not 6120; 1230 on 13750 not 13695 (Benno Klink, *BC-DX*) We hear the 1830 on 13695 best—supposed to be reduced carrier LSB, but usually more modulation on the high side, with wobbly carrier. Very informal woman announcer greets listeners between shows and gushes about what a great place to visit the Turkish Republic of Northern Cyprus is (gh, OK)

UKOGBANI *BBC On Air* for April, May gave misleading info on BBC frequencies: 11835, African stream via Ascension is really on until 2300* with good signal here; 5975 and 6175 to North America again this summer close at 0700* not 0800* but now duplicating European stream, the 0730 features should be audible on 7325, 9410, 12095. Half-hour feature blocks at 1215, 1615 are gone, and no American frequencies at 1830 which remains, but try 12095, 9410 (gh) You can still get a free sample of *BBC On Air* by phoning 1-800-875-2997 (Will Martin, MO)

R. Free London, pirate, planned to replace 6400 with 5805 from May 18, a good clear frequency heard in NAm, and increase power from 12 to 90 watts (Andrew Yoder, *PiPa*)

UKRAINE RUI has some new English hours: 1200 to NAm on 12050, Au on 12045, Scandinavia on 7150; 2100 LAm 13720; also to NAm at 2100, 0000 on 9550, 12040; 0300 on same plus 7150 (Bob Thomas, CT) Also new at 1700 on 12050 (NRCU Kyiv via Joerg Sajuk, Germany, *BC-DX*)

From April 14, R. Marabu will add high-power SW 50 kW via Radio Independence, Lviv, in cooperation with the All-Ukrainian Festival "Alternativa," daily 1000-1200 and 2100-2400 on 11830, plus MW and FM (R. Marabu, P.O. Box 1166, 49187 Belm, Germany) *Not heard here, but one day until 2102* had barely modulated German on this frequency with fair signal; could above times be local UT+3? - gh*

USA WRMI, 9955 as of April, remnants of which may still be in effect: *Viva Miami* in English: M-F 1430, Tu-F 0015, Tu-Sa 0330; also Wed 1400, Sa 2030 (weeks 1, 5), Sa 2100-2200, 2300 (weeks 2, 4, 5). *Computer Beat* Mon 1330, Tue 1315, Sat 2330, Sun 2000. *AWR Wavescan* Tu-Sa 0245; Tue, Wed 1330; Sat 2015, 2230 (weeks 4, 5), Sun 1215, 2015, Mon 0000 (WRMI) WRMI will soon be on the air 24 hours (Jeff White, *Viva Miami*) *Jeff planned to be traveling a lot in May, so likely more and more VM reruns - gh*

WORLD OF RADIO on WWCR as of April: Thu 2030 15685, Sat 0530 5070, 1130 5070, 1300 15685, Sun 0900 3210, 2330 5070 (12160 in June, July, August), Tue 1230 15685. *Mundo Radial*, gh's monthly Spanish DX report aired weekly is now on Thu at 2100 following *W.O.R.*, Fri 2115 on 15685. *Ask WWCR* biweekly aired weekly, Fri 2000 15685, Sat 0915 5070, Sun 2315 12160, Mon 0500 5070, 2100 15685. See also INTERNATIONAL VACUUM (gh)

DXing with Cumbre, the only program worth listening to on World Harvest Radio, rescheduled to: WHRI, Sat 0500 5745, 7315; 1430 6040; 1730, 2230 9495; Sun 0330, 2200 5745; KWHR, Sat 0230 17510, 0500 17780, Sun 1830 13625, Mon 0330 17510. Also realtime feed on website (*DWC*)

KJES, The Lord's Ranch, NM, finally into prime-time on new 7555 at 0100-0230, usual children's bible readings, co-channel to RTTY station which may object (Sheldon Harvey, PQ & gh, *World of Radio*)

WINB for Z-97 on unexpected 13790 from 2000 ex-11740, confounding some listeners (George Thurman, TX)

WRNO back on 7355 ex-7455 at 0800-1500 Z-97 (George Jacobs & Associates)

VOA *Communications World* managed to get a Greenville USB frequency for the Sat 1230 broadcast, improving reception in NAm: 7768.5 but came on late two weeks running; also on 9760, 6160 from Philippines; best bets at other times are Sat 1030 on 5985 Delano, 1730 on 17895, 15410 Morocco, 2130 9760 (gh)

Establishment of a R. Free Iran, and a R. Free Africa were suggested at congressional hearing on budget for international broadcasting (VOA *Communications World*)

VATICAN R. Vaticana to NAm 0250-0310 as usual for summer J-97 on 9605 ex-6095 //7305 (R. Vaticana)

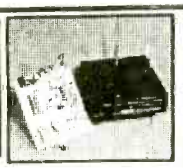
VENEZUELA YVTO, 5000, spurs on 4900, 5100, 5200 are heard nightly; also, automated voice IDs are not synchronized to run at same time each minute, but repeat every 50 seconds, occasionally stepping on time announcement each minute at :50. It's pretty bad when a standard time and frequency station experiences these technical lapses, and obvious inattention by operators (Randy Stewart, MO) Also weak spurs on 4800, 5300 (Brian Alexander, PA)

VIETNAM [non] Voice of Vietnam via Russia in English to us: 0100-0127, 0230-0257 on 7250 (Bob Thomas, CT) Now in between in Vietnamese (Ivan Grishin, Ont.) Also English at 0330 (Brian Carling, *Cumbre DX* via *BC-DX*)

Until the Next, Best of DX and 73 de Glenn!
http://hudson.idt.net/~khecht19/radio/shortwave/ghauser

RAMSEY

Synthesized FM Stereo Transmitter



Microprocessor controlled for easy freq programming using DIP switches, no drift, your signal is rock solid all the time - just like the commercial stations. Audio quality is excellent, connect to the line output of any CD player, tape deck or mike mixer and you're on-the-air. Foreign buyers will appreciate the high power output capability of the FM-25; many Caribbean folks use a single FM-25 to cover the whole island. New, improved, clean and hum-free runs on either 12 VDC or 120 VAC. Kit comes complete with case set, whip antenna, 120 VAC power adapter - easy one evening assembly.

FM-25, Synthesized FM Stereo Transmitter Kit $129.95

Tunable FM Stereo Transmitter

A lower cost alternative to our high performance transmitters. Offers great value, tunable over the 88-108 MHz FM broadcast band, plenty of power and our manual goes into great detail outlining aspects of antennas, transmitting range and the FCC rules and regulations. Connects to any cassette deck, CD player or mixer and you're on-the-air, you'll be amazed at the exceptional audio quality! Runs on internal 9V battery or external power from 5 to 15 VDC, or optional 120 VAC adapter. Add our matching case and whip antenna set for a nice finished look.

FM-10A, Tunable FM Stereo Transmitter Kit $34.95
CFM, Matching Case and Antenna Set $14.95

RF Power Booster Amplifier

Add some serious muscle to your signal, boost power up to 1 watt over a frequency range of 100 KHz to over 1000 MHz! Use as a lab amp for signal generators, plus many foreign users employ the LPA-1 to boost the power of their FM Stereo transmitters, providing radio service through an entire town. Power required: 12 to 15 volts DC at 250mA, gain of 38dB at 10 MHz, 10 dB at 1000 MHz. For a neat, professionally finished look, add the optional matching case set.

LPA-1, Power Booster Amplifier Kit $39.95
CLPA, Matching Case Set for LPA-1 Kit $14.95
LPA-1WT, Fully Wired LPA-1 with Case $99.95

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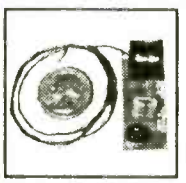
World's smallest FM transmitter. Size of a sugar cube! Uses SMT (Surface Mount Technology) devices and mini electret condenser microphone, even the battery is included. We give you two complete sets of SMT parts to allow for any errors or mishaps-build it carefully and you've got extra SMT parts to build another! Audio quality and pick-up is unbelievable, transmission range up to 300 feet, tunable to anywhere in standard FM band 88 to108 MHz. 7/8"w x 3/8"h x 3/4"h.

FM-5 Micro FM Wireless Mike Kit $19.95

Crystal Controlled Wireless Mike



Super stable, drift free, not affected by temperature, metal or your body! Frequency is set by a crystal in the 2 meter Ham band of 146.535 MHz, easily picked up on any scanner radio or 2 meter rig. Changing the crystal to put frequency anywhere in the 140 to 160 MHz range-crystals cost only five or six dollars. Sensitive electret condensor mike picks up whispers anywhere in a room and transmit up to 1/4 mile. Powered by 3 volt Lithium or pair of watch batteries which are included. Uses the latest in SMT surface mount parts and we even include a few extras in case you sneeze and loose a part!

FM-6, Crystal Controlled FM Wireless Mike Kit $39.95
FM-6WT Fully Wired FM-6 ..... $69.95

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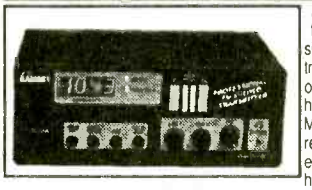
Super Pro FM Stereo Radio Transmitter



A truly professional frequency synthesized FM Stereo transmitter station in one easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set frequency easily with the Up/Down freq buttons and the big LED digital display. Plus there's input low pass filtering that gives great sound no matter what the source (no more squeals or swishing sounds from cheap CD player inputs!) Peak limiters for maximum 'punch' in your audio - without over modulation, LED bargraph meters for easy setting of audio levels and a built-in mixer with mike and line level inputs. Churches, drive-ins, schools and colleges find the FM-100 to be the answer to their transmitting needs, you will too. No one offers all these features at this price! Kit includes sharp looking metal cabinet, whip antenna and 120 volt AC adapter. Also runs on 12 volts DC.

We also offer a high power export version of the FM-100 that's fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped outside the USA, or within the US if accompanied by a signed statement that the unit will be exported.

FM-100, Professional FM Stereo Transmitter Kit $299.95
FM-100WT, Fully Wired High Power FM-100 ..... $429.95

Speech Descrambler Scrambler

Decode all that gibberish! This is the popular descrambler / scrambler that you've read about in all the Scanner and Electronic magazines. The technology used is known as speech inversion which is compatible with most cordless phones and many police department systems, hook it up to scanner speaker terminals and you're in business. Easily configured for any use: mike, line level and speaker output/inputs are provided. Also communicate in total privacy over telephone or radio, full duplex operation - scramble and unscramble at the same time. Easy to build, all complex circuitry contained in new custom ASIC chip for clear, clean audio. Runs on 9 to 15VDC, RCA phono type jacks. Our matching case set adds a super nice professional look to your kit.

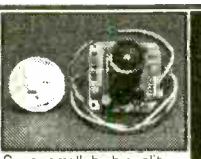
SS-70A, Speech Descrambler/Scrambler Kit $39.95
CSS, Custom Matching Case and Knob Set $14.95
SS-70AWT, Fully Wired SS-70A with Case $79.95
AC12-5, 12 Volt DC Wall Plug Adapter $9.95

Tone-Grabber Touch Tone Decoder / Reader

Dialed phone numbers, repeater codes, control codes, anywhere touch-tones are used, your TG-1 will decode and store any number it hears. A simple hook-up to any radio speaker or phone line is all that is required, and since the TG-1 uses a central office quality decoder and microprocessor, it will decode digits at virtually any speed! A 256 digit non-volatile memory stores numbers for 100 years - even with the power turned off, and an 8 digit LED display allows you to scroll through anywhere in memory. To make it easy to pick out numbers and codes, a dash is inserted between any group or set of numbers that were decoded more than 2 seconds apart. The TG-1 runs from any 7 to 15 volt DC power source and is both voltage regulated and crystal controlled for the ultimate in stability. For stand-alone use add our matching case set for a clean, professionally finished project. We have a TG-1 connected up here at the Ramsey factory on the FM radio. It's fun to see the phone numbers that are dialed on the morning radio show! Although the TG-1 requires less than an evening to assemble (and is fun to build, too!), we offer the TG-1 fully wired and tested in matching case for a special price.

TG-1, Tone Grabber Kit $99.95
CTG, Matching Case Set for TG-1 Kit $14.95
TG-1WT, Fully Wired Tone Grabber with Case $149.95
AC12-5, 12 Volt DC Wall Plug Adapter $9.95

Mini-Peeper Micro Video Camera



Super small, high quality fully assembled B & W CCD TV camera the size of an ice cube! Provides excellent pictures in low light (2 lux), or use our IR-1 Infra-Red light source to invisibly illuminate an entire room on a pitch black night! Imagine the possibilities... build it into a smoke detector, wall clock, lamp, book, radio. Exact same camera that's in big buck detective catalogues and stores. Kit includes: fully assembled CCD camera module, connectors, interface PC board kit with proper voltage regulation and filtering, hook-up details, even a mini microphone for sensitive sound! Two models available: Wide Angle Lens 3.6mm/f2, adjustable focus lens, 92 degree view; Pinhole Lens 5.5mm/f4.5, 60 degree view. The Pinhole Lens is physically much flatter and provides even greater depth of focus. The camera itself is 1.2" square. The Wide Angle Lens is about 1" long; Pinhole Lens about 1/2", interface PC board is 1" x 2" and uses RCA jacks for easy hook-up to VCRs, TVs or cable runs. Power required is 9 to 14 VDC @ 150 mA. Resolution: 380 x 350 lines. Instruction manual contains ideas on mounting and disguising the Mini-Peeper along with info on adding one of our TV Transmitter kits (such as the MTV-7 unit below) for wireless transmission!

MP-1, Wide Angle Lens CCD TV Camera Outfit $169.95
MP-1PH, Pin-Hole Lens CCD TV Camera Outfit $189.95

MicroStation Synthesized UHF TV Transmitter

Now you can be in the same league as James Bond. This transmitter is so small that it can fit into a pack of cigarettes - even including a CCD TV camera and battery! Model airplane enthusiasts put the MTV-7A into airplanes for a dynamite view from the cockpit, and the MTV-7A is the transmitter of choice for balloon launches. Transmitter features synthesized, crystal controlled operation for drift-free transmission of both audio and video on your choice of frequencies. Standard UHF TV Channel 52 (which should only be used outside of the USA to avoid violating FCC rules), and 439.25 MHz or 911.25 MHz which are in the amateur ham bands. The 439.25 MHz unit has the nifty advantage of being able to be received on a regular 'cable-ready' TV set tuned to Cable channel 68, or use our ATV-74 converter and receive it on regular TV channel 3. The 911.25 MHz unit is suited for applications where reception on a regular TV is not desired, an ATV-79 must be used for operation. The MTV-7A's output power is almost 100 mW, so transmitting range is pretty much 'line-of-sight' which can mean many miles! The MTV-7A accepts standard black and white or color video and has its own, on-board, sensitive electret micorphone. The MTV-7A is available in kit form or fully wired and tested. Since the latest in SMT (Surface Mount Technology) is used to provide for the smallest possible size, the kit version is recommended for experienced builders only. Runs on 12 VDC @ 150 mA and includes a regulated power source for a CCD camera.

MTV-7A, UHF TV Channel 52 Transmitter Kit $159.95
MTV-7AWT, Fully Wired Channel 52 Transmitter $249.95
MTV-7A4, 439.25 MHz TV Transmitter Kit $159.95
MTV-7A4WT, Fully Wired 439.25 MHz Transmitter $249.95
MTV-7A9, 911.25 MHz TV Transmitter Kit $179.95
MTV-7A9WT, Fully Wired 911.25 MHz Transmitter $269.95
ATV-74, 439.25 MHz Converter Kit $159.95
ATV-74WT, Fully Wired 439.25 MHz Converter $249.95
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Larry Van Horn, N5FPW
steditor@grove.net

DXing the Radio Basement

This month's *DeMaw's Workshop* got me thinking about one of my favorite utility bands—the basement frequencies down below 200 kHz.

While I have had some success over the years in the 0-200 kHz frequency range, it wasn't until we moved into the countryside that I was able to exploit monitoring activity here to its fullest. In this month's *Utility World* column we will take a look at some of the radio systems (manmade and natural) transmitting in radio's basement.

■ Music of the Earth

One of the more fascinating activities to listen to in the basement band is natural radio. With an inexpensive ELF/VLF (extremely low frequency/very low frequency) receiver, a wide range of natural radio sounds can be heard. The frequency range for natural radio reception runs from 200 Hz to 10 kHz.

As you read in this month's cover story, lightning storms, Earth's magnetic-field (the Magnetosphere), and the Aurora Borealis and Australis (Northern and Southern Lights) all produce an amazing variety of electromagnetic "sounds." Sferics (lightning-stroke static), tweeks, whistlers of countless variety, the incredible "chorus" (chirping, barking, and squawking radio "sounds" produced by the Sun's solar wind hitting Earth's magnetic field), various kinds of "hiss," bizarre "wavering-tone" emissions, and an endless variety of fascinating radio emissions can be heard in this spectrum.

For more information on natural radio, see *DXing the Planet Earth* in the October 1992 *Monitoring Times*. As the author of that piece, I can rightfully say, you really ought to give natural radio listening a try. It is unlike any radio you have ever heard before.

■ The Navy's ELF Communication System

The ELF frequency range is critically important to the Navy because of its value in providing a way to communicate with submerged submarines. As a result of the high electrical conductivity of sea water, signals are attenuated rapidly as they propagate downward through it. In effect, the sea water "hides" the submarine from detection while simultaneously preventing it from communicating with the outside world through normal radio transmissions.

The degree to which a signal is attenuated depends on its frequency, however. The lower the frequency, the more deeply a signal can be received in sea water. In order to receive conventional radio transmissions a submarine must travel at slow speeds and be near the surface of the water. Both of these situations make a submarine more susceptible to enemy detection. Frequencies in the ELF range, however, can be received considerably deeper, and broadcasts using this mode provide a primary link between the nation's commander-in-chief and the submarine force.

One of the great difficulties associated with the use of ELF for communication purposes, is the problem of generating a useful signal. The physical size of an antenna that can produce a usable signal with reasonable efficiency is inversely proportional to the frequency. For example, an antenna useful for cellular telephone frequencies need only be several inches long to be completely effective. At ELF, on the other hand, a reasonably efficient antenna must be quite large.

The ELF system, which became operational in 1989, uses two transmitting antennas, one in Clam Lake, Wisconsin, and one in Republic, Michigan. The two sites must operate simultaneously to meet worldwide coverage requirements.

Each antenna looks like a power line, mounted on wooden poles. The Wisconsin antenna consists of two lines, each about 14 miles long. The Michigan antenna uses three lines, two about 14 miles long and one about 28 miles long. Each site has a transmitter building near the antenna. The transmitter facility in Michigan uses about six acres of land and the one in Wisconsin about two acres. The operating frequencies are 44 and 76 Hz.

■ Alpha and Omega

The United States and Russia both operate navigation radio systems in the 10-15 kHz area. The Russian systems is known as "Alpha" and was modeled after the United States system known as "Omega."

Omega was initially developed by the Department of Defense and like many older navigation systems is being phased out in favor of the satellite-based global positioning system or GPS. Omega's navigation system is officially set for termination on September 30, 1997. Natural radio listeners will really appreciate getting rid of these powerful manmade radio signals that interfere with sferics reception in this portion of the radio spectrum.

Listen for Russian Alpha signals on 11.9, 12.6, and 14.8 kHz. The U.S. Omega system can be heard on 10.2, 11.05, 11.33, 11.55, 11.8, 12.85, 13.1, and 13.6 kHz. The two U.S. stations that are part of the international omega network are located in Haiku, Hawaii, and Lamoure, North Dakota.

■ Navy/Air Force Strategic Communications

The spectrum from 15 to 100 kHz is dominated by U.S Navy strategic submarine communications system and the U.S.Air Force SLFCS (Survivable Low Frequency Communications System). Shore-based stations and aircraft (military airborne command post) transmitters are utilized in this range. The predominant mode used by the military in this range is MSK (Multi-Shift Keying).

Table 1 is a list of U.S. Navy VLF stations, callsigns, and frequencies that are known to operate in this portion of the spectrum.

The U.S. Air Force also has a strategic communications system in the 15-100 kHz range. It is called the survivable low frequency communications system or SLFCS. The SLFCS system is capable of transmitting and/or receiving secure, low data rate messages during pre-, trans-, and post-attack nuclear scenarios. The SLFCS provides connectivity between an airborne command post and military ground stations.

Broadcast Loggings

GLOBAL FORUM

Gayle Van Horn

0000 UTC on 9570
PORTUGAL: Radio Portugal Int'l. Frequency quote to news by Christian Miguel. Strong and clear signal quality. (Sue Wilden, Columbus, IN)
0005 UTC on 9710
MALI: China Radio Int'l. News and update on upcoming Hong Kong reunification. (Wilden, IN)
0012 UTC on 7405
USA: Voice of America. Japanese and NYSE prices to news on Albania. (Wilden, IN)
0013 UTC on 6725.6
PERU: Radio Satelite. Nice Peruvian music to Spanish announcements. Station ID and announcer chat. (Mark Veldhuis, Borne, Netherlands, via email)
0028 UTC on 5900
BELGIUM: Radio Vlaanderen Int'l. Interval signal to ID, frequency information and program preview. *Brussels Calling* at 0031, signal fair to poor by 0048. (Steve Ponder, Houston, TX, via email)
0030 UTC on 6185
MEXICO: Radio Educacion Int'l. Spanish ID "para Radio Educacion de Mexico enforme..." (Brian Bagwell, St. Louis, MO) **Radio Mexico Int'l** on 9705 at 1600-1630. (Lee Silvi, Mentor, OH; Mahendra Vaghjee, Rose Hill, Mauritius)
0044 UTC on 9700
GERMANY: Deutsche Welle. Spanish program to IDs. German service logged on 15275//17810 at 2102. (Wilden, IN)
0155 UTC on 9575
ITALY: Radio Roma. Italian. Male/female announcers with news text. (Jerry Witham, Keaau, HI) Station noted 2230 on 9685 in Italian. (Howard Moser, Lincolnshire, IL) Italian service on 17780 at 1410 with national soccer game Bologna vs. Naples. (Bob Fraser, Cohasset, MA)
0240 UTC on 3300
GUATEMALA: Radio Cultural. Weak romantic choral songs to 0259. ID and national news items . (Giovanni Serra, Rome, Italy, *TFW* via email)
0405 UTC on 5019.7
COLOMBIA: Ecos del Atrato. (Tent) Spanish text and ballads. No ID heard so presumed for this poor signal quality. (Serra, Italy)
0425 UTC on 4775
SWAZILAND: Trans World Radio. English sign-on for religious programming, suffering rapid drop in signal. (Lora Humelsine, via email)
0500 UTC on 7125
RUSSIA: Voice of Russia. Eastern European news covering NATO Expansion and Albanian elections. (Moser, IL) *Moscow Yesterday and Today* program featuring the coronation of Catherine the Great and her cultural works, heard on 5940 at 2030. (Fraser, MA)
0540 UTC on 9675
SOUTH AFRICA: Channel Africa. ID and text of parliamentary speech about budget proposals. (Witham, HI) News coverage of Zaire to sports update. (Moser, IL)
0828 UTC on 4918.9
ECUADOR: Radio Quito. Spanish. Non-stop Latin music to brief announcement and station ID. SINPO=34444. (Veldhuis, NLD; Wilden, IN)
0845 UTC on 4831.9
COSTA RICA: Radio Reloj. Latin music to Spanish time check and regional news. (Veldhuis, NLD)
1058 UTC on 4820
HONDURAS: La Voz de Evangelica. Spanish religious program with prayers and hymns. (Brian Boulden, Fairfield, CA, via email)
1104 UTC on 4890
PAPUA NEW GUINEA: NBC. National news and regional weather update. (Boulden, CA; Witham, HI) Noted 1930-2006 to news. (Walter Mola, Torino, Italy, *TFW*)
1135 UTC on 9580
AUSTRALIA: Radio Australia. Commentary on cultural ties with Thailand. (Tom Banks, Dallas, TX) *Dateline* show by Jane Murphy at 1330 on 5995. (Wilden, IN)
1400 UTC on 9530
THAILAND: Radio Thailand. English news to festival information. (Silvi, OH; Vaghjee, MAU)
1410 UTC on 7160
MALAYSIA: RTM Kuching. English ID to music mix of regional and European pop songs. SIO=333, //7160. (Humelsine) RTM noted on 4895 //5005 at 2245. (Giampiero Bernardini, Chieti, Italy/*TFW*; Vaghjee, MAU)
1429 UTC on 9535
JAPAN: NHK World/Radio Japan. English features // 12045. Radio Japan via Gabon in English on 15355//9535 at 1510-1559. (Silvi, OH)
1505 UTC on 5987
MYANMAR: Radio Myanmar. Commentary in English on economic sanctions to weather forecast. Announcement noted as "52nd Anniversary of the Armed Forces Objective." Instrumental music to anthem and 1559*. (Vaghjee, MAU)
1625 UTC on 6543.8
SOMALIA: Clandestine: Voice of Ala Suma Waljama. (Tent) Islamic prayers and text. **Radio Mogadishu** in regional language to music. (Witham, HI)
1629 UTC on 6130
CANADA: CHNX Nova Scotia. Great signal for *Oldies 96* relay show. (Silvi, OH) Canada's **RCI via Sackville** on 9535 at 0006. (Wilden, IN)
1630 UTC on 11750
QATAR: Qatar BC Svc. Radio drama play to Arabic text. (Silvi, OH)
1743 UTC on 4976
UGANDA: Radio Uganda. News report on press conference of South African Commerce and Industry members. Soccer results and ads for public health. (Vaghjee, MAU)
1755 UTC on 9548
BANGLADESH: Bangla Betar. English programming on history of the Islamic religion, into regional music. (Witham, HI)
1800 UTC on 6160
CANADA: CKZN Newfoundland. Talk show, news, and CBC relay. (Silvi, OH)
1821 UTC on 3335
TAIWAN: CBS. Very long text in Chinese about Zhongguo. (Serra, Italy, *TFW*)
1825 UTC on 7288
TUNISIA: RTV Tunisienne. Arabic. Talk to telephone call-in with musical request. National news and religious programming at 1908, // 7475, 12005. (Vaghjee, MAU)
1957 UTC on 7395
USA: WRNO. LSU/Georgia baseball game (Wilden, IN)
2015 UTC on 9605
MADAGASCAR: Radio Netherlands. *Sounds Interesting* program on international radio on the Internet. (Fraser, MA)
2020 UTC on 7335
BULGARIA: Radio Bulgaria. Commentary that Bulgaria considers the I.M.F. demands as unrealistic, // 9700. (Fraser, MA; Wilden, IN; Vaghjee, MAU)
2043 UTC on 11835
ASCENSION ISLANDS: BBC-WS. *Newshour* with report on the continuing hostage situation in Peru, // 11750. (Fraser, MA)
2146 UTC on 6195
UNITED KINGDOM: BBC-WS. Weak signal for 40's and 50's music show. (Wilden, IN)
2153 UTC on 7450
GREECE: Voice of Greece. Traditional Greek music, time tones at 2154. Interval signal at 2202 to station announcement. (Wilden, IN)
2200 UTC on 7500
MOLDOVA: Radio Moldova Int'l. News and talk to ID at 2214. SINPO=22342. (Zacharias Liangas, Thessalloniki, Greece, *TFW*)
2300 UTC on 4747.5
PERU: Radio Huanta 2000. Spanish. SINPO: 44444 to 2330. Peruvian music to ID as, "A travos de esta emisora Radio Huanta 2000". Ad to public service announcement. (Pedro Arrunategui, Lima, Peru/*TFW*)
2310 UTC on 9655
TURKEY: Voice of Turkey. *Songs & Stories* program on the various regions of Turkey. (Fraser, MA)
2320 UTC on 9725
COSTA RICA: Adventist World Radio. *Your Story Hour* program to musical ID as "the Voice of Hope" at 2329. *It is Written* program at 2359 to station ID. (Ponder, TX) AWR on 5030 at 1112 with *Amazing Facts* show. (Boulden, CA)
2324 UTC on 3339.9
PERU: Radio Altura. Spanish. Music to ad and ID, "una sola calidad Altura, una emisora al servicio del paos." Peruvian **Radio Paucartambo** noted on 5894.8 at 2325.(Arrunategui, Peru)
2325 UTC on 11700
NORTH KOREA: Radio Pyongyang. English news to Asian music at 2328. Communist readings to time/frequency quote at 2343. Strong signal quality with considerable polar flutter to 2346*.(Rudy Hanau, Rye Brook, NY, via email) Monitored on 11700 to 2310 (Moser, IL)
2350 UTC on 3316
SIERRA LEONE: SLBS. Afro pop and easy listening music. News and public service announcements at 0000 to 0016* with national anthem. (Banks, TX)
2354 UTC on 4004.9
PERU: Radio La Voz del Campesino. Fair signal quality and ID as, "Radio La Voz del Campesino del Alto Piuraa." Campesino music and announcements to 0110*. (Arrunategui, Peru)

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

Gayle Van Horn, gayle@grove.net

Danke Schön Deutschland

From the heart of Europe, we spotlight QSLing from Germany. One of the first stations to be confirmed by a new world band listener is Deutsche Welle. DW broadcasts via worldwide transmitters from Europe, Asia, Africa, Canada, and the Caribbean. While a favorite among DXers for their generous enclosures of free stickers, pennants, and their excellent news magazine *DW-radio tune-in*, they usually include a "no data" QSL, except for a special occasion or broadcast. *DW-online* is available at **<http://www.dwelle.de>** with links to their English and multilingual services, as well as *Audio On Demand,* music, news, and email at **<online@dwelle.de>**.

Bayerischer Rundfunk from Munich is the public broadcasting authority for Bavaria. Broadcasting in German on 6085 kHz, 24 hours, *Bayern 3* confirms with full data cards. Their website **<http://www.br-online.de/>** is mostly in German, but accepts English reception reports at the email link. Return postage or currency is appreciated if corresponding via airmail.

Radio Bremen also broadcasts in German. Although not as widely heard, they transmit on 6190 kHz, 24 hours, and verify with a QSL card and stickers from: Burgermeister-Spitta-Allee 45, 28329 Bremen, Germany **<http://www.radiobremen.de/>**.

Sudwestfunk, a publicly owned station, transmits from Rohrdorf and is responsible for the Rhineland-Palatinate and southern Baden-Wurttemberg area. Their QSL policy includes a full data card. The pop/rock DJ format is easy to recognize on 7265 kHz, 24 hours in German. Send your report and return postage to; Hans Bredowstr., D-76530 Baden-Baden, Germany. Station website **<http://www.swf3.de>** includes Real Audio and an email ink.

ASCENSION ISLANDS

BBC Atlantic Relay Station, 9915 kHz. Full data verification on station letterhead, signed by Mrs. Nicola Nicholls. Received in 66 days for an English report and one U.S. dollar. Station address: BBC Atlantic Relay Station, English Bay, Ascension Island, South Atlantic Ocean. (Darren White, Hattiesburg, MS)

AUSTRALIA

VLC-Radio Australia, 9590 kHz. Full data QSL card signed by Danotia Gordon. Received in 106 days for an English report and two IRCs, my personal amateur radio QSL card and a souvenir postcard. Station address: P.O. Box 428G, Melbourne, VIC, Australia. (Irv McWherter, via email)

COASTAL STATION

OXI Nuuk Radio, 500 kHz. Full data QSL letter, prepared QSL card signed by Bjorn Jokumsen and personal letter from Sven Lutzen. Received in 98 days for a utility report and one U.S. dollar. Station address: Greenland Telecom, P.O. Box 1002, DK-3900 Nuuk, Greenland. (Hank Holbrook, Dunkirk, MD)

VFF Frobisher Radio, 500 kHz. Full data prepared QSL verified and amateur radio QSL card. Received in eleven months for an English utility report and mint stamps. Station address: Transport Canada, Iqaluit C.G.R.S., Iqaluit, NWT (Frobisher Bay) Canada. (Holbrook, MD)

GERMANY

Bayerischer Rundfunk, 6085 kHz. Full data color winter scenery card of Sonnenobservatorium with illegible signature. Received in eight days for English report sent via email at station website. Full data plastic sticker card received via snailmail, signed by Thomas Sella. Assortment of station stickers and two oversized station brochures/program schedules and personal note from veri signer. Station address: Rundfunkplatz 1, D-80300 Munich, Germany. (Gayle Van Horn, Brasstown, NC) Station verified in 14 days for a taped recording of *Gute Nacht Freunde* program. Station schedule, decals, and my returned cassette tape. (Stokes Schwartz, Madison, WI)

Deutsche Welle, 6040 kHz. No data globe card unsigned. Received in 82 days for an English report and one IRC. Station address: Postfach 10 04 44, D-50588 Cologne, Germany. (Frank Hillton, Charleston, SC)

Columbus Canterbury ELUB8, 16528 kHz USB. (Merchant ship) Full data prepared QSL card stamped and signed by Second Officer, Hubert Frik, who doubles as Radio Officer. Received in 26 days for a German utility report and two U.S. dollars. This Hamburg-Sued ship was formerly known as the *Monte Rosa* DGLM but was recently reflagged as ELUB8. Most traffic is now via satellite, except for daily exchanges on HF SSB (16528 kHz at 0000Z). Included within the card, a letter on official Telex paper and a current list of the line's 19 ships, only four of which retain German flags. The ship's HF radio is a Sailor Compact RE-2100. I wrote to the ship's home office in Hamburg, but they have an agent at Columbus Line, 249 East Ocean Blvd., Suite 200, Long Beach, CA 90802. (Rick Albright, Merced, CA, via email)

MADAGASCAR

Radio Netherlands Relay Station, 11655 kHz. Full data QSL folder card, signed by Rahamefy Eddy. Received in 42 days for an English report and two IRC's. Station address: P.O. Box 404, Antananarivo-101, Madagascar. (White, MS; Tom Banks, Dallas, TX)

MEDIUM WAVE

KFDI, 1070 kHz AM. Full data prepared QSL card signed by David A. Early-Chief Engineer. Received in eight days for an AM report and mint stamps. Station address: P.O. Box 1402, Wichita, KS 67201. (Terry Jones, Plankinton, SD)

KWKH, 1130 kHz AM. Full data prepared QSL card with illegible signature. Received in seven days for an English AM report and mint stamps. Station address: P.O. Box 31130, Shreveport, LA 71130. (Jones, SD)

CKWX, 1130 kHz AM. Station's slogan...*All News, All Day, All Night, All the Time.* Received in 12 days for an English AM report and two IRC's. Station address: 2440 Ash St., Vancouver, BC Canada V5Z 4J6. (Jim Wright, Federal Heights, CO)

CFAC, 960 kHz AM. Station's slogan...*Calgary's Home of Country Music.* QSL verification on station letterhead from Robin Hilderhrand. Received in 41 days for an English AM report and two IRC's. Station address: 3320 17th Ave., S.W., Calgary AB Canada T3E 6X6. (Wright, CO)

PALUA

Voice of Hope, 9985 kHz. Partial data QSL card unsigned. Received in 22 days for an English report and two IRC's. Station address: P.O. Box 66, Korne, Palau 96940. (White, MS)

SHIP TRAFFIC

A.V. Kastner ZCAM9, 500 kHz (Bulk Carrier). Full data QSL note. Received for an English utility report and mint stamps. Ship address: Strachen Shipping Co., 10416 Alta Dr., Jacksonville, FL 32226. (Holbrook, MD)

SS Mayaguez WZJE, 500 kHz (Container Vessel). Full data QSL letter. Received for an English utility report and one U.S. dollar. Ship address: Puerto Rico Marine Management, Inc., P.O. Box 71306, San Juan, Puerto Rico 00936-1306. (Holbrook, MD)

How to Use the Shortwave Guide

1: Convert your time to UTC.

Eastern and Pacific Times are already converted to Coordinated Universal Time (UTC) at the top of each page. The rule is: convert your local time to 24-hour format; add (during Daylight Savings Time) 4,5,6, or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively.

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 (8:30 pm Eastern, 5:30 pm Pacific).

2: Choose a program or station you want to hear.

Some selected programs appear on the lower half of the page for prime listening hours—space does not permit 24-hour listings.

Occasionally program listings will be followed by "See X 0000." This information indicates that the program is a rerun, and refers to a previous summary of the program's content. The letter stands for a day of the week, as indicated below, and the four digits represent a time in UTC.

S: Sunday T: Tuesday H: Thursday A: Saturday
M: Monday W: Wednesday F: Friday

3: Find the frequencies for the program or station you want to hear.

Look at the page which corresponds to the time you will be listening. Comprehensive frequency information for English broadcasts can be found at the top half of the page. All frequencies are in kHz.

The frequency listing uses the same day codes as the program listings; if a broadcast is not daily, those day codes will appear before the station name. Irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "vl" (various languages).

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

Not all stations can be heard and none all the time on all frequencies. To help you find the most promising frequency, we've included information on the target area of each broadcast. Frequencies beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible. Every frequency is followed by one of these target codes:

am:	The Americas	as:	Asia
na:	North America	au:	Australia
ca:	Central America	pa:	Pacific
sa:	South America	va:	various
eu:	Europe	do:	domestic broadcast
af:	Africa	om:	omnidirectional
me:	Middle East		

Consult the propagation charts. To further help you find the right frequency, we've included charts at the back of this section which take into account conditions affecting the audibility of shortwave broadcasts. Simply pick out the region in which you live and find the chart for the region in which the station you want to hear is located. The chart indicates the optimum frequencies for a given time in UTC.

Hot News

Programming Tips by Jim Frimmel

Deutsche Welle Introduces Newslink

The Voice of Germany dropped *European Journal* and *Newsline Cologne* in favor of a news magazine program called *Newslink* to provide comprehensive news from Europe. The new program runs about a half-hour and is broadcast live four times a day. *NewsLink* can be heard to North America at 01 and 03 hours and to other regions at 02, 04, 06, 09, 11, 16, 19, 20, and 23 hours UTC.

Internet TV

In other news from Germany, Deutsche Welle TV became the first European broadcaster to go live on the internet (**www.dwelle.de**). Almost simultaneously here in the U.S., Trinity Broadcasting Network began simulcasting its programs via the TBN website at **www.tbn.org/home.htm**. See our April column (p. 43) for details about the new RealPlayer technology that is making this possible.

Computer Beat

That's the name of a new program on WRMI dealing with the world of computers and the world wide web. Tune your shortwave to 9955 kHz on Sun at 2000, Mon at 1330, Tue at 1315, or Sat at 2330.

BBC Feature on Hong Kong

To mark the occasion of the return of the British colony to China the end of this month, BBC is featuring a six-part program called "Hong Kong: Imperial Orphan." Former Beijing correspondent Tim Luard presents the extraordinary story of how a remote colonial outpost grew to outshine the two empires which spawned it. Part one of the series began the third weekend of May and continues through June 26th.

AE Stream: Sun 1701 (repeated Tues 0630 and 1130)

AF Stream: Sun 1030 (repeated Tue 1930)

AS Stream: Sat 0530 (repeated Wed 1830 and Thu 0230)

The Return of Waveguide

BBC's *Waveguide* program appears to have re-emerged during May. Assuming that it will continue in June, the schedule should be as follows:

AE Stream: Tue 1730 (repeated Wed 1230)

AF Stream: Sun 1501 (repeated Mon 0730)

AS Stream: Sun 1501 and Wed 0345 (repeated 2345)

The Demise of Monitor Radio

See pages 6 and 38 for other reports on The Christian Science Church's surprise decision to sell major portions of its broadcasting operations. In addition to Monitor Radio, WSHB in Cypress Creek, South Carolina, and KHBI on the island of Saipan are up for sale or lease.

Summertime in Italy

August is the month of vacations in Italy and most Italians will be enjoying it at the beach or in the mountains. The Italian exodus was foretold recently when Radio Vaticana's March to October broadcast schedule arrived. The printed schedule was prominently labeled as being effective for "april-may-june-july-september-October 1997."

Tops in Shortwave Listenership

It is generally assumed that the two most influential shortwave broadcasters are the Voice of America (VOA) and the British Broadcasting Corporation (BBC). But, which broadcasters rank second and third in this category? According to Spanish Radio and TV, Vatican Radio occupies the third spot and Spanish External Radio comes in fourth. Spain produces 42 hours of broadcasting each day in Spanish, three dialects, and six foreign languages. (Hmmm... I wonder if Deutsche Welle comes in fifth? Any broadcasters care to challenge this?)

Selected Programs for June

World Harvest Radio (WHRI and KWHR) and World Wide Christian Broadcasting (WWCR) provide the bulk of the featured programs for this month. These schedules were current at press time, but the nature of commercial radio combined with printing lead time often defeats all efforts to bring you the latest. If religious programs aren't your cup of tea, you can use this information to tune out as well as tune in.

Frequencies

0000-0100	Anguilla,Caribbean Beacon	6090am			
0000-0100	Australia, Radio	13605pa	15415as	15510as	17750as
0000-0100 vl	Australia, VL8K Katherine	5025do			
0000-0100 vl	Australia, VL8T Tent Crk	4910do			
0000-0015	Cambodia, Natl Voice of	11940as			
0000-0100	Canada, CBC N Quebec Svc	9625do			
0000-0100	Canada, CFCX Montreal	6005do			
0000-0100	Canada, CFRX Toronto	6070do			
0000-0100	Canada, CFVP Calgary	6030do			
0000-0100	Canada, CHNX Halifax	6130do			
0000-0100	Canada, CKZN St John's	6160do			
0000-0100	Canada, CKZU Vancouver	6160do			
0000-0100	China, China Radio Intl	9710na	11695na	11760na	
0000-0100	Costa Rica,RF Peace Intl	6205am	7385am		
0000-0010	Croatia, Croatian Radio	5895eu	7165eu		
0000-0027	Czech Rep, Radio Prague	5930na	7345na		
0000-0100	Ecuador, HCJB	9745am	21455am		
0000-0030	Egypt, Radio Cairo	9900na			
0000-0015 vl	Ghana, Ghana Broadc Corp	3366do	4915do		
0000-1100	Guam, TWR/KTWR	9870as			
0000-0045	India, All India Radio	7150as	9705as	9950as	11620as
0000-0100	Japan, R Japan/NHK World	6155eu	6180eu		
0000-0030	Kazakhstan, Radio Almaty	6230eu			
0000-0100	Lebanon, Voice of Hope	9960va			
0000-0100	Liberia,LCN/R Liberia Int	5100do			
0000-0100	Malaysia, Radio	7295do			
0000-0100	Malaysia, RTM Kuching	7160do			
0000-0100	Netherlands, Radio	6020na	6165na	9845na	
0000-0100	New Zealand, R NZ Intl	15115pa			
0000-0050	North Korea, R Pyongyang	11335na	13760na	15130na	
0000-0100 vl	Papua New Guinea, NBC	9675do			
0000-0100	Russia,Voice of Russia WS	7105na	7125na	7250na	
0000-0030 mtwhfa	Serbia, Radio Yugoslavia	9580na	11870na		
0000-0100	Spain, R Exterior Espana	6055am			
0000-0030	Thailand, Radio	9690af			
0000-0100	Ukraine, R Ukraine Intl	5905na	6010na	6020na	7150na
		7180na	7240na	9550na	9560na
		9905na	12040na		
0000-0100	United Kingdom, BBC WS	5965as	5970am	5975am	6175am
		6195as	9410as	9590am	11750sa
		11955as	15310as		
0000-0045	United Kingdom, BBC WS	3915as			
0000-0030	United Kingdom, BBC WS	7110as	9580as	11945as	15280as
0000-0100	USA, KAIJ Dallas TX	5810am			
0000-0100	USA, KTBN Salt Lk City UT	15590am			
0000-0100	USA, KWHR Naalehu HI	17510as			
0000-0100	USA, Monitor Radio Intl	7535na	9430sa	15665as	15725as
0000-0100	USA, Voice of America	7215as	9770as	11760as	15185as
		15290as	17735as	17820as	
0000-0100 twhfa	USA, Voice of America	5995am	6130am	7405am	9455am
		9775am	11695am	13740am	
0000-0100	USA, WEWN Birmingham AL	5825eu	6890na	15375sa	
0000-0100	USA, WGTG McCaysville GA	5085am			
0000-0100	USA, WHRI Noblesville IN	5745am			
0000-0100	USA, WINB Red Lion PA	11950am			
0000-0100	USA, WJCR Upton KY	7490na			
0000-0100	USA, WRMI/R Miami Intl	9955am			
0000-0100	USA, WRNO New Orleans LA	7355am			
0000-0100	USA, WWCR Nashville TN	3215am	5070am	7435am	13845am
0000-0100	USA, WYFR Okeechobee FL	6085na	9505ca		
0030-0100	Australia, Radio	9660pa	11640as	12080pa	13755pa
		15365pa	17795pa	17860pa	17880pa
0030-0055	Austria, R Austria Intl	9655na			
0030-0100	Iran, VOIRI	6050eu	9022eu	9685eu	
0030-0100	Lithuania, Radio Vilnius	5910na			
0030-0100	Netherlands, Radio	5905as	7305as	9855as	11655as
0030-0100	Sri Lanka, Sri Lanka BC	9730as			
0030-0100	Thailand, Radio	15370as			
0035-0040	India, All India Radio	4860do	5050do	7110do	11830do
		11870do			
0050-0100	Italy, RAI Intl	6010na	9675na	11800na	

Selected Programs

Sundays

0000 India, All India Radio: Press Review.
0000 USA, KWHR Naalehu HI: Prophetic Voice Broadcast. A program from Gospel Truth Ministries of Cincinnati.
0000 USA, WWCR #1 Nashville TN: What Does the Bible Say?. M. H. Reynolds exposes other religions.
0000 USA, WWCR #3 Nashville TN: World of Prophecy. Texe Marrs and a guest discuss the evils and pitfalls of today and the outlook for tomorrow.
0000 WHRI (Angel 2): Open Bible Dialog. Joseph Chambers takes listeners' phone calls.
0030 India, All India Radio: News and Commentary.
0030 USA, KWHR Naalehu HI: Message of Hope. Sam White.
0030 USA, WWCR #1 Nashville TN: Life's Railway to Heaven. WT English evangelizes from South Carolina.

Mondays

0000 India, All India Radio: Press Review.
0000 USA, WWCR #1 Nashville TN: Universal World Church. O. Lee Jaggers of Los Angeles preaches about the tree of life.
0000 USA, WWCR #3 Nashville TN: Commodities Market Update. Bill Mischack.
0000 WHRI (Angel 2): The Hour of Courage. Ron Wilson talks politics and the precious metals market.
0015 USA, WWCR #3 Nashville TN: Wonderful Words of Life. See S 1115.
0030 India, All India Radio: News and Commentary.
0030 USA, WWCR #1 Nashville TN: International House of Prayer. Jacqueline Brown conducts services from Brooklyn, New York.
0030 USA, WWCR #3 Nashville TN: 70th Week Magazine. Ben McKnight talks about survivalist subjects.
0045 USA, WWCR #1 Nashville TN: Faithful Teaching Ministry. Jeffrey Hayes.
0045 WHRI (Angel 1): Truth for the World. Churches of Christ spokesman Jim Dearman examines Scripture.

Tuesdays

0000 India, All India Radio: Press Review.
0000 USA, KWHR Naalehu HI: USA Radio News. A five-minute news bulletin.
0000 USA, WWCR #1 Nashville TN: Newswatch Magazine. David Smith compares world news to bible prophecy.
0000 USA, WWCR #3: The Intelligence Report (live). See M 1600.
0000 WHRI (Angel 2): Jack McLamb Show (live). Jack McLamb.
0005 India, All India Radio: Radio Newsreel.
0005 USA, KWHR Naalehu HI: People to People (live). A program offering practical scriptural insights with Bob George.
0030 India, All India Radio: News and Commentary.

Wednesdays

0000 India, All India Radio: Press Review.
0000 USA, KWHR Naalehu HI: USA Radio News. See T 0000.
0000 USA, WWCR #1 Nashville TN: Newswatch Magazine. See T 0000.
0000 USA, WWCR #3 Nashville TN: The Intelligence Report (live). See M 1600.
0000 WHRI (Angel 2): Jack McLamb Show (live). See T 0000.
0005 USA, KWHR Naalehu HI: People to People (live). See T 0005.
0030 India, All India Radio: News and Commentary.

Thursdays

0000 India, All India Radio: Press Review.
0000 USA, KWHR Naalehu HI: USA Radio News. See T 0000.
0000 USA, WWCR #1 Nashville TN: Newswatch Magazine. See T 0000.
0000 USA, WWCR #3 Nashville TN: The Intelligence Report (live). See M 1600.
0000 WHRI (Angel 2): Jack McLamb Show (live). See T 0000.
0005 India, All India Radio: Radio Newsreel.
0005 USA, KWHR Naalehu HI: People to People (live). See T 0005.
0030 India, All India Radio: News and Commentary.
0054 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (5th). See W 1254.
0054 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (12th/19th/26th). See A 2354.

Fridays

0000 India, All India Radio: Press Review.
0000 USA, KWHR Naalehu HI: USA Radio News. See T 0000.
0000 USA, WWCR #1 Nashville TN: Newswatch Magazine. See T 0000.
0000 USA, WWCR #3 Nashville TN: The Intelligence Report (live). See M 1600.
0000 WHRI (Angel 2): Jack McLamb Show (live). See T 0000.
0005 USA, KWHR Naalehu HI: People to People (live). See T 0005.
0030 India, All India Radio: News and Commentary.

Saturdays

0000 India, All India Radio: Press Review.
0000 USA, KWHR Naalehu HI: USA Radio News. See T 0000.
0000 USA, WWCR #1 Nashville TN: Newswatch Magazine. See T 0000.
0000 USA, WWCR #3 Nashville TN: The Intelligence Report (live). See M 1600.
0000 WHRI (Angel 2): Jack McLamb Show (live). See T 0000.
0005 India, All India Radio: Radio Newsreel.
0005 USA, KWHR Naalehu HI: People to People (live). See T 0005.
0030 India, All India Radio: News and Commentary.

Hauser's Highlights

AUSTRALIA : Radio Australia

Z-97 recommended for NAm:

0030-0400	13755		
0030-0630	17795		
0030-0800	15365		
0400-0630	11880		
0630-1230	9860	9580	
0800-0900	6020		
[1230-1300	9580]		
1300-1700	5995	11800	
1300-2100	9580,		
1430-2100	12080		
1530-1800	6060		
1700-2130	11880	9860	
1830-2200	7240		
2130-2400	17860	17795	13755
2200-2400	15365		

(RA website)

Frequencies

0100-0200	Anguilla,Caribbean Beacon	6090am			
0100-0200	Australia, Radio	9660pa	11640as	12080pa	13605pa
		13755pa	15365pa	15415as	15510as
		17715as	17750pa	17795pa	17860pa
		17880pa			
0100-0200 vl	Australia, VL8K Katherine	5025do			
0100-0200 vl	Australia, VL8T Tent Crk	4910do			
0100-0200	Canada, CBC N Quebec Svc	9625do			
0100-0200	Canada, CFCX Montreal	6005do			
0100-0200	Canada, CFRX Toronto	6070do			
0100-0200	Canada, CFVP Calgary	6030do			
0100-0200	Canada, CHNX Halifax	6130do			
0100-0200	Canada, CKZN St John's	6160do			
0100-0200	Canada, CKZU Vancouver	6160do			
0100-0200	Canada, R Canada Intl	9535am	9755am	11715am	13670am
0100-0200	Costa Rica,RF Peace Intl	6205am	7385am		
0100-0110	Croatia, Croatian Radio	5895eu	7165eu		
0100-0200	Cuba, Radio Havana	6000na	9820na	9830na	
0100-0127	Czech Rep, Radio Prague	6200na	7345na		
0100-0200	Ecuador, HCJB	9745am	21455am		
0100-0150	Germany, Deutsche Welle	6040na	6085na	6145na	9640na
		11810na			
0100-0115	Ghana, Ghana Broadc Corp	3366do	4915do		
0100-0130	Hungary, Radio Budapest	6075na	6075na	6190na	9580na
0100-0200	Indonesia, Voice of	9525na			
0100-0125	Iran, VOIRI	6050eu	9022eu	9685eu	
0100-0200 th	Ireland,W Coast R Ireland	9875am			
0100-0110	Italy, RAI Intl	6010na	9675na	11800na	
0100-0200	Japan, R Japan/NHK World	5960na	11790as	11860as	11890na
		13630am	15500as	15590as	17810as
		21610as			
0100-0200	Lebanon, Voice of Hope	9960va			
0100-0200	Liberia,LCN/R Liberia Int	5100do			
0100-0200 smtwh	Malaysia, Radio	7295do			
0100-0125	Netherlands, Radio	6020na	6165na	9845na	
0100-0200	Netherlands, Radio	5905as	7305as	9855as	
0100-0200	New Zealand, R NZ Intl	15115pa			
0100-0200 vl	Papua New Guinea, NBC	9675do			
0100-0200	Philippines, FEBC/R Intl	15450as			
0100-0200	Russia,Voice of Russia WS	7105na	12010na	12050na	13665na
		15180na	15595na		
0100-0130	Slovakia, R Slovakia Intl	5930na	7300na	9440na	
0100-0200	Spain, R Exterior Espana	6055am			
0100-0200	Sri Lanka, Sri Lanka BC	9730as			
0100-0130	Switzerland, Swiss R Intl	6135na	9885na	9905ca	
0100-0200	United Kingdom, BBC WS	5965as	5970sa	5975am	6175am
		6195as	9410as	9590am	9605as
		11750am	11955as	15280as	15310as
		15360as			
0100-0200	USA, KAIJ Dallas TX	5810am			
0100-0200	USA, KJES Mesquite NM	7555am			
0100-0200	USA, KTBN Salt Lk City UT	7510am			
0100-0200	USA, KWHR Naalehu HI	17510au			
0100-0200	USA, Monitor Radio Intl	7535na	9430am		
0100-0200	USA, Voice of America	7115as	7205as	9635as	11705as
		11725as	15170as	15250as	17740as
		17820as			
0100-0200 twhfa	USA, Voice of America	5995am	6130am	7405am	9445am
		9775am	13740am		
0100-0200	USA, WEWN Birmingham AL	5825eu	6890na	15375na	
0100-0200	USA, WGTG McCaysville GA	5085am			
0100-0200	USA, WHRI Noblesville IN	5745am			
0100-0200	USA, WINB Red Lion PA	11950am			
0100-0200	USA, WJCR Upton KY	7490na			
0100-0200	USA, WRMI/R Miami Intl	9955am			
0100-0200	USA, WRNO New Orleans LA	7355am			
0100-0200 mtwhf	USA, WVHA Greenbush ME	5850eu			
0100-0200	USA, WWCR Nashville TN	2390am	3215am	5070am	5935am
0100-0200	USA, WYFR Okeechobee FL	6065na	9505na		
0100-0130	Uzbekistan, R Tashkent	7190eu	9375eu	9530eu	9715eu
0100-0126	Vietnam, Voice of	7240na			
0130-0150	Greece, Voice of	6260na	7450na	9420na	9935na
0130-0200	Netherlands, Radio	5905as	9855as	11655as	
0130-0200	Sweden, Radio	9435as			
0130-0200 s	Sweden, Radio	7290am			
0140-0159	Vatican State, Vatican R	5980as	7335as		
0145-0200	Albania, R Tirana Intl	6115na	7160na		

Selected Programs

Sundays

0100 Canada, RCI Montreal: News. News from either the Canadian Broadcasting Corporation (CBC) or Radio Canada International (RCI).
0100 USA, KWHR Naalehu HI: The Water of Life Broadcast. Doyle Davidson preaches from Plano, Texas.
0100 USA, WWCR #1 Nashville TN: Faith Holiness Church. Larry Cain evangelizes from South Carolina.
0100 USA, WWCR #3 Nashville TN: Protecting Your Wealth (live). Mike Callahan's financial commentary, investments, and politics dealing with money issues.
0100 WHRI (Angel 2): Open Bible Dialog. See S 0000.
0107 Canada, RCI Montreal: Innovation Canada. Canadian entrepreneurs, inventors, and researchers and their ideas and discoveries.
0130 USA, WWCR #1 Nashville TN: The Lights of Spiritual Guidance. Gospel and song with J. Harold Lowman.
0131 Canada, RCI Montreal: Earth Watch. Environment and ecology matters.

Mondays

0100 Canada, RCI Montreal: News. See S 0100.
0100 USA, WWCR #1 Nashville TN: First Hand. Rick Livingood with a world evangelism update.
0100 USA, WWCR #3 Nashville TN: Free at Last. Mike Seymour with a half-hour of music and scripture.
0100 WHRI (Angel 1/2): USA Radio News. See S 0400.
0105 WHRI (Angel 1): Music. See S 0200.
0106 WHRI (Angel 2): Radio Free America (live). Tom Valentine hosts this talk/interview program.
0107 Canada, RCI Montreal: The Arts in Canada. A look at the Canadian arts scene.
0115 USA, WWCR #1 Nashville TN: Christ at the Door. Leland Wood.
0130 USA, KWHR Naalehu HI: Christ Gospel Broadcast. See S 1300.
0130 USA, WWCR #1 Nashville TN: Standing in the Gap. Rose Ondush evangelizes from the Pocono Mountains in Pennsylvania.
0131 Canada, RCI Montreal: The Mailbag. Listener letters, musical selections, and happenings in Canada.
0145 USA, KWHR Naalehu HI: Bible Gems. Jim Kristoff evangelizes from Indiana.
0145 USA, WWCR #1: Miracle Revival Hour. Terry Dixon.

Tuesdays

0100 Canada, RCI Montreal: News. See S 0100.
0100 USA, KWHR Naalehu HI: Turn Your Radio On. See M 0400.
0100 USA, WWCR #1 Nashville TN: Patriot Radio News Hour (live). Eric Ceaderstrom.
0100 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). A newstalk radio program.
0100 WHRI (Angel 2): The Prophecy Club. See S 2330.
0111 Canada, RCI Montreal: Spectrum. A weekday magazine program of current affairs, features, and a business report.
0130 WHRI (Angel 2): The Hour of Courage. See M 0000.
0155 Canada, RCI Montreal: News. See S 0100.

Wednesdays

0100 Canada, RCI Montreal: News. See S 0100.
0100 USA, KWHR Naalehu HI: Music. See S 1600.
0100 USA, WWCR #1 Nashville TN: Patriot Radio News Hour (live). See T 0100.
0100 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0100 WHRI (Angel 2): The Prophecy Club. See S 2330.
0111 Canada, RCI Montreal: Spectrum. See T 0111.
0130 WHRI (Angel 2): The Hour of Courage. See M 0000.
0155 Canada, RCI Montreal: News. See S 0100.

Thursdays

0100 Canada, RCI Montreal: News. See S 0100.
0100 USA, KWHR Naalehu HI: Music. See S 1600.
0100 USA, WWCR #1 Nashville TN: Patriot Radio News Hour (live). See T 0100.
0100 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0100 WHRI (Angel 2): The Prophecy Club. See S 2330.
0111 Canada, RCI Montreal: Spectrum. See T 0111.
0130 WHRI (Angel 2): The Hour of Courage. See M 0000.
0155 Canada, RCI Montreal: News. See S 0100.

Fridays

0100 Canada, RCI Montreal: News. See S 0100.
0100 USA, KWHR Naalehu HI: Music. See S 1600.
0100 USA, WWCR #1 Nashville TN: Patriot Radio News Hour (live). See T 0100.
0100 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0100 WHRI (Angel 2): The Prophecy Club. See S 2330.
0111 Canada, RCI Montreal: Spectrum. See T 0111.
0130 WHRI (Angel 2): The Hour of Courage. See M 0000.
0155 Canada, RCI Montreal: News. See S 0100.

Saturdays

0100 Canada, RCI Montreal: News. See S 0100.
0100 USA, KWHR Naalehu HI: Home Schooling. Terry and Vicki Brady of the Home Education network take calls about schooling.
0100 USA, WWCR #1 Nashville TN: Patriot Radio News Hour (live). See T 0100.
0100 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0100 WHRI (Angel 2): The Prophecy Club. See S 2330.
0111 Canada, RCI Montreal: Spectrum. See T 0111.
0130 WHRI (Angel 2): The Hour of Courage. See M 0000.
0154 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (7th). See W 1254.
0154 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (14th/21st/28th). In this co-production with Ireland and Scotland, the competition between major cities of a country is examined.
0155 Canada, RCI Montreal: News. See S 0100.

FREQUENCIES

0200-0300	Anguilla,Caribbean Beacon	6090am			
0200-0300 t-th/vl	Argentina, RAE	11710am			
0200-0300	Australia, Radio	13605pa	13755pa	15415as	15510as
		17715as	17750pa		
0200-0300 vl	Australia, VL8K Katherine	5025do			
0200-0300 vl	Australia, VL8T Tent Crk	4910do			
0200-0210	Bangladesh, Bangla Betar	4880do			
0200-0300	Canada, CBC N Quebec Svc	9625do			
0200-0300	Canada, CFCX Montreal	6005do			
0200-0300	Canada, CFRX Toronto	6070do			
0200-0300	Canada, CFVP Calgary	6030do			
0200-0300	Canada, CHNX Halifax	6130do			
0200-0300	Canada, CKZN St John's	6160do			
0200-0300	Canada, CKZU Vancouver	6160do			
0200-0300 twhfa	Canada, R Canada Intl	6120am	9535am	9755am	11715am
		13670am			
0200-0300 sm	Canada, R Canada Intl	6120am	9535am	9755am	11715am
		13670am			
0200-0300	Costa Rica,RF Peace Intl	6205am	7385am		
0200-0210	Croatia, Croatian Radio	5895eu	7165eu		
0200-0300	Cuba, Radio Havana	6000na	9820na	9830na	
0200-0300	Ecuador, HCJB	9745am	21455am		
0200-0300	Egypt, Radio Cairo	9475na			
0200-0250	Germany, Deutsche Welle	7285as	9615as	9690as	11945as
		11965as	12045as		
0200-0300 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
0200-0300	Lebanon, Voice of Hope	9960va			
0200-0300 smtwh	Malaysia, Radio	7295do			
0200-0300 s	Malta, VO Mediterranean	15550as	17570au		
0200-0230	Netherlands, Radio	5905as	7305as	9855as	9855as
0200-0300	New Zealand, R NZ Intl	15115pa			
0200-0230 m	Norway, Radio Norway Intl	7465na	9560na		
0200-0300 vl	Papua New Guinea, NBC	9675do			
0200-0300	Philippines, FEBC/R Intl	15450as			
0200-0256	Romania, R Romania Intl	5990na	6155na	9510na	9570na
		11940na	12990na		
0200-0300	Russia,Voice of Russia WS	7105na	12010na	12050na	13645na
		13665na	15180na	15595na	
0200-0300	S Africa, Investment Ch	6160af	7190af	9525af	11820me
0200-0230	Serbia, Radio Yugoslavia	7130na			
0200-0300	Slovakia, Adv World Radio	11610as			
0200-0300	South Korea, R Korea Intl	7275as	11725am	11810am	15575am
0200-0300	Sri Lanka, Sri Lanka BC	9730as			
0200-0300	Taiwan, VO Free China	5950na	7130as	9680na	11740ca
		11825as	15345as		
0200-0300	United Kingdom, BBC WS	5970sa	5975am	6135af	6175am
		6195eu	9410va	9605as	11955as
		15280as	15310as	15360as	
0200-0230	United Kingdom, BBC WS	9590am	9915am		
0200-0300	USA, KAIJ Dallas TX	5810am			
0200-0230	USA, KJES Mesquite NM	7555am			
0200-0300	USA, KTBN Salt Lk City UT	7510am			
0200-0300	USA, KVOH Los Angeles CA	9975am			
0200-0300	USA, KWHR Naalehu HI	17510au			
0200-0300	USA, Monitor Radio Intl	5850na	7535am		
0200-0300	USA, Voice of America	7115as	7205as	9635as	11705as
		11725as	15170as	15250as	17740as
		17820as			
0200-0300	USA, WEWN Birmingham AL	5825eu	6890na		
0200-0300	USA, WGTG McCaysville GA	5085am			
0200-0300	USA, WHRI Noblesville IN	5745am			
0200-0300	USA, WINB Red Lion PA	11950am			
0200-0300	USA, WJCR Upton KY	7490na			
0200-0300 mtwhf	USA, WRMI/R Miami Intl	9955am			
0200-0300	USA, WRNO New Orleans LA	7355am			
0200-0300	USA, WWCR Nashville TN	2390am	3215am	5070am	5935am
0200-0300	USA, WYFR Okeechobee FL	6065na	9505na		
0215-0225	Nepal, Radio	7165do			
0230-0300	Albania, R Tirana Intl	6140na	7160na		
0230-0259	Austria, R Austria Intl	9655na	9870sa	13730sa	
0230-0300	Hungary, Radio Budapest	6190na	9840na	11910na	
0230-0300	Netherlands, Radio	9855as	11655as		
0230-0300 vl	Philippines, R Pilipinas	11885me	15120me	15270me	
0230-0300	Sweden, Radio	7135na			
0230-0300	United Kingdom, BBC WS	7325am	9895am		
0230-0256	Vietnam, Voice of	7250na			
0230-0300 vl	Zambia, R Zambia/ZNBC 2	6165do			
0245-0300	India, All India Radio	3945do	6045do	7110do	11830do
		15135do			
0245-0255 vl	Mozambique, R Mozambique	4855do	7242do		
0250-0300 sf	Greece, Voice of	6260na	7450na	9420na	9935na
0250-0300	Vatican State, Vatican R	7305am	9605am		
0255-0300 vl	Zambia, R Zambia/ZNBC 1	4910do			

SELECTED PROGRAMS

Sundays

0200 Canada, RCI Montreal: News. See S 0100.
0200 USA, KWHR Naalehu HI: Faith Mountain Ministries. Henry Vanderbush.
0200 USA, WWCR #1 Nashville TN: Open Bible Dialog. Joseph Chambers preaches Bible prophecy from North Carolina.
0200 USA, WWCR #3: Spectrum (live). SWLs and Hams call 1-800-774-7435 with technical questions and comments.
0200 WHRI (Angel 1): Music. Contemporary christian music and inspiration.
0200 WHRI (Angel 2): World of Prophecy. Texe Marrs and a guest discuss the evils and pitfalls of today and the outlook for tomorrow.
0205 Canada, RCI Montreal: Double Exposure. The comedy team of Bob Robertson and Linda Cullen present their award-winning brand of political satire and mimicry.
0230 USA, KWHR Naalehu HI: Living Faith Ministries. Bill Perg.
0232 Canada, RCI Montreal: The Royal Canadian Air Farce. The traveling comedy show that was brought back by popular demand.
0245 USA, KWHR Naalehu HI: Faith Christian Church. Paul Shirek.

Mondays

0200 Canada, RCI Montreal: News. See S 0100.
0200 USA, KWHR Naalehu HI: Methodist Hour. Music, interviews, and timely messages.
0200 USA, WWCR #1 Nashville TN: World of Prophecy. See S 0000.
0200 WHRI (Angel 1): UPI News. See S 0400.
0200 WHRI (Angel 2): USA Radio News. See S 0400.
0205 Canada, RCI Montreal: The Inside Track. An award-winning program of sports journalism, examining the impact of sports on the lives of Canadians.
0205 WHRI (Angel 1): Music. See S 0200.
0206 WHRI (Angel 2): Radio Free America (live). See M 0106.
0230 USA, KWHR Naalehu HI: The Voice of Power. RW Schambach preaches from Tyler, Texas.
0231 Canada, RCI Montreal: Now the Details. A CBC program about the media.

Tuesdays

0200 Canada, RCI Montreal: News. See S 0100.
0200 USA, WWCR #1 Nashville TN: Truth House. Evangelistic teachings by E.C. Fultcher plus his global shortwave club.
0200 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0206 Canada, RCI Montreal: The Best of Morningside. Repeats of the CBC's morning program.
0215 USA, KWHR Naalehu HI: Music. See S 1600.
0230 WHRI (Angel 1): Music. See S 0200.
0245 WHRI (Angel 1): Sold Out for Jesus. See M 1115.

Wednesdays

0200 Canada, RCI Montreal: News. See S 0100.
0200 USA, WWCR #1 Nashville TN: Truth House. See T 0200.
0200 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0206 Canada, RCI Montreal: The Best of Morningside. See T 0206.
0215 USA, KWHR Naalehu HI: Music. See S 1600.
0230 WHRI (Angel 1): Music. See S 0200.
0245 WHRI (Angel 1): Sold Out for Jesus. See M 1115.

Thursdays

0200 Canada, RCI Montreal: News. See S 0100.
0200 USA, WWCR #1 Nashville TN: Truth House. See T 0200.
0200 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0206 Canada, RCI Montreal: The Best of Morningside. See T 0206.
0215 USA, KWHR Naalehu HI: Music. See S 1600.
0230 WHRI (Angel 1): Music. See S 0200.
0245 WHRI (Angel 1): Sold Out for Jesus. See M 1115.
0254 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (5th). See W 1254.
0254 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (12th/19th/26th). See A 2354.

Fridays

0200 Canada, RCI Montreal: News. See S 0100.
0200 USA, WWCR #1 Nashville TN: Truth House. See T 0200.
0200 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0206 Canada, RCI Montreal: The Best of Morningside. See T 0206.
0215 USA, KWHR Naalehu HI: Music. See S 1600.
0230 WHRI (Angel 1): Music. See S 0200.
0245 WHRI (Angel 1): Sold Out for Jesus. See M 1115.

Saturdays

0200 Canada, RCI Montreal: News. See S 0100.
0200 USA, WWCR #1 Nashville TN: Truth House. See T 0200.
0200 USA, WWCR #3 Nashville TN: The Stan Solomon Show (live). See T 0100.
0206 Canada, RCI Montreal: The Best of Morningside. See T 0206.
0215 USA, KWHR Naalehu HI: Music. See S 1600.
0230 USA, KWHR Naalehu HI: DXing with Cumbre. See M 0330.
0230 WHRI (Angel 1): Music. See S 0200.
0245 WHRI (Angel 1): Sold Out for Jesus. See M 1115.

Frequencies

0300-0400	Anguilla,Caribbean Beacon	6090am			
0300-0400	Australia, Radio	13605pa	13755pa	15415as	15510as
		17750pa	17795pa		
0300-0400 vl	Australia, VL8K Katherine	5025do			
0300-0400 vl	Australia, VL8T Tent Crk	4910do			
0300-0400 vl	Canada, CBC N Quebec Svc	9625do			
0300-0400	Canada, CFCX Montreal	6005do			
0300-0400	Canada, CFRX Toronto	6070do			
0300-0400	Canada, CFVP Calgary	6030do			
0300-0400	Canada, CHNX Halifax	6130do			
0300-0400	Canada, CKZN St John's	6160do			
0300-0400	Canada, CKZU Vancouver	6160do			
0300-0400	China, China Radio Intl	9690am	9710am	11695am	
0300-0400 vl	Costa Rica,Faro del Carib	5055do			
0300-0400	Costa Rica,RF Peace Intl	6205am	7385am		
0300-0310	Croatia, Croatian Radio	5895eu	7165eu		
0300-0400	Cuba, Radio Havana	6000na	9820na	9830na	
0300-0327	Czech Rep, Radio Prague	5930as	7345as		
0300-0400	Ecuador, HCJB	9745am	21455am		
0300-0330	Egypt, Radio Cairo	9475na			
0300-0350	Germany, Deutsche Welle	6085na	6185na	9535na	9615na
		9640na			
0300-0400	Guatemala, Radio Cultural	3300do			
0300-0400	Japan, R Japan/NHK World	17685va			
0300-0400 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
0300-0400	Lebanon, Voice of Hope	9960va			
0300-0400 vl	Lesotho, Radio Lesotho	4800do			
0300-0400 vl	Malaysia, RTM Kuching	7160do			
0300-0400 s	Malta, VO Mediterranean	15550as	17570au		
0300-0330	Mexico, Radio Mexico Intl	9705na			
0300-0325	Netherlands, Radio	9855as	11655as		
0300-0400	New Zealand, R NZ Intl	15115pa			
0300-0400 vl	Papua New Guinea, NBC	9675do			
0300-0330 vl	Philippines, R Pilipinas	11885as	15120as	15270as	
0300-0400	Russia,Voice of Russia WS	7125na	12000na	12010na	12050na
		13645na	13665na	15180na	15595na
0300-0330	S Africa, Channel Africa	5955af			
0300-0400	S Africa, Investment Ch	6160af	7190af	9535me	11820me
0300-0400	Sri Lanka, Sri Lanka BC	9730as			
0300-0400	Taiwan, VO Free China	5950na	7130na	9680na	11825as
		15345as			
0300-0330	Thailand, Radio	9655na	11890na	11905na	
0300-0400	Turkey, Voice of	7270as	7300eu	15190va	
0300-0315 mtwhf	Uganda, Radio	4976do			
0300-0400	Ukraine, R Ukraine Intl	7150na	9550na	12040na	
0300-0330	United Kingdom, BBC WS	5970sa	6135af	7325am	9895am
		15360as			
0300-0400	United Kingdom, BBC WS	3255af	5975am	6005af	6180eu
		6190af	6195va	9410eu	9600af
		9605as	9895am	11760as	12095af
		15310as	17790as	21660as	
0300-0400	USA, KAIJ Dallas TX	5810am			
0300-0400	USA, KTBN Salt Lk City UT	7510am			
0300-0400	USA, KVOH Los Angeles CA	9975am			
0300-0400	USA, KWHR Naalehu HI	17510au			
0300-0400	USA, Monitor Radio Intl	5850na	7535af		
0300-0400	USA, Voice of America	6080af	6115af	7105af	7280af
		7290af	7340af	9575af	9885af
0300-0330 smtwh	USA, Voice of America	4960af			
0300-0400	USA, WEWN Birmingham AL	5825eu	6890na	9370sa	
0300-0400	USA, WGTG McCaysville GA	5085am			
0300-0400	USA, WHRI Noblesville IN	5745am	7315am		
0300-0400	USA, WJCR Upton KY	7490na			
0300-0400	USA, WRMI/R Miami Intl	9955am			
0300-0400	USA, WRNO New Orleans LA	7395am			
0300-0400	USA, WWCR Nashville TN	2390am	3215am	5070am	5935am
0300-0400	USA, WYFR Okeechobee FL	9985af			
0300-0345	USA, WYFR Okeechobee FL	6065na	9505na		
0300-0310	Vatican State, Vatican R	7305na	9605am		
0300-0400 vl	Zambia, R Zambia/ZNBC 1	4910do			
0300-0400 vl	Zambia, R Zambia/ZNBC 2	6165do			
0300-0400 vl	Zimbabwe, Zimbabwe BC	3396do			
0310-0340	Vatican State, Vatican R	7360af			
0330-0357	Czech Rep, Radio Prague	9480me	11600as		
0330-0355	Moldova, R Moldova Intl	7520eu			
0330-0400 twhfa	Portugal, R Portugal Intl	6150am	9570am		
0330-0400	Slovakia, Adv World Radio	9465af			
0330-0400	Sweden, Radio	9430na			
0330-0400	Tanzania, Radio	5050af			
0330-0400	United Kingdom, BBC WS	6175am	9610af	11730af	11955as
		15280as			
0335-0355 vl	India, All India Radio	7110do	11830do	15135do	
0340-0350	Greece, Voice of	6260na	7450na	9420na	9935na
0345-0400	Burundi, Radio Nationale	6140do			
0345-0400	Tajikistan,Radio Dushanbe	4975as	9905as		
0345-0400 as	Uganda, Radio	4976do			
0356-0400	Zambia, Christian Voice	3330af	6065af		

Selected Programs

Sundays

0300 USA, KWHR Naalehu HI: Whole Truth Broadcast. Bishop Rapha.
0300 USA, WWCR #1 Nashville TN: Faith Mountain Ministries. Henry Vanderbush.
0300 USA, WWCR #3 Nashville TN: The Golden Age of Radio Theater. Relive the golden moments of radio's yesteryear.
0300 WHRI (Angel 1): Music. See S 0200.
0300 WHRI (Angel 2): Biblical Studies Institute. Bob Tref evangelizes from Rapid City, South Dakota.
0330 USA, WWCR #1 Nashville TN: The Street Preacher. Steven Keeler.
0330 WHRI (Angel 2): DXing with Cumbre. A what's-on-the-air program hosted by Marie Lamb.
0345 USA, WWCR #1 Nashville TN: A Study in God's Word. From North Carolina, Hezakiah Smith reads Scripture.

Mondays

0300 USA, KWHR Naalehu HI: The Sword of the Spirit. Mike Keyes evangelizes from Tucson, Arizona.
0300 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
0300 WHRI (Angel 1): UPI News. See S 0400.
0305 WHRI (Angel 1): Music. See S 0200.
0306 WHRI (Angel 2): Radio Free America (live). See M 0106.
0330 USA, KWHR Naalehu HI: DXing with Cumbre. A what's-on-the-air program hosted by Marie Lamb.

Tuesdays

0300 USA, KWHR Naalehu HI: UPI News. Five minutes of news from the UPI Radio Network.
0300 USA, WWCR #1 Nashville TN: The Radio Bible Hour. J. Harold Smith.
0300 USA, WWCR #3 Nashville TN: Scriptures for America (live). Peter J. Peters exposes the world's evils.
0300 WHRI (Angel 1): UPI News. See S 0400.
0305 USA, KWHR Naalehu HI: Music. See S 1600.
0305 WHRI (Angel 1): Music. See S 0200.
0330 USA, WWCR #1 Nashville TN: The Prophecy Club. Stan Johnson discusses bible prophecy from Topeka, Kansas.

Wednesdays

0300 USA, KWHR Naalehu HI: UPI News. See T 0300.
0300 USA, WWCR #1 Nashville TN: The Radio Bible Hour. See T 0300.
0300 USA, WWCR #3 Nashville TN: Scriptures for America (live). See T 0300.
0300 WHRI (Angel 1): UPI News. See S 0400.
0305 USA, KWHR Naalehu HI: Music. See S 1600.
0305 WHRI (Angel 1): Music. See S 0200.
0330 USA, WWCR #1 Nashville TN: The Prophecy Club. See T 0330.

Thursdays

0300 USA, KWHR Naalehu HI: UPI News. See T 0300.
0300 USA, WWCR #1 Nashville TN: The Radio Bible Hour. See T 0300.
0300 USA, WWCR #3 Nashville TN: Scriptures for America (live). See T 0300.
0300 WHRI (Angel 1): UPI News. See S 0400.
0305 USA, KWHR Naalehu HI: Music. See S 1600.
0305 WHRI (Angel 1): Music. See S 0200.
0330 USA, WWCR #1 Nashville TN: The Prophecy Club. See T 0330.

Fridays

0300 USA, KWHR Naalehu HI: UPI News. See T 0300.
0300 USA, WWCR #1 Nashville TN: The Radio Bible Hour. See T 0300.
0300 USA, WWCR #3 Nashville TN: Scriptures for America (live). See T 0300.
0300 WHRI (Angel 1): UPI News. See S 0400.
0305 USA, KWHR Naalehu HI: Music. See S 1600.
0305 WHRI (Angel 1): Music. See S 0200.
0330 USA, WWCR #1 Nashville TN: The Prophecy Club. See T 0330.

Saturdays

0300 USA, KWHR Naalehu HI: UPI News. See T 0300.
0300 USA, WWCR #1 Nashville TN: The Radio Bible Hour. See T 0300.
0300 USA, WWCR #3 Nashville TN: Scriptures for America (live). See T 0300.
0300 WHRI (Angel 1): UPI News. See S 0400.
0305 WHRI (Angel 1): Music. See S 0200.
0330 USA, WWCR #1 Nashville TN: The Prophecy Club. See T 0330.

Hauser's Highlights

NEW ZEALAND: R. New Zealand Intl

J-97 from May 3 to Oct 25:

1650	M-F	6145
1855	Sat/Sun	6145
1952		9845
2052	Sun-Thu	11735
2107	Fri	11735
2059	Sat	11735
2307	daily	15115
0459		9795
0817	M-F	6100
0758	Sat/Sun	6100

1206-1650 occasional for sport on 6105 (RNZI website)

Frequencies

0400-0500	Anguilla,Caribbean Beacon	6090am			
0400-0500	Australia, Radio	11880pa	13605as	15240pa	15415as
		17750as	17795pa		
0400-0500 vl	Australia, VL8K Katherine	5025do			
0400-0500 vl	Australia, VL8T Tent Crk	4910do			
0400-0500	Bulgaria, Radio	9485na	11720na		
0400-0500 vl	Canada, CBC N Quebec Svc	9625do			
0400-0500	Canada, CFCX Montreal	6005do			
0400-0500	Canada, CFRX Toronto	6070do			
0400-0500	Canada, CFVP Calgary	6030do			
0400-0500	Canada, CHNX Halifax	6130do			
0400-0500	Canada, CKZN St John's	6160do			
0400-0500	Canada, CKZU Vancouver	6160do			
0400-0430	Canada, R Canada Intl	9715me	11835me	15275me	
0400-0500	China, China Radio Intl	9730am			
0400-0500	Costa Rica,RF Peace Intl	6205am	7385am		
0400-0500	Cuba, Radio Havana	6000na	6180na	9820na	9830na
0400-0500 vl	Cyprus, BRT International	6150do			
0400-0500	Ecuador, HCJB	9745am	21455am		
0400-0450	Germany, Deutsche Welle	5990af	6015af	7225af	9565af
		11765af			
0400-0500 twhfa	Guatemala, Radio Cultural	3300do			
0400-0415	Israel, Kol Israel	7465na	9435na	17545af	
0400-0500 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
0400-0500	Lebanon, Voice of Hope	9960va			
0400-0500 s	Malta, VO Mediterranean	15550as	17570au		
0400-0430 m-a/vl	Mexico, Radio Mexico Intl	9705na			
0400-0458	New Zealand, R NZ Intl	15115pa			
0400-0450	North Korea, R Pyongyang	15180as	15230as	17765as	
0400-0430 m	Norway, Radio Norway Intl	7485na			
0400-0500 vl	Papua New Guinea, NBC	9675do			
0400-0456	Romania, R Romania Intl	5990na	6155na	9510na	9570na
		11940na	12990na		
0400-0500	Russia,Voice of Russia WS	12000na	12010na	12050na	13645na
		13665na	15180na	15595na	
0400-0430	S Africa, Channel Africa	5955af			
0400-0430	S Africa, Investment Ch	6160af	7190af	9525me	
0400-0430	Slovakia, Adv World Radio	11600af			
0400-0500	Slovakia, Adv World Radio	7215eu			
0400-0430	Sri Lanka, Sri Lanka BC	9730as			
0400-0430	Switzerland, Swiss R Intl	6135na	9885na		
0400-0500	Switzerland, Swiss R Intl	9905ca			
0400-0430	Tanzania, Radio	5050af			
0400-0500	Turkey, Voice of	7340na			
0400-0415	Uganda, Radio	4976do			
0400-0500	United Kingdom, BBC WS	3255af	3955eu	5975af	6005af
		6175am	6180eu	6190af	6195eu
		7160af	9410na	9600af	11760va
		11955as	12085af	12095va	15280as
		15310as	15575va	17640af	17790as
		21660as			
0400-0430	United Kingdom, BBC WS	9605as	9610af	9895am	11730af
0400-0500	USA, KAIJ Dallas TX	5810am			
0400-0500	USA, KTBN Salt Lk City UT	7510am			
0400-0500	USA, KVOH Los Angeles CA	9975am			
0400-0500	USA, KWHR Naalehu HI	17780as			
0400-0500	USA, Monitor Radio Intl	7535eu	9840af		
0400-0500	USA, Voice of America	6080af	7170af	7265af	7280af
		7290af	9575af	9885af	11965me
		15205va			
0400-0500	USA, WEWN Birmingham AL	5825eu	6890na	9370sa	
0400-0500	USA, WGTG McCaysville GA	5085am			
0400-0500	USA, WHRI Noblesville IN	5745am	7315am		
0400-0500	USA, WJCR Upton KY	7490na			
0400-0500 smtwhf	USA, WMLK Bethel PA	9465eu			
0400-0500	USA, WRNO New Orleans LA	7395am			
0400-0500	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am
0400-0405 mtwhf	USA, WWCR Nashville TN	3215am			
0400-0500	USA, WYFR Okeechobee FL	6065na	9505na	9985eu	11695af
0400-0430	Vietnam, Voice of	12020na	15010na		
0400-0500	Zambia, Christian Voice	3330af	6065af		
0400-0500 vl	Zambia, R Zambia/ZNBC 1	4910do			
0400-0500 vl	Zambia, R Zambia/ZNBC 2	6165do			
0400-0500 vl	Zimbabwe, Zimbabwe BC	3396do			
0415-0440 vl	Italy, RAI Intl	5975eu	7270eu		
0425-0500	Nigeria, FRCN/Radio	3326do	4770do	4990do	
0430-0500	Australia,DefenseForces R	13525as			
0430-0459	Austria, R Austria Intl	6155eu	13730eu		
0430-0500 m-f/vl	Lesotho, Radio Lesotho	4800do			
0430-0455	Moldova, R Moldova Intl	7520na			
0430-0500	Netherlands, Radio	6165na	9590na		
0430-0500	S Africa, Investment Ch	9525me	11820me	15225af	
0430-0500	Serbia, Radio Yugoslavia	9580na	11870na		
0430-0500	Slovakia, Adv World Radio	11600eu			
0430-0500	Swaziland, Trans World R	3200af	4775af	6070af	6100af
0430-0500	United Kingdom, BBC WS	15420af			
0455-0500	Malaysia, Voice of	6175as	9750as	15295au	
0459-0500	New Zealand, R NZ Intl	9795pa			

Selected Programs

Sundays

0400 Canada, RCI Montreal: News. See S 0100.
0400 USA, KWHR Naalehu HI: Gospel Crusade Ministries. Scripture teachings by Roger Headrick and free bible correspondence courses.
0400 USA, WWCR #1 Nashville TN: The Old Land Mark Church. R. L. Mitchell presents the Holy Way Hour from Chicago.
0400 USA, WWCR #3 Nashville TN: USA Radio News. News summary from the USA Radio News Network.
0400 WHRI (Angel 1): UPI News. Five minutes of news from the UPI Radio Network.
0400 WHRI (Angel 2): USA Radio News. A five-minute news bulletin.
0403 WHRI (Angel 1): Turn Your Radio On. Bill Brasier plays southern gospel music.
0404 WHRI (Angel 2): The Pat Boone Show. Pat Boone sings.
0405 Canada, RCI Montreal: Innovation Canada. See S 0107.
0405 USA, WWCR #3 Nashville TN: America's Greatest Heroes. USA Radio Network.
0430 USA, KWHR Naalehu HI: Prophetic Voice Broadcast. See S 0000.

Mondays

0400 Canada, RCI Montreal: News. See S 0100.
0400 USA, KWHR Naalehu HI: Turn Your Radio On. Bill Brasier plays southern gospel music.
0400 USA, WWCR #3 Nashville TN: The Extraordinary Science Radio Hour. J.W. McGinnis of the Tesla Society.
0400 WHRI (Angel 2): The Prophecy Club. See S 2330.
0407 Canada, RCI Montreal: The Mailbag. See M 0131.
0430 WHRI (Angel 2): The Hour of Courage. See M 0000.

Tuesdays

0400 Canada, RCI Montreal: News. See S 0100.
0400 USA, KWHR Naalehu HI: Music. See S 1600.
0400 USA, WWCR #1/3 Nashville TN: Scriptures for America (live). See T 0300.
0400 WHRI (Angel 1): Bob Enyart (live). Bob takes listener phone calls about everyday Christian topics.
0400 WHRI (Angel 2): The Prophecy Club. See S 2330.
0411 Canada, RCI Montreal: Spectrum. See T 0111.
0430 WHRI (Angel 2): The Hour of Courage. See M 0000.

Wednesdays

0400 Canada, RCI Montreal: News. See S 0100.
0400 USA, KWHR Naalehu HI: Music. See S 1600.
0400 USA, WWCR #1/3 Nashville TN: Scriptures for America (live). See T 0300.
0400 WHRI (Angel 1): Bob Enyart (live). See T 0400.
0400 WHRI (Angel 2): The Prophecy Club. See S 2330.
0411 Canada, RCI Montreal: Spectrum. See T 0111.
0430 WHRI (Angel 2): The Hour of Courage. See M 0000.

Thursdays

0400 Canada, RCI Montreal: News. See S 0100.
0400 USA, KWHR Naalehu HI: Music. See S 1600.
0400 USA, WWCR #1/3 Nashville TN: Scriptures for America (live). See T 0300.
0400 WHRI (Angel 1): Bob Enyart (live). See T 0400.
0400 WHRI (Angel 2): The Prophecy Club. See S 2330.
0411 Canada, RCI Montreal: Spectrum. See T 0111.
0430 WHRI (Angel 2): The Hour of Courage. See M 0000.
0454 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (5th). See W 1254.
0454 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (12th/19th/26th). See A 2354.

Fridays

0400 Canada, RCI Montreal: News. See S 0100.
0400 USA, KWHR Naalehu HI: Music. See S 1600.
0400 USA, WWCR #1/3 Nashville TN: Scriptures for America (live). See T 0300.
0400 WHRI (Angel 1): Bob Enyart (live). See T 0400.
0400 WHRI (Angel 2): The Prophecy Club. See S 2330.
0411 Canada, RCI Montreal: Spectrum. See T 0111.
0430 WHRI (Angel 2): The Hour of Courage. See M 0000.

Saturdays

0400 Canada, RCI Montreal: News. See S 0100.
0400 USA, KWHR Naalehu HI: The Pat Boone Show. Pat Boone sings.
0400 USA, WWCR #1/3 Nashville TN: Scriptures for America (live). See T 0300.
0400 WHRI (Angel 1/2): Bob Enyart (live). See T 0400.
0411 Canada, RCI Montreal: Spectrum. See T 0111.

Hauser's Highlights
JAPAN: R Japan NHK

Z-97 English to NAm:

0100-0200	5960-C, 11790, 13630
0500-0530	11895-F, 13630, 15230
0500-0600	6110-C
0600-0700	9835, 12030, 15230
1100-1200	6120-C
1500-1600	9535
1700-1800	9535, 9835
2100-2200	13630

C=Canada, F=French Guiana
(BC-DX)

Frequencies

0500-0600	Anguilla,Caribbean Beacon	6090am			
0500-0600	Australia, Radio	13605as	15510as	15530as	17795pa
0500-0600 vl	Australia, VL8K Katherine	5025do			
0500-0600 vl	Australia, VL8T Tent Crk	4910do			
0500-0600	Australia,DefenseForces R	13525as			
0500-0600 vl	Cameroon, Radio Cameroon	4850do			
0500-0600	Canada, CFCX Montreal	6005do			
0500-0600	Canada, CFRX Toronto	6070do			
0500-0600	Canada, CFVP Calgary	6030do			
0500-0600	Canada, CHNX Halifax	6130do			
0500-0600	Canada, CKZU Vancouver	6160do			
0500-0530 mtwhf	Canada, R Canada Intl	6050eu	7295af	11835af	15430me
0500-0600	China, China Radio Intl	9560am			
0500-0600	Costa Rica, Adv World R	5030ca	6150ca	9725ca	
0500-0600	Costa Rica,RF Peace Intl	6205am	7385am		
0500-0600	Cuba, Radio Havana	6000na	9830na		
0500-0600	Ecuador, HCJB	9745am	21455am		
0500-0550	Germany, Deutsche Welle	5960na	6045na	6120na	6145na
		6185na	9615na	9650na	
0500-0600	Guyana, GBC/Voice of	3290do			
0500-0600 vl	Italy, IRRS	3985va			
0500-0530 vl	Italy, IRRS	7125va			
0500-0600	Japan, R Japan/NHK World	6110na	7230eu	11840as	11895eu
		11920na	13630		
0500-0530	Japan, R Japan/NHK World	13630na	15230na		
0500-0600 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
0500-0600	Lebanon, Voice of Hope	9960va			
0500-0505	Lesotho, Radio Lesotho	4800do			
0500-0600	Liberia,LCN/R Liberia Int	5100do			
0500-0510 mtwhf	Malawi, MBC	3380do			
0500-0600	Malaysia, Voice of	6175as	9750as	15295au	
0500-0525	Netherlands, Radio	5995na	6165na	9590na	
0500-0600	New Zealand, R NZ Intl	9795pa			
0500-0505	Nigeria, FRCN/Radio	3326do	4770do	4990do	
0500-0600 vl	Papua New Guinea, NBC	9675do			
0500-0600	Russia,Voice of Russia WS	12000na	12010na	12040na	12050na
		13645na	13665na	15595na	
0500-0530	S Africa, Channel Africa	9675af			
0500-0600	S Africa, Investment Ch	9525me	11820me	15225af	17790me
0500-0556	Spain, R Exterior Espana	6055am			
0500-0515	Uganda, Radio	4976do			
0500-0600	United Kingdom, BBC WS	3255af	3955eu	5975am	6005af
		6175am	6180eu	6190af	6195va
		7120va	7160af	9410va	9600af
		9610af	9740as	11760as	12095as
		15310as	15360as	15420af	15575va
		17640af	17760as	17885af	21660as
0500-0530	United Kingdom, BBC WS	15280as	17790as		
0500-0600	USA, KAIJ Dallas TX	5810am			
0500-0600	USA, KTBN Salt Lk City UT	7510am			
0500-0600	USA, KVOH Los Angeles CA	9975am			
0500-0600	USA, KWHR Naalehu HI	9930as			
0500-0600	USA, Monitor Radio Intl	7535eu			
0500-0600	USA, Voice of America	5970af	6035af	6080af	7170va
		7195af	9630af	11965me	12080af
		15205va			
0500-0600	USA, WGTG McCaysville GA	5085am			
0500-0600	USA, WHRI Noblesville IN	5745am	7315am		
0500-0600	USA, WJCR Upton KY	7490na			
0500-0600 smtwhf	USA, WMLK Bethel PA	9465eu			
0500-0600	USA, WRNO New Orleans LA	7355am			
0500-0600	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am
0500-0600	USA, WYFR Okeechobee FL	5985na	7355eu	9985af	11580eu
0500-0530	Vatican State, Vatican R	9660af	11625af		
0500-0520	Vatican State, Vatican R	4005eu	5882eu	7250eu	
0500-0600	Zambia, Christian Voice	3330af	6065af		
0500-0530 vl	Zambia, R Zambia/ZNBC 1	4910do			
0500-0600 vl	Zambia, R Zambia/ZNBC 2	6165do			
0500-0530 vl	Zimbabwe, Zimbabwe BC	3396do			
0505-0600	Swaziland, Trans World R	3200af	4775af	6070af	9500af
0525-0600	Ghana, Ghana Broadc Corp	3366do	4915do		
0530-0559	Austria, R Austria Intl	6015na			
0530-0600 vl	Kiribati, Radio	9810do			
0530-0556	Romania, R Romania Intl	11790af	11940af	15250af	15270af
		15340as	17720as	17790af	
0530-0600	Thailand, Radio	9655eu	11905eu	15115eu	
0530-0600 vl	Zambia, R Zambia/ZNBC 1	7220do			
0530-0600 vl	Zimbabwe, Zimbabwe BC	5975do			

Selected Programs

Sundays

0500 USA, KWHR Naalehu HI: Breakthrough. Rod Parsley conducts services from the World Harvest Church in Columbus, OH.
0500 USA, WWCR #1 Nashville TN: These Last Days. Apparitions and prophecies of the Lady of the Roses.
0500 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
0500 WHRI (Angel 1/2): The Joy of Living Broadcast. Ms. Hurst and Ms. Smith evangelize with words and song.
0505 USA, WWCR #3 Nashville TN: Ham Radio and More. Amateur radio and satellite news and techniques with Len Winkler.
0515 WHRI (Angel 1): Music. See S 0200.
0515 WHRI (Angel 2): Taste God's Goodness. Lela Pendergrass teaches about the coming rapture.
0530 USA, WWCR #1 Nashville TN: The Lutheran Reformation Hour. Richard Shekner preaches from Chicago Heights, Illinois.
0530 WHRI (Angel 1/2): The Mercies of God Radio Broadcast. Pastor Peter Notier from Michigan preaches mercy for lost sinners.

Mondays

0500 USA, KWHR Naalehu HI: Music. See S 1600.
0500 USA, WWCR #1 Nashville TN: Rock the Universe. See S 1200.
0500 USA, WWCR #3 Nashville TN: Ask WWCR. See S 2315.
0500 WHRI (Angel 1): John Hagee Today. Evangelizing by John Hagee of the Cornerstone Church in San Antonio, TX.
0500 WHRI (Angel 2): UPI News. See S 0400.
0515 USA, WWCR #3 Nashville TN: The Old Time Religion Hour. Brother Hogan will send you a Bible.
0530 USA, WWCR #3 Nashville TN: The Hour of Courage. Ron Wilson talks politics and the precious metals market.
0530 WHRI (Angel 1): In Touch. See S 1200.
0555 WHRI (Angel 1): Inside Pitch. Marvin Lau.

Tuesdays

0500 USA, KWHR Naalehu HI: Music. See S 1600.
0500 USA, WWCR #1/3 Nashville TN: USA Radio News. See S 0400.
0500 WHRI (Angel 1): John Hagee Today. See M 0500.
0500 WHRI (Angel 2): UPI News. See S 0400.
0505 USA, WWCR #3 Nashville TN: The Spoken Word of God. Alexander Scourby narrates the King James version of The New Testament.
0506 USA, WWCR #1 Nashville TN: For the People (hour 2). Chuck Harder is back with his old talk radio show.
0515 USA, WWCR #3 Nashville TN: The Old Time Religion Hour. See M 0515.
0530 USA, WWCR #3 Nashville TN: The Hour of Courage. See M 0530.
0530 WHRI (Angel 1): In Touch. See S 1200.
0555 WHRI (Angel 1): Inside Pitch. See M 0555.

Wednesdays

0500 USA, KWHR Naalehu HI: Music. See S 1600.
0500 USA, WWCR #1/3 Nashville TN: USA Radio News. See S 0400.
0500 WHRI (Angel 1): John Hagee Today. See M 0500.
0500 WHRI (Angel 2): UPI News. See S 0400.
0505 USA, WWCR #3 Nashville TN: The Spoken Word of God. See T 0505.
0506 USA, WWCR #1 Nashville TN: For the People (hour 2). See T 0506.
0515 USA, WWCR #3 Nashville TN: The Old Time Religion Hour. See M 0515.
0530 USA, WWCR #3 Nashville TN: The Hour of Courage. See M 0530.
0530 WHRI (Angel 1): In Touch. See S 1200.
0555 WHRI (Angel 1): Inside Pitch. See M 0555.

Thursdays

0500 USA, KWHR Naalehu HI: Music. See S 1600.
0500 USA, WWCR #1/3 Nashville TN: USA Radio News. See S 0400.
0500 WHRI (Angel 1): John Hagee Today. See M 0500.
0500 WHRI (Angel 2): UPI News. See S 0400.
0505 USA, WWCR #3 Nashville TN: The Spoken Word of God. See T 0505.
0506 USA, WWCR #1 Nashville TN: For the People (hour 2). See T 0506.
0515 USA, WWCR #3 Nashville TN: The Old Time Religion Hour. See M 0515.
0530 USA, WWCR #3 Nashville TN: The Hour of Courage. See M 0530.
0530 WHRI (Angel 1): In Touch. See S 1200.
0555 WHRI (Angel 1): Inside Pitch. See M 0555.

Fridays

0500 USA, KWHR Naalehu HI: Music. See S 1600.
0500 USA, WWCR #1/3 Nashville TN: USA Radio News. See S 0400.
0500 WHRI (Angel 1): John Hagee Today. See M 0500.
0500 WHRI (Angel 2): UPI News. See S 0400.
0505 USA, WWCR #3 Nashville TN: The Spoken Word of God. See T 0505.
0506 USA, WWCR #1 Nashville TN: For the People (hour 2). See T 0506.
0515 USA, WWCR #3 Nashville TN: The Old Time Religion Hour. See M 0515.
0530 USA, WWCR #3 Nashville TN: The Hour of Courage. See M 0530.
0530 WHRI (Angel 1): In Touch. See S 1200.
0555 WHRI (Angel 1): Inside Pitch. See M 0555.

Saturdays

0500 USA, KWHR Naalehu HI: DXing with Cumbre. See M 0330.
0500 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
0500 USA, WWCR #3 Nashville TN: Countdown. Joseph Krill.
0500 WHRI (Angel 1/2): DXing with Cumbre. See S 0330.
0506 USA, WWCR #1 Nashville TN: For the People (hour 2). See T 0506.
0515 USA, WWCR #3 Nashville TN: Lyon Gold and Silver Magnet Program. Jackie Lyon hawks a variety of products for healing.
0530 USA, KWHR Naalehu HI: Christian Country Music. Joe Brashier plays country music with a Christian slant.
0530 USA, WWCR #3 Nashville TN: World of Radio. See S 2330.
0530 WHRI (Angel 1): Christian Country Music. Joe Brashier plays country music with a Christian slant.
0530 WHRI (Angel 2): A Temple of Jesus Christ. Cleveland Waters.

Frequencies

0600-0700	Anguilla,Caribbean Beacon	6090am			
0600-0700	Australia, Radio	13605as	15415as	15530as	17750as
0600-0630	Australia, Radio	11880pa	17795pa		
0600-0700 vl	Australia, VL8K Katherine	5025do			
0600-0700 vl	Australia, VL8T Tent Crk	4910do			
0600-0633	Australia,DefenseForces R	13525as			
0600-0700 vl	Canada, CBC N Quebec Svc	9625do			
0600-0700	Canada, CFCX Montreal	6005do			
0600-0700	Canada, CFRX Toronto	6070do			
0600-0700	Canada, CFVP Calgary	6030do			
0600-0700	Canada, CHNX Halifax	6130do			
0600-0700	Canada, CKZU Vancouver	6160do			
0600-0700	Costa Rica,RF Peace Intl	6205am	7385am		
0600-0700	Cuba, Radio Havana	6000na	9830na		
0600-0700	Ecuador, HCJB	9745am	21455am		
0600-0650	Germany, Deutsche Welle	11915af	13790af	15185af	17820as
		17860af	21680af		
0600-0615	Ghana, Ghana Broadc Corp	3366do	4915do		
0600-0700	Guyana, GBC/Voice of	3290do			
0600-0700 vl	Italy, IRRS	3985va			
0600-0700	Japan, R Japan/NHK World	5975eu	7230eu	9835as	11740as
		11840as	11910am	11920na	12030as
		15230na	15550va	17810as	
0600-0700 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
0600-0700 vl	Kiribati, Radio	9810do			
0600-0700	Lebanon, Voice of Hope	9960va			
0600-0700	Liberia,LCN/R Liberia Int	5100do			
0600-0700	Malaysia, Voice of	6175as	9750as	15295au	
0600-0700	New Zealand, R NZ Intl	9795pa			
0600-0630	Nigeria, FRCN/Radio	3326do	4770do	4990do	
0600-0650	North Korea, R Pyongyang	15180as	15230as		
0600-0630 s	Norway, Radio Norway Intl	7180eu	7295pa	9590af	13805af
0600-0700 vl	Papua New Guinea, NBC	9675do			
0600-0700	Russia,Voice of Russia WS	12000au	12010as	12040as	12050as
		13645pa	13665pa	15470pa	15490pa
		15560va	15580va	15595va	17570au
		17580au	17610au	17610pa	17795va
0600-0630	S Africa, Channel Africa	11900af			
0600-0700	S Africa, Investment Ch	9675af	11800af	15165af	15225af
		17790af			
0600-0655	S Africa, Trans World R	11730af			
0600-0610	Sierra Leone, SLBS	3316do			
0600-0630	Slovakia, Adv World Radio	13715af			
0600-0700	Slovakia, Adv World Radio	5905am			
0600-0630 vl	Solomon Islands, SIBC	5020do	9545do		
0600-0700	United Kingdom, BBC WS	5975am	6005af	6175am	6180eu
		6190af	6195eu	7145as	7160af
		7325va	9410va	9600af	9740as
		11760as	11780eu	11940af	12095eu
		15310as	15360as	15420af	15565va
		15575va	17640af	17785as	17885af
		21660as			
0600-0700	USA, KAIJ Dallas TX	5810am			
0600-0700	USA, KTBN Salt Lk City UT	7510am			
0600-0700	USA, KVOH Los Angeles CA	9975am			
0600-0700	USA, KWHR Naalehu HI	9930as			
0600-0700	USA, Monitor Radio Intl	7535eu			
0600-0630	USA, Voice of America	5970af	5995af	6035af	6080af
		7170va	7195af	9630af	11805af
		11950af	11965me	12080af	15205va
0600-0700	USA, WEWN Birmingham AL	5825eu	6890na	9370na	
0600-0700	USA, WHRI Noblesville IN	5745am	7315am		
0600-0700	USA, WJCR Upton KY	7490na			
0600-0700 smtwhf	USA, WMLK Bethel PA	9465eu			
0600-0700	USA, WRNO New Orleans LA	7355am			
0600-0700	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am
0600-0700	USA, WYFR Okeechobee FL	5985am	9455af		
0600-0645	USA, WYFR Okeechobee FL	7355eu	9985eu		
0600-0630	Vietnam, Voice of	5925as	10060as		
0600-0700	Yemen, Yemeni Rep Radio	9780do			
0600-0700	Zambia, Christian Voice	3330af	6065af		
0600-0700 vl	Zambia, R Zambia/ZNBC 1	7220do			
0600-0700 vl	Zimbabwe, Zimbabwe BC	5975do			
0603-0610	Croatia, Croatian Radio	5985eu	7165eu	9830eu	
0605-0700	Swaziland, Trans World R	4775af	6100af	9500af	9650af
		11730af			
0630-0700	Australia, Radio	9580pa	9860pa		
0630-0700	Belgium, R Vlaanderen Int	6035eu	9925eu	9940au	
0630-0700	Georgia, Radio	11805eu			
0630-0658	Vatican State, Vatican R	11625af	13765af	15570af	
0631-0640	Romania, R Romania Intl	9550eu	9665eu	11810eu	15365eu
0645-0700 as	Monaco, Trans World Radio	9755eu			
0645-0700	Romania, R Romania Intl	11740pa	11840pa	15250pa	15270pa
		17720pa			
0655-0700 mtwhf	Monaco, Trans World Radio	9755eu			

Selected Programs

Sundays

0600 USA, KWHR Naalehu HI: Witness of Power. Randy Brodhagen.
0600 USA, WWCR #1 Nashville TN: Ever Increasing Faith. Fredrick "K.C." Price evangelizes from Los Angeles.
0600 USA, WWCR #3 Nashville TN: Prophecy Flash. William Dankenbring preaches about the second coming.
0600 WHRI (Angel 1/2): The Call to Worship. Bernie Timmerman with services from Zion Chapel, Holland, Michigan.
0630 USA, KWHR Naalehu HI: Eternal Good News. Germaine Lockwood teaches from the Old Testament.
0630 USA, WWCR #3 Nashville TN: Faith Mountain Ministries. See S 0300.
0630 WHRI (Angel 1): The Banner of Truth Broadcast. Sponsored by the Free Reformed Churches of North America.
0630 WHRI (Angel 2): The Voice of Power. RW Schambach preaches from Tyler, Texas.
0645 WHRI (Angel 1): Music. See S 0200.

Mondays

0600 USA, KWHR Naalehu HI: World Harvest. Joe Brashier is both disc jockey and host.
0600 USA, WWCR #1/3 Nashville TN: USA Radio News. See S 0400.
0600 WHRI (Angel 1/2): The Radio Bible Hour. Dr. J. Harold Smith has been preaching on the radio since 1935.
0605 USA, WWCR #1 Nashville TN: The Hour of Courage. See M 0530.
0605 USA, WWCR #3 Nashville TN: Freedom's Call. Bo Gritz hosts this talk radio program.
0615 WHRI (Angel 1/2): Faith Seminar of the Air. Kenneth Hagin evangelizes.
0630 WHRI (Angel 1/2): Listen to Jesus. Clinton and Sarah Outerbach from The Redeeming Love Christian Center of Nanuet, NY.
0635 USA, WWCR #1 Nashville TN: Ken's Country Classics. Key Berryhill with country music from a bygone era.
0645 WHRI (Angel 1/2): The Voice of Praise. Pastor Kenneth Ivey teaches from the word of God.

Tuesdays

0600 USA, KWHR Naalehu HI: World Harvest. See M 0600.
0600 USA, WWCR #1/3 Nashville TN: USA Radio News. See S 0400.
0600 WHRI (Angel 1/2): The Radio Bible Hour. See M 0600.
0605 USA, WWCR #1 Nashville TN: The Hour of Courage. See M 0530.
0605 USA, WWCR #3 Nashville TN: Freedom's Call. See M 0605.
0615 WHRI (Angel 1/2): Faith Seminar of the Air. See M 0615.
0630 WHRI (Angel 1/2): Listen to Jesus. See M 0630.
0635 USA, WWCR #1 Nashville TN: The Intelligence Report. See M 1600.
0645 WHRI (Angel 1/2): The Voice of Praise. See M 0645.

Wednesdays

0600 USA, KWHR Naalehu HI: World Harvest. See M 0600.
0600 USA, WWCR #1/3 Nashville TN: USA Radio News. See S 0400.
0600 WHRI (Angel 1/2): The Radio Bible Hour. See M 0600.
0605 USA, WWCR #1 Nashville TN: The Hour of Courage. See M 0530.
0605 USA, WWCR #3 Nashville TN: Freedom's Call. See M 0605.
0615 WHRI (Angel 1/2): Faith Seminar of the Air. See M 0615.
0630 WHRI (Angel 1/2): Listen to Jesus. See M 0630.
0635 USA, WWCR #1 Nashville TN: The Intelligence Report. See M 1600.
0645 WHRI (Angel 1/2): The Voice of Praise. See M 0645.

Thursdays

0600 USA, KWHR Naalehu HI: World Harvest. See M 0600.
0600 USA, WWCR #1/3 Nashville TN: USA Radio News. See S 0400.
0600 WHRI (Angel 1/2): The Radio Bible Hour. See M 0600.
0605 USA, WWCR #1 Nashville TN: The Hour of Courage. See M 0530.
0605 USA, WWCR #3 Nashville TN: Freedom's Call. See M 0605.
0615 WHRI (Angel 1/2): Faith Seminar of the Air. See M 0615.
0630 WHRI (Angel 1/2): Listen to Jesus. See M 0630.
0635 USA, WWCR #1 Nashville TN: The Intelligence Report. See M 1600.
0645 WHRI (Angel 1/2): The Voice of Praise. See M 0645.

Fridays

0600 USA, KWHR Naalehu HI: World Harvest. See M 0600.
0600 USA, WWCR #1/3 Nashville TN: USA Radio News. See S 0400.
0600 WHRI (Angel 1/2): The Radio Bible Hour. See M 0600.
0605 USA, WWCR #1 Nashville TN: The Hour of Courage. See M 0530.
0605 USA, WWCR #3 Nashville TN: Freedom's Call. See M 0605.
0615 WHRI (Angel 1/2): Faith Seminar of the Air. See M 0615.
0630 WHRI (Angel 1/2): Listen to Jesus. See M 0630.
0635 USA, WWCR #1 Nashville TN: The Intelligence Report. See M 1600.
0645 WHRI (Angel 1/2): The Voice of Praise. See M 0645.

Saturdays

0600 USA, KWHR Naalehu HI: The Banner of Truth Broadcast. Sponsored by the Free Reformed Churches of North America.
0600 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
0600 USA, WWCR #3 Nashville TN: Music City Discovery. Listen to the latest singers to hit Nashville.
0600 WHRI (Angel 1): UPI News. See S 0400.
0600 WHRI (Angel 2): The Call to Worship. See S 0600.
0604 WHRI (Angel 1): Turn Your Radio On. See S 0403.
0606 USA, WWCR #1 Nashville TN: Unshackled. Pacific Garden Mission's radio drama.
0615 USA, KWHR Naalehu HI: Call to Christ. Jimmy Surgeoner.
0630 USA, KWHR Naalehu HI: The Word of God Broadcast. Sister Polly preaches from the Knoxville House of Faith in Tennessee.
0630 USA, WWCR #3 Nashville TN: Words of Hope. See S 1230.
0630 WHRI (Angel 2): The Voice of Power. See S 0630.
0635 USA, WWCR #1 Nashville TN: The Intelligence Report. See M 1600.
0645 USA, KWHR Naalehu HI: Truth for the World. Churches of Christ spokesman Jim Dearman examines Scripture.
0645 USA, WWCR #3 Nashville TN: Have a Good Day. Rubin Leuthold.

FREQUENCIES

0700-0800	Anguilla,Caribbean Beacon	6090am			
0700-0800	Australia, Radio	9580pa	9860pa	13605as	15415as
		15530as	17750as		
0700-0800 vl	Australia, VL8K Katherine	5025do			
0700-0800 vl	Australia, VL8T Tent Crk	4910do			
0700-0800	Canada, CFCX Montreal	6005do			
0700-0800	Canada, CFRX Toronto	6070do			
0700-0800	Canada, CFVP Calgary	6030do			
0700-0800	Canada, CHNX Halifax	6130do			
0700-0800	Canada, CKZU Vancouver	6160do			
0700-0800	Costa Rica,RF Peace Intl	6205am	7385am		
0700-0727	Czech Rep, Radio Prague	7345eu	9505eu		
0700-0800	Ecuador, HCJB	9645pa	21455au		
0700-0800 as	Eqt Guinea, R East Africa	15186af			
0700-0800 mtwhf	Eqt Guinea, Radio Africa	15186af			
0700-0715	Ghana, Ghana Broadc Corp	3366do	4915do		
0700-0800	Guyana, GBC/Voice of	3290do			
0700-0800 vl	Italy, IRRS	3985va			
0700-0800	Japan, R Japan/NHK World	7230eu	11740as	11850pa	11910as
		11920as	15230me	17810va	17815af
0700-0800 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
0700-0800 vl	Kiribati, Radio	9810do			
0700-0800	Lebanon, Voice of Hope	9960va			
0700-0715	Liberia,LCN/R Liberia Int	5100do			
0700-0800 asmtwh	Malaysia, Radio	7295do			
0700-0800	Malaysia, Voice of	6175as	9750as	15295au	
0700-0800	Monaco, Trans World Radio	9755eu			
0700-0758 as	New Zealand, R NZ Intl	9795pa			
0700-0750	North Korea, R Pyongyang	15340af	17765me		
0700-0730 s	Norway, Radio Norway Intl	15245me			
0700-0800 vl	Papua New Guinea, NBC	9675do			
0700-0745	Romania, R Romania Intl	15370pa	17720pa	17790pa	17805pa
0700-0715 s	Romania, R Romania Intl	15370pa	17720pa	17790pa	17805pa
0700-0745	Romania, R Romania Intl	11740pa	11840pa	15250pa	15270pa
		17720pa			
0700-0800	Russia,Voice of Russia WS	15470pa	15490pa	15560va	17570au
		17610au	17795va		
0700-0800	S Africa, Investment Ch	15165af	15170af	17665af	21745af
0700-0710	Sierra Leone, SLBS	3316do			
0700-0800 vl	Solomon Islands, SIBC	5020do	9545do		
0700-0800	Swaziland, Trans World R	9650af			
0700-0800	Taiwan, VO Free China	5950na			
0700-0800	United Kingdom, BBC WS	5975am	6175am	6190af	7145as
		7325eu	9410eu	9610af	9740as
		11760as	11835af	11940af	11955as
		12095va	15310as	15360as	15485af
		15575va	17640af	17760af	17785as
		17830af	21660as		
0700-0800 as	United Kingdom, BBC WS	17885af			
0700-0715	United Kingdom, BBC WS	6005af	7160af		
0700-0730	United Kingdom, BBC WS	6180eu	6195eu	7325af	9410eu
		11780eu			
0700-0800	USA, KAIJ Dallas TX	5810am			
0700-0800	USA, KTBN Salt Lk City UT	7510am			
0700-0800	USA, KWHR Naalehu HI	9930au			
0700-0800	USA, Monitor Radio Intl	7535eu			
0700-0800	USA, WEWN Birmingham AL	5825eu			
0700-0800	USA, WHRI Noblesville IN	5760am	7315am		
0700-0800	USA, WJCR Upton KY	7490na			
0700-0800 smtwhf	USA, WMLK Bethel PA	9465eu			
0700-0800	USA, WRNO New Orleans LA	7355am			
0700-0800	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am
0700-0800 vl	Vanuatu, Radio	3945do	7260do		
0700-0800	Zambia, Christian Voice	6065af			
0700-0800 vl	Zambia, R Zambia/ZNBC 1	7220do			
0700-0800 vl	Zimbabwe, Zimbabwe BC	5975do			
0703-0710	Croatia, Croatian Radio	5895eu	7165eu	9830eu	
0730-0755	Austria, R Austria Intl	6155eu	13730eu	15410me	17870me
0730-0800	Ecuador, HCJB	5865eu			
0730-0745 s	Greece, Voice of	7430eu	7450eu	9425eu	11645eu
0730-0735	India, All India Radio	15185do	15260do		
0730-0800	Netherlands, Radio	9720pa	9820pa		
0730-0800 as	Palau, KHBN/Voice of Hope	9730as			
0730-0800	United Kingdom, BBC WS	15400va	15565va		
0740-0800	Guam, TWR/KTWR	15200as			
0745-0800 s	Ghana, Ghana Broadc Corp	3366do	4915do		
0745-0755	Greece, Voice of	7430eu	9425au	11645eu	
0759-0800 as	New Zealand, R NZ Intl	9700pa			

0800-0900	Anguilla,Caribbean Beacon	6090am			
0800-0900	Australia, Radio	5995pa	6020pa	6080pa	9710pa
		9860pa	12080pa	13605pa	21725as
0800-0830	Australia, Radio	15415as	17715pa	17880as	
0800-0830 vl	Australia, VL8K Katherine	5025do			
0800-0830 vl	Australia, VL8T Tent Crk	4910do			
0800-0900	Bhutan, Bhutan BC Service	6030do			
0800-0900 vl	Canada, CBC N Quebec Svc	9625do			
0800-0900	Canada, CFCX Montreal	6005do			
0800-0900	Canada, CFRX Toronto	6070do			
0800-0900	Canada, CFVP Calgary	6030do			
0800-0900	Canada, CHNX Halifax	6130do			
0800-0900	Canada, CKZU Vancouver	6160do			
0800-0900	Costa Rica,RF Peace Intl	6205am	7385am		
0800-0900	Ecuador, HCJB	5865eu	9645pa	21455au	
0800-0900 as	Eqt Guinea, R East Africa	15186af			
0800-0900 mtwhf	Eqt Guinea, Radio Africa	15186af			
0800-0830	Finland, YLE/R Finland	13645as	15235au		
0800-0805 s	Ghana, Ghana Broadc Corp	3366do			
0800-0900	Guam, TWR/KTWR	15200as			
0800-0900	Guyana, GBC/Voice of	3290do			
0800-0900	Indonesia, Voice of	9525as			
0800-0900 vl	Italy, IRRS	7125va			
0800-0900 vl	Kiribati, Radio	9810do			
0800-0900	Lebanon, Voice of Hope	9960va			
0800-0900	Liberia,LCN/R Liberia Int	5100do			
0800-0900	Malaysia, Radio	7295do			
0800-0825	Malaysia, Voice of	6175as	9750as	15295au	
0800-0835 a	Monaco, Trans World Radio	9755eu			
0800-0850 s	Monaco, Trans World Radio	9755eu			
0800-0820 mtwhf	Monaco, Trans World Radio	9755eu			
0800-0825	Netherlands, Radio	9720pa	9820pa		
0800-0816 mtwhf	New Zealand, R NZ Intl	9795pa			
0800-0900	New Zealand, R NZ Intl	9700pa			
0800-0850	North Korea, R Pyongyang	15180as	15230as		
0800-0830 s	Norway, Radio Norway Intl	15170as			
0800-0805	Pakistan, Radio	15470eu	17900eu		
0800-0900 as	Palau, KHBN/Voice of Hope	9730as			
0800-0900 vl	Papua New Guinea, NBC	9675do			
0800-0900	Russia,Voice of Russia WS	9810as	11800as	15470pa	15490pa
		15560va	17610au	17795va	
0800-0900	S Africa, Investment Ch	15165af	17665af	17665af	21745af
0800-0900 f	Seychelles, FEBA Radio	15540as			
0800-0810	Sierra Leone, SLBS	3316do			
0800-0900 vl	Solomon Islands, SIBC	5020do	9545do		
0800-0900	South Korea, R Korea Intl	9570au	13670eu		
0800-0900	United Kingdom, BBC WS	6190af	7325eu	9410eu	9740as
		11750as	11760as	11940af	11955as
		12095eu	15310as	15360va	15400af
		15485va	15575va	17640va	17760as
		17785as	17830af	21660as	
0800-0900 as	United Kingdom, BBC WS	15565va	17885af		
0800-0815	United Kingdom, BBC WS	7145pa	11835af		
0800-0900	USA, KAIJ Dallas TX	5810am			
0800-0900	USA, KNLS Anchor Point AK	9615as			
0800-0900	USA, KTBN Salt Lk City UT	7510am			
0800-0900	USA, KWHR Naalehu HI	9930as			
0800-0900	USA, Monitor Radio Intl	7535eu	9845eu	11550pa	15665eu
0800-0900	USA, WEWN Birmingham AL	5825eu	5960na		
0800-0900	USA, WHRI Noblesville IN	5760am	7315am	9930am	
0800-0900	USA, WJCR Upton KY	7490na			
0800-0900	USA, WRNO New Orleans LA	7355am			
0800-0900 as	USA, WVHA Greenbush ME	13825af			
0800-0900	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am
0800-0830 vl	Vanuatu, Radio	3945do	7260do		
0800-0900	Zambia, Christian Voice	6065af			
0800-0900 vl	Zambia, R Zambia/ZNBC 1	7220do			
0800-0900 vl	Zimbabwe, Zimbabwe BC	5975do			
0803-0810	Croatia, Croatian Radio	5895eu	7165eu	9830eu	
0815-0900 mtwtf	Nigeria, FRCN/Radio	3326do	4770do	4990do	
0817-0900 mtwhf	New Zealand, R NZ Intl	9700pa			
0820-0900 vl	Chile, R Esperanza	6089am			
0830-0900 vl	Australia, VL8A Alice Spg	2310do			
0830-0900 vl	Australia, VL8K Katherine	2485do			
0830-0900 vl	Australia, VL8T Tent Crk	2325do			
0830-0900	Georgia, Radio	11910me			
0830-0840	India, All India Radio	7250do	15185do	15260do	
0830-0900	Netherlands, Radio	9720pa	9820pa		
0830-0900	Slovakia, R Slovakia Intl	11990au	15460au	17570au	
0830-0900	United Kingdom, BBC WS	15280as			
0850-0853 s	Russia, R Pacific Ocean	7185as			
0855-0900	Guam, TWR/KTWR	11830au			

FREQUENCIES

0900-1000	Anguilla,Caribbean Beacon	6090am			
0900-1000	Australia, Radio	9860pa	13605as	21725as	
0900-1000 vl	Australia, VL8A Alice Spg	2310do			
0900-1000 vl	Australia, VL8K Katherine	2485do			
0900-1000 vl	Australia, VL8T Tent Crk	2325do			
0900-0925	Belgium, R Vlaanderen Int	6035eu	7190eu		
0900-1000	Canada, CFCX Montreal	6005do			
0900-1000	Canada, CFRX Toronto	6070do			
0900-1000	Canada, CFVP Calgary	6030do			
0900-1000	Canada, CHNX Halifax	6130do			
0900-1000	Canada, CKZU Vancouver	6160do			
0900-0935 vl	Chile, R Esperanza	6089am			
0900-1000	China, China Radio Intl	11755pa	15440pa		
0900-1000	Costa Rica,RF Peace Intl	6205am	7385am		
0900-0927	Czech Rep, Radio Prague	15640me	17485af		
0900-1000	Ecuador, HCJB	9645pa	21455au		
0900-0930	Ecuador, HCJB	5865eu			
0900-1000 as	Eqt Guinea, R East Africa	15186af			
0900-1000 mtwhf	Eqt Guinea, Radio Africa	15186af			
0900-0950	Germany, Deutsche Welle	6160au	9565af	12025af	15410af
		17715au	17800af	21600af	21680au
0900-0915 mtwtf	Ghana, Ghana Broadc Corp	3366do	4915do		
0900-0915	Guam, TWR/KTWR	11830as			
0900-1000	Guyana, GBC/Voice of	3290do			
0900-0930 vl/m-f	Italy, IRRS	7125va			
0900-0930 vl	Kiribati, Radio	9810do			
0900-1000	Lebanon, Voice of Hope	9960va			
0900-0915	Liberia,LCN/R Liberia Int	5100do			
0900-1000	Malaysia, Radio	7295do			
0900-0930	Mongolia, Voice of	15170as			
0900-0925	Netherlands, Radio	9720pa	9820au	13700pa	
0900-1000	New Zealand, R NZ Intl	9700pa			
0900-0930 s	Norway, Radio Norway Intl	13800as	15170au		
0900-1000 as	Palau, KHBN/Voice of Hope	9730as			
0900-1000 vl	Papua New Guinea, NBC	4890do			
0900-1000	Russia,Voice of Russia WS	9810as	11800as	11880as	17610au
		17795va			
0900-1000	S Africa, Investment Ch	15165af	17665af	21745af	
0900-0930	Switzerland, Swiss R Intl	9885pa	13685pa	17515au	
0900-1000	United Kingdom, BBC WS	5965as	6190af	6195as	9410eu
		9740as	11750as	11765va	11940af
		11945as	12095eu	15190sa	15360as
		15400af	15485va	15565as	15575va
		17640va	17705eu	17830af	21660as
0900-0915	United Kingdom, BBC WS	7325eu	15310as	15360pa	17785as
0900-0945	United Kingdom, BBC WS	9580as	11760as	11955as	15280as
0900-1000	USA, KAIJ Dallas TX	5810am			
0900-1000	USA, KTBN Salt Lk City UT	7510am			
0900-1000	USA, Monitor Radio Intl	7395sa	7535eu	13840au	15665as
0900-1000	USA, WEWN Birmingham AL	5960na			
0900-1000	USA, WGTG McCaysville GA	9400am			
0900-1000	USA, WHRI Noblesville IN	6040am	9495am	9930am	
0900-1000	USA, WJCR Upton KY	7490na			
0900-1000 as	USA, WRMI/R Miami Intl	9955am			
0900-1000	USA, WRNO New Orleans LA	7355am			
0900-1000 as	USA, WVHA Greenbush ME	13825af			
0900-1000	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am
0900-1000	USA, WYFR Okeechobee FL	5950na			
0900-1000	Zambia, Christian Voice	6065af			
0900-1000 vl	Zambia, R Zambia/ZNBC 1	7220do			
0900-1000 vl	Zimbabwe, Zimbabwe BC	5975do			
0915-1000	Ghana, Ghana Broadc Corp	6130do	7295do		
0930-1000 s	Armenia, Voice of	15270eu			
0930-0955 mtwhfa	Austria, R Austria Intl	15240au	17870au		
0930-1000	Canada, CKZN St John's	6160do			
0930-1000	Georgia, Radio	11910me			
0930-1000	Netherlands, Radio	12065au	13710pa		
0930-1000	Philippines, FEBC/R Intl	11635as			
0935-1000	Pakistan, Radio	17900eu			
0944-0949 vl	Kazakhstan, Radio Almaty	11840eu			

1000 UTC

1000-1100	Anguilla,Caribbean Beacon	6090am			
1000-1100	Australia, Radio	9710pa	9860pa	13605as	21725as
1000-1100 vl	Australia, VL8A Alice Spg	2310do			
1000-1100 vl	Australia, VL8K Katherine	2485do			
1000-1100 vl	Australia, VL8T Tent Crk	2325do			
1000-1100 vl	Canada, CBC N Quebec Svc	9625do			
1000-1100	Canada, CFCX Montreal	6005do			
1000-1100	Canada, CFRX Toronto	6070do			
1000-1100	Canada, CFVP Calgary	6030do			
1000-1100	Canada, CHNX Halifax	6130do			
1000-1100	Canada, CKZN St John's	6160do			
1000-1100	Canada, CKZU Vancouver	6160do			
1000-1100	China, China Radio Intl	11755pa	15440pa		
1000-1100	Costa Rica,RF Peace Intl	6205am	7385am		
1000-1100	Ecuador, HCJB	9645pa	21455au		
1000-1100 as	Eqt Guinea, R East Africa	15186af			
1000-1100 mtwhf	Eqt Guinea, Radio Africa	15186af			
1000-1100	India, All India Radio	11585as	13700as	15050as	17387au
		17840as			
1000-1100 vl	Italy, IRRS	7125va			
1000-1100	Jordan, Radio	11690eu			
1000-1100	Lebanon, Voice of Hope	9960va			
1000-1100	Malaysia, Radio	7295do			
1000-1100 vl	Malaysia, RTM Kuching	7160do			
1000-1100 vl	Malaysia,RTM KotaKinabalu	5980do			
1000-1025	Netherlands, Radio	12065au	13710pa		
1000-1100	New Zealand, R NZ Intl	9700pa			
1000-1100 as	Palau, KHBN/Voice of Hope	9730as			
1000-1100 vl	Papua New Guinea, NBC	4890do			
1000-1100	Philippines, FEBC/R Intl	11635as			
1000-1100	Russia,Voice of Russia WS	7330as	9810as	9835as	11655as
		11800au	11880au	15170pa	15435pa
		15490va	15510va	17560va	17610va
		17775va	17795va		
1000-1100	S Africa, Investment Ch	9675af	11970af	15165af	17665af
1000-1005	Solomon Islands, SIBC	5020do	9545do		
1000-1100	United Kingdom, BBC WS	5965va	6190af	6195am	9410eu
		9740as	11750as	11760as	11765va
		11940af	12095eu	15310as	15485va
		15565as	15575me	17640af	17705af
		17885va	21660as		
1000-1100 as	United Kingdom, BBC WS	15190am	15400am	17830af	
1000-1030	United Kingdom, BBC WS	15360as			
1000-1100	USA, KAIJ Dallas TX	5810am			
1000-1100	USA, KTBN Salt Lk City UT	7510am			
1000-1100	USA, KWHR Naalehu HI	9930as			
1000-1100	USA, Monitor Radio Intl	6095na	7395sa	15665as	15725as
1000-1100	USA, Voice of America	5985pa	6165am	7405am	9590am
		11720as	15425as		
1000-1100	USA, WEWN Birmingham AL	15745na			
1000-1100	USA, WGTG McCaysville GA	9400am			
1000-1100	USA, WHRI Noblesville IN	6040am	9495am	9930am	
1000-1100	USA, WJCR Upton KY	7490na			
1000-1100	USA, WRMI/R Miami Intl	9955am			
1000-1100	USA, WRNO New Orleans LA	7355am			
1000-1100 as	USA, WVHA Greenbush ME	13825af			
1000-1100	USA, WWCR Nashville TN	2390am	5070am	5935am	15685am
1000-1100	USA, WYFR Okeechobee FL	5950na	7355na		
1000-1030	Vietnam, Voice of	5940as	7270as	7400as	9840as
		12020as	15010as		
1000-1100	Zambia, Christian Voice	6065af			
1000-1100 vl	Zambia, R Zambia/ZNBC 1	7220do			
1020-1030 mtwhf	Vatican State, Vatican R	5882eu	9645eu	11740eu	15595eu
		17550eu			
1030-1055 s	Austria, R Austria Intl	15240au	17870au		
1030-1057	Czech Rep, Radio Prague	7345eu	9505eu		
1030-1100 mtwhf	Ethiopia, Radio	5990do	7110do	9705do	
1030-1100	Guam, AWR/KSDA	9870as			
1030-1100	Netherlands, Radio	6045eu	9860eu	12065as	13710as
1030-1100	South Korea, R Korea Intl	11715am			
1030-1100	Sri Lanka, Sri Lanka BC	11835as	17850as		
1030-1055	UAE, Radio Dubai	13675eu	15395eu	17630eu	21605me

THANK YOU ...

ADDITIONAL CONTRIBUTORS TO THIS MONTH'S SHORTWAVE GUIDE:

John Babbis, Silver Spring, MD; Iva Delcheva, Radio Bulgaria;Bob Todd Dokey, Lodi, CA; Paul R. Donegan, Glendale, CA; Ed Evans, Monitor Radio; Mark J. Fine, Remington, VA; Bob Fraser, Cohasset, MA; Clyde W. Harmon, Anniston, AL; Frank Hillton, Charleston, SC; Paul Jablonowski, Greenfield, WI; Rafal Kiepuszewski, Polish Radio Warsaw; Rev. Michael G. Mayer, Dover, DE; Jim Moats, Ravenna,OH; William D. Ricker, Boston, MA; Bill Scarbrough, Robert E. Thomas, Bridgeport, CT; Knoxville, TN; Lee Silvi, Mentor, OH; Vural Tekeli, VO Turkey; Mahendra Vaghjee, Rose Hill, Mauritius; Larry Van Horn, Brasstown, NC; Valeria Vasilica, Radio Moldova Intl; Jeff White, WRMI Radio; Alden C. Wires Jr., East Point, GA; BBCMS; BBC *Summary of World Broadcasts*; *BBC On-Air*; Internet Shortwave Newsgroups; NASWA *Journal*; Cumbre DX; Fine Tuning.

Frequencies

1100-1200	Anguilla,Caribbean Beacon	11775am			
1100-1200	Australia, Radio	9580pa	9770pa	9860pa	11660as
		13605as			
1100-1130	Australia, Radio	11640as			
1100-1200 vl	Australia, VL8A Alice Spg	2310do			
1100-1200 vl	Australia, VL8K Katherine	2485do			
1100-1200 vl	Australia, VL8T Tent Crk	2325do			
1100-1200	Canada, CFCX Montreal	6005do			
1100-1200	Canada, CFRX Toronto	6070do			
1100-1200	Canada, CFVP Calgary	6030do			
1100-1200	Canada, CHNX Halifax	6130do			
1100-1200	Canada, CKZN St John's	6160do			
1100-1200	Canada, CKZU Vancouver	6160do			
1100-1200	Costa Rica, Adv World R	7375am	9725am	13750am	
1100-1200	Costa Rica,RF Peace Intl	6205am	7385am		
1100-1200	Ecuador, HCJB	12005am	15115am	21455au	
1100-1200 as	Eqt Guinea, R East Africa	15186af			
1100-1200	Eqt Guinea, Radio Africa	9530as			
1100-1150	Germany, Deutsche Welle	15370af	15410af	17765af	17800af
1100-1200	Iran, VOIRI	7180me	9585af	11875me	15260af
1100-1200 vl	Italy, IRRS	7125va			
1100-1200	Japan, R Japan/NHK World	6120na	7125na	11815as	
1100-1200	Jordan, Radio	11690eu			
1100-1200	Lebanon, Voice of Hope	9960va			
1100-1110	Liberia,LCN/R Liberia Int	5100do			
1100-1200	Malaysia, Radio	7295do			
1100-1200 vl	Malaysia, RTM Kuching	7160do			
1100-1200 vl	Malaysia,RTM KotaKinabalu	5980do			
1100-1200	Mozambique, Radio Maputo	11820af	11835af		
1100-1125	Netherlands, Radio	12065as	13710as		
1100-1200	New Zealand, R NZ Intl	9700pa			
1100-1150	North Korea, R Pyongyang	4404na	6575na	9975na	11335na
1100-1120	Pakistan, Radio	15470eu	17900eu		
1100-1130 as	Palau, KHBN/Voice of Hope	9730as			
1100-1200 vl	Papua New Guinea, NBC	4890do			
1100-1200	Russia,Voice of Russia WS	4740as	11655as	11880as	15170as
		15460as	15490as	15510as	15560as
		17560as	17610as	17755as	17775as
		17795as			
1100-1200	S Africa, Investment Ch	9675af	11970af	15165af	17665af
		21745af			
1100-1200	Singapore,R Singapore Int	6105as	6155as		
1100-1130	Sri Lanka, Sri Lanka BC	11835as	17850as		
1100-1130	Switzerland, Swiss R Intl	13635as	15415as	17515as	
1100-1200	Taiwan, Voice of Asia	7445as			
1100-1200	United Kingdom, BBC WS	5965am	6190af	6195va	9410eu
		9580as	11750as	11760as	11940af
		11955as	12095eu	15220am	15310as
		15485va	15565as	15575va	17640na
		17705eu	17830af	17885af	21660af
1100-1130 as	United Kingdom, BBC WS	15190am			
1100-1130	United Kingdom, BBC WS	9700as	11765va	15310as	17785as
1100-1145	United Kingdom, BBC WS	15400af	17790as		
1100-1200	USA, KAIJ Dallas TX	5810am			
1100-1200	USA, KTBN Salt Lk City UT	7510am			
1100-1200	USA, KWHR Naalehu HI	9930as			
1100-1200	USA, Monitor Radio Intl	6095na	7395sa	9355eu	9430au
1100-1200	USA, Voice of America	5985pa	6160as	9645as	9760as
		11720as	15160as	15425as	
1100-1200	USA, WEWN Birmingham AL	15375eu	15745na		
1100-1200	USA, WHRI Noblesville IN	6040am	9495am		
1100-1200	USA, WJCR Upton KY	7490na			
1100-1200	USA, WRMI/R Miami Intl	9955am			
1100-1200	USA, WRNO New Orleans LA	7355am			
1100-1200 as	USA, WVHA Greenbush ME	13825eu			
1100-1200	USA, WWCR Nashville TN	2390am	5935am	7435am	15685am
1100-1200	USA, WYFR Okeechobee FL	5950na	11830na	11970na	
1100-1145	USA, WYFR Okeechobee FL	7355na			
1100-1130	Vietnam, Voice of	7285as	9730as		
1100-1200	Zambia, Christian Voice	6065af			
1100-1200 vl	Zambia, R Zambia/ZNBC 1	7220do			
1120-1140	Australia,DefenseForces R	4763as			
1130-1200 vl	China, China Radio Intl	6995as	11445as	11700as	
1130-1140	Lesotho, Radio Lesotho	4800do			
1130-1200	Myanmar, Voice of	5990do			
1130-1200	Netherlands, Radio	6045eu	9860eu		
1130-1200	Sweden, Radio	11650na	15240na		
1130-1200	United Kingdom, BBC WS	6195am	17705va		
1130-1200 f	Vatican State, Vatican R	15595as	17550au		
1135-1140	India, All India Radio	9595do	11620do	11710do	15185do

Selected Programs

Sundays

1100 USA, KWHR Naalehu HI: The Water of Life Broadcast. See S 0100.
1100 USA, WWCR #1 Nashville TN: Words of Hope (Paul Bryson). Paul Bryson preaches from Georgia.
1100 USA, WWCR #3 Nashville TN: America's Jukebox Gold. Bryan McKaye spotlights the music of the 50's and 60's.
1100 WHRI (Angel 1/2): Breakthrough. Rod Parsley conducts services from the World Harvest Church in Columbus, OH.
1115 USA, WWCR #1 Nashville TN: Wonderful Words of Life. The international ministry of the Salvation Army.
1130 USA, WWCR #1 Nashville TN: Staff of Life. Irene Armstrong evangelizes from Zion, Illinois.
1145 USA, WWCR #1: Church of Christ. Nokamis Yeldell.

Mondays

1100 USA, KWHR Naalehu HI: Biblical Studies Institute. Bob Tref evangelizes from Rapid City, South Dakota.
1100 USA, WWCR #1 Nashville TN: World Wide Country Radio (repeat). News, weather and the best of country music.
1100 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1100 WHRI (Angel 1): Ever Increasing Faith. Fredrick "K.C." Price evangelizes from Crenshaw Christian Center in Los Angeles.
1100 WHRI (Angel 2): UPI News. See S 0400.
1105 WHRI (Angel 2): Music. See S 0200.
1106 WWCR #3: Good Morning from America (live). Gary Kaye hosts a WWCR-produced variety music and call-in program.
1115 WHRI (Angel 1): Sold Out for Jesus. Paul Tebbano evangelizes from Cookton Park, New York.
1115 WHRI (Angel 2): Abundant Life. Walter Holland evangelizes from Texas.
1130 USA, KWHR Naalehu HI: Faith Seminar of the Air. Kenneth Hagin evangelizes.
1130 USA, WWCR #1 Nashville TN: Grace and Truth. RJ Bruno.
1130 WHRI (Angel 1/2): The Hour of Courage. See M 0000.
1145 USA, KWHR: Listen to Jesus. Clinton and Sarah Outerbach from The Redeeming Love Christian Center of Nanuet, NY.

Tuesdays

1100 USA, KWHR Naalehu HI: UPI News. See T 0300.
1100 USA, WWCR #1 Nashville TN: World Wide Country Radio (repeat). See M 1100.
1100 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1100 WHRI (Angel 1): Ever Increasing Faith. See M 1100.
1100 WHRI (Angel 2): UPI News. See S 0400.
1105 USA, KWHR Naalehu HI: Music. See S 1600.
1105 WHRI (Angel 2): Music. See S 0200.
1106 USA, WWCR #3 Nashville TN: Good Morning from America (live). See M 1106.
1115 WHRI (Angel 1): Sold Out for Jesus. See M 1115.
1115 WHRI (Angel 2): Abundant Life. See M 1115.
1130 USA, KWHR: Faith Seminar of the Air. See M 1130.
1130 USA, WWCR #1: Women Who Overcome. Shirley Beaver.
1130 WHRI (Angel 1/2): The Hour of Courage. See M 0000.
1145 USA, KWHR Naalehu HI: Listen to Jesus. See M 1145.

Wednesdays

1100 USA, KWHR: Biblical Studies Institute. See M 1100.
1100 USA, WWCR #1: The Hour of Courage. See M 0530.
1100 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1100 WHRI (Angel 1): Ever Increasing Faith. See M 1100.
1100 WHRI (Angel 2): UPI News. See S 0400.
1105 WHRI (Angel 2): Music. See S 0200.
1106 USA, WWCR #3 Nashville TN: Good Morning from America (live). See M 1106.
1115 WHRI (Angel 1): Sold Out for Jesus. See M 1115.
1115 WHRI (Angel 2): Abundant Life. See M 1115.
1130 USA, KWHR: Faith Seminar of the Air. See M 1130.
1130 USA, WWCR #1: Wonderful Words of Life. See S 1115.
1130 WHRI (Angel 1): The Hour of Courage. See M 0000.
1130 WHRI (Angel 2): The Hour of Courage. See M 0000.
1145 USA, KWHR Naalehu HI: Listen to Jesus. See M 1145.

Thursdays

1100 USA, KWHR Naalehu HI: UPI News. See T 0300.
1100 USA, WWCR #1: The Hour of Courage. See M 0530.
1100 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1100 WHRI (Angel 1): Ever Increasing Faith. See M 1100.
1100 WHRI (Angel 2): UPI News. See S 0400.
1105 USA, KWHR Naalehu HI: Music. See S 1600.
1105 WHRI (Angel 2): Music. See S 0200.
1106 USA, WWCR #3 Nashville TN: Good Morning from America (live). See M 1106.
1115 WHRI (Angel 1): Sold Out for Jesus. See M 1115.
1115 WHRI (Angel 2): Abundant Life. See M 1115.
1130 USA, KWHR: Faith Seminar of the Air. See M 1130.
1130 USA, WWCR #1: Ken's Country Classics. See M 0635.
1130 WHRI (Angel 1/2): The Hour of Courage. See M 0000.
1145 USA, KWHR Naalehu HI: Listen to Jesus. See M 1145.

Fridays

1100 USA, KWHR: Biblical Studies Institute. See M 1100.
1100 USA, WWCR #1: The Hour of Courage. See M 0530.
1100 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1100 WHRI (Angel 1): Ever Increasing Faith. See M 1100.
1100 WHRI (Angel 2): UPI News. See S 0400.
1105 WHRI (Angel 2): Music. See S 0200.
1106 USA, WWCR #3 Nashville TN: Good Morning from America (live). See M 1106.
1115 WHRI (Angel 1): Sold Out for Jesus. See M 1115.
1115 WHRI (Angel 2): Abundant Life. See M 1115.
1130 USA, KWHR: Faith Seminar of the Air. See M 1130.
1130 USA, WWCR #1: The Street Preacher. See S 0330.
1130 WHRI (Angel 1/2): The Hour of Courage. See M 0000.
1145 USA, WWCR #1 Nashville TN: First Hand. See M 0100.
1154 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (6th). See W 1254.
1154 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (13th/20th/27th). See A 2354.

Saturdays

1100 USA, KWHR Naalehu HI: Eternal Good News. See S 0630.
1100 USA, WWCR #1 Nashville TN: USA Radio News. See S 0400.
1100 USA, WWCR #3: Ken's Country Classics. See M 0635.
1100 WHRI (Angel 1/2): UPI News. See S 0400.
1105 USA, WWCR #1 Nashville TN: Word of Wisdom. Howard Kirkwood evangelizes from Arkansas.
1105 WHRI (Angel 1): Music. See S 0200.
1106 WHRI (Angel 2): For the People (repeat). Chuck Harder is back with his old talk radio show.
1110 USA, WWCR #1: The View from Europe. Harvey Thomas presents the European point of view on current events.
1115 USA, KWHR: Church of the Living God. Arnold Rogers.
1115 USA, WWCR #1 Nashville TN: Rhema Radio Church. Kenneth Hagin, Jr. preaches from Tulsa, Oklahoma.
1130 USA, WWCR #3 Nashville TN: World of Radio. See S 2330.
1130 WHRI (Angel 1): The Voice of Power. See S 0630.
1145 USA, WWCR #1 Nashville TN: Brother Ed. Ed Skultety evangelizes from Oregon.

FREQUENCIES

1200-1300	Anguilla,Caribbean Beacon	11775am			
1200-1300	Australia, Radio	5995as	9580pa	9710as	9860pa
		11660as	13605as		
1200-1300 vl	Australia, VL8A Alice Spg	2310do			
1200-1300 vl	Australia, VL8K Katherine	2485do			
1200-1300 vl	Australia, VL8T Tent Crk	2325do			
1200-1300	Brazil, Radio Bras	15445na			
1200-1230	Bulgaria, Radio	13790as			
1200-1215	Cambodia, Natl Voice of	11940as			
1200-1300 vl	Canada, CBC N Quebec Svc	9625do			
1200-1300	Canada, CFCX Montreal	6005do			
1200-1300	Canada, CFRX Toronto	6070do			
1200-1300	Canada, CFVP Calgary	6030do			
1200-1300	Canada, CHNX Halifax	6130do			
1200-1300	Canada, CKZN St John's	6160do			
1200-1300	Canada, CKZU Vancouver	6160do			
1200-1230	Canada, R Canada Intl	9660as	9715me	11835me	11975me
		15195as			
1200-1300	Canada, R Canada Intl	9640am	11855am	13650am	
1200-1300	China, China Radio Intl	7385na	9565as	9715as	11660as
		11795pa	15440am		
1200-1230 vl	China, China Radio Intl	6995as	11700as	12110as	
1200-1300	Costa Rica, Adv World R	5030am	6150am	9725am	13750am
1200-1300 vl	Cyprus, BRT International	6150do			
1200-1300	Ecuador, HCJB	12005am	15115am	21455am	
1200-1300 as	Eqt Guinea, R East Africa	15186af			
1200-1300	Eqt Guinea, Radio Africa	9530as			
1200-1300	France, Radio France Intl	9805af	11600va	11615va	13625eu
		15155eu	15195eu	15530af	15540va
1200-1230	Iran, VOIRI	7180me	9585me	11875me	15260af
1200-1300 vl	Italy, IRRS	7125va			
1200-1300	Japan, R Japan/NHK World	7125as			
1200-1300	Jordan, Radio	11690eu			
1200-1300	Lebanon, Voice of Hope	9960va			
1200-1300	Malaysia, Radio	7295do			
1200-1300 vl	Malaysia,RTM KotaKinabalu	5980do			
1200-1250	Myanmar, Voice of	5990do			
1200-1300	Netherlands, Radio	6045eu	9860eu		
1200-1206	New Zealand, R NZ Intl	9700pa			
1200-1230 s	Norway, Radio Norway Intl	9590eu	13805as	15605au	
1200-1300 vl	Papua New Guinea, NBC	4890do			
1200-1255	Poland, Polish R Warsaw	6095eu	7145eu	7270eu	9525eu
		11815eu			
1200-1300	Russia,Voice of Russia WS	4740as	4975as	11655as	11785as
		11880as	15110as	15170as	15230as
		15430as	15435as	15490as	15510as
		17610as	17755as	17775as	17795as
1200-1300	S Africa, Investment Ch	9675af	11970af	15165af	17665af
		21745af			
1200-1300	Singapore,R Singapore Int	6105as	6155as		
1200-1300	South Korea, R Korea Intl	7285af			
1200-1300	Taiwan, VO Free China	7130au	9610as		
1200-1300	Ukraine, R Ukraine Intl	7150eu	12050na		
1200-1300	United Kingdom, BBC WS	6190af	6195va	9410eu	9515am
		9580as	9740as	11750as	11760as
		11940af	11955as	15220am	15310as
		15485va	15565va	15575va	17640va
		17705af	17830af	17885af	21660af
1200-1300	USA, KAIJ Dallas TX	5810am			
1200-1300	USA, KTBN Salt Lk City UT	7510am			
1200-1300	USA, KWHR Naalehu HI	9930as			
1200-1300	USA, Monitor Radio Intl	6095na	9355as	9430au	9455sa
1200-1230	USA, Voice of America	6160as	9645as	9760as	11715as
		15160as	15425as		
1200-1300	USA, WEWN Birmingham AL	15375sa	15745eu		
1200-1300	USA, WGTG McCaysville GA	9400am			
1200-1300	USA, WHRI Noblesville IN	6040am	15105am		
1200-1300	USA, WJCR Upton KY	7490na			
1200-1300	USA, WRMI/R Miami Intl	9955am			
1200-1300	USA, WRNO New Orleans LA	7355am			
1200-1300	USA, WWCR Nashville TN	7435am	9475am	13845am	15685am
1200-1300	USA, WYFR Okeechobee FL	5950na	11830na	13695na	
1200-1245	USA, WYFR Okeechobee FL	11970am			
1200-1230	Uzbekistan, R Tashkent	7285as	9715as	15295as	
1200-1300	Zambia, Christian Voice	6065af			
1200-1300 vl	Zambia, R Zambia/ZNBC 1	7220do			
1203-1210	Croatia, Croatian Radio	5895eu	7165eu	13830eu	
1207-1300 occsnal	New Zealand, R NZ Intl	6070pa			
1215-1300	Egypt, Radio Cairo	17595as			
1215-1300	United Kingdom, BBC WS	15220am			
1230-1255	Austria, R Austria Intl	6155eu	13730na		
1230-1300	Bangladesh, Bangla Betar	7185as	9550as		
1230-1255 s	Belgium, R Vlaanderen Int	13785na	15535as		
1230-1300 mtwhf	Finland, YLE/R Finland	11900na	15400na		
1230-1235	India, All India Radio	4860do	6185do	17865do	
1230-1300 w	Indonesia, RRI Sorong	4875do			
1230-1300	Mongolia, Voice of	12085as			
1230-1300	Romania, R Romania Intl	9690eu	11885eu	15365eu	17720eu
1230-1300	Serbia, Radio Yugoslavia	11835eu			
1230-1300	South Korea, R Korea Intl	9570as	9640as	13670as	
1230-1300 mtwhf	Sri Lanka, Sri Lanka BC	9730as			
1230-1300	Sweden, Radio	13740as	15240pa		
1230-1300	Thailand, Radio	9505as	9655as	9810as	
1230-1300	Turkey, Voice of	13750eu	15290as		
1230-1300	Vietnam, Voice of	5940as	7270as	7400as	9840as
		12020as	15010as		
1240-1250	Greece, Voice of	11645af			

SELECTED PROGRAMS

Sundays

1200 USA, WWCR #1 Nashville TN: Voice of Hope. Oliver Fenison.
1200 USA, WWCR #3: Rock the Universe. Rich Adcock's selections of rock recordings includes some rare treats.
1200 WHRI (Angel 1): Witness of Power. Randy Brodhagen.
1200 WHRI (Angel 2): In Touch. The Atlanta Bible-teaching ministry of Charles Stanley.
1230 USA, WWCR #1 Nashville TN: Words of Hope. Eugene Brown preaches from Nashville, Tennessee.
1230 WHRI (Angel 1): Message of Hope. Sem White.
1245 USA, WWCR #1: Totally Devoted. Charles Johnson.

Mondays

1200 USA, WWCR #1: New Harvest International. Dennis Deruz.
1200 USA, WWCR #3: USA Radio News. See S 0400.
1200 WHRI (Angel 2): The Voice of Praise. See M 0645.
1206 USA, WWCR #3 Nashville TN: Good Morning from America (live). See M 1106.
1215 USA, WWCR #1: Lords and Sons. Larry Williams.
1215 WHRI (Angel 1/2): Reach Out. Pastor Jerry Lynn, Calvary Chapel of Albany, New York with Bible teaching.
1230 USA, WWCR #1: Bread of Life Victory Hour (1). Brother Jack Meeks offers a free bible study correspondence course.
1230 USA, WWCR #1: The Hour of Grace (3/5). Gene Griffin.
1230 USA, WWCR #1 Nashville TN: Victory Baptist Church (2/4). David Robinson preaches from Hildebrand, NC.
1230 WHRI (Angel 1/2): Faith Seminar of the Air. See M 0615.
1245 USA, WWCR #1 Nashville TN: Walking Through the Land of Promises. Bobbie Lively evangelizes from Tennessee.
1245 WHRI (Angel 1): Abundant Life. See M 1115.
1245 WHRI (Angel 2): Life in the Word. Joyce Meyer offers help by example for everyday living.

Tuesdays

1200 USA, WWCR #1: The King is Coming. Steve Johnson.
1200 USA, WWCR #3: USA Radio News. See S 0400.
1200 WHRI (Angel 2): The Voice of Praise. See M 0645.
1206 USA, WWCR #3 Nashville TN: Good Morning from America (live). See M 1106.
1215 USA, WWCR #1 Nashville TN: Have in God. Claude Milan.
1215 WHRI (Angel 1/2): Reach Out. See M 1215.
1230 USA, WWCR #1 Nashville TN: World of Radio. See S 2330.
1230 WHRI (Angel 1/2): Faith Seminar of the Air. See M 0615.
1245 WHRI (Angel 1): Abundant Life. See M 1115.
1245 WHRI (Angel 2): Life in the Word. See M 1245.

Wednesdays

1200 USA, WWCR #1: Faith and Truth. Ken Megilligan.
1200 USA, WWCR #3: USA Radio News. See S 0400.
1200 WHRI (Angel 2): The Voice of Praise. See M 0645.
1206 USA, WWCR #3 Nashville TN: Good Morning from America (live). See M 1106.
1215 USA, WWCR #1: Faith Revival Ministries. Randolph Scott.
1215 WHRI (Angel 1/2): Reach Out. See M 1215.
1230 USA, WWCR #1 Nashville TN: The Chapel Hour. Otis Tillman evangelizes from Buffalo, New York.
1230 WHRI (Angel 1/2): Faith Seminar of the Air. See M 0615.
1245 WHRI (Angel 1): Abundant Life. See M 1115.
1245 WHRI (Angel 2): Life in the Word. See M 1245.
1254 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (4th). Ginger da Silva speaks with the Labour Union leader Wim Kok 20 years after his first interview.
1254 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (11th/18th/25th). See A 2354.

Thursdays

1200 USA, WWCR #1 Nashville TN: Abounding Grace. Gary Jones of the Charismatic Teaching Center near Orlando, Florida.
1200 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1200 WHRI (Angel 2): The Voice of Praise. See M 0645.
1206 USA, WWCR #3 Nashville TN: Good Morning from America (live). See M 1106.
1215 WHRI (Angel 1/2): Reach Out. See M 1215.
1230 USA, WWCR #1 Nashville TN: Afterglow. Don Johnson plays beautiful sacred music.
1230 WHRI (Angel 1/2): Faith Seminar of the Air. See M 0615.
1245 WHRI (Angel 1): Abundant Life. See M 1115.
1245 WHRI (Angel 2): Life in the Word. See M 1245.

Fridays

1200 USA, WWCR #1 Nashville TN: Faith for Today. William Rowe.
1200 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1200 WHRI (Angel 2): The Voice of Praise. See M 0645.
1206 WWCR #3: Good Morning from America (live). See M 1106.
1215 WHRI (Angel 1/2): Reach Out. See M 1215.
1230 WHRI (Angel 1/2): Faith Seminar of the Air. See M 0615.
1245 USA, WWCR #1 Nashville TN: Battle Cry Sounding. Deborah Green evangelizes.
1245 WHRI (Angel 1): Abundant Life. See M 1115.
1245 WHRI (Angel 2): Life in the Word. See M 1245.

Saturdays

1200 USA, WWCR #1: Brother Ed (from 1145). See A 1145.
1200 USA, WWCR #3 Nashville TN: The Extraordinary Science Radio Hour. See M 0400.
1200 WHRI (Angel 1/2): UPI News. See S 0400.
1205 WHRI (Angel 1): The Pat Boone Show. See S 0404.
1207 WHRI (Angel 2): For the People (repeat). See A 1106.
1215 USA, WWCR #1: Bible Prophecy for Today. Tom Benvenutti analyzes the news and its application to Bible prophecy.
1230 USA, KWHR Naalehu HI: Day of Decision. Bob Roman evangelizes from Texas.
1230 USA, WWCR #1: Battle Cry Sounding. See F 1245.

Frequencies

1300-1400	Anguilla,Caribbean Beacon	11775am			
1300-1400	Australia, Radio	9580pa	9770pa	11800pa	
1300-1330	Australia, Radio	13605as			
1300-1400 vl	Australia, VL8A Alice Spg	2310do			
1300-1400 vl	Australia, VL8K Katherine	2485do			
1300-1400 vl	Australia, VI8T Tent Crk	2325do			
1300-1325 mtwhfa	Belgium, R Vlaanderen Int	13785as	15535as		
1300-1320	Brazil, Radio Bras	15445na			
1300-1400 vl	Canada, CBC N Quebec Svc	9625do			
1300-1400	Canada, CFCX Montreal	6005do			
1300-1400	Canada, CFRX Toronto	6070do			
1300-1400	Canada, CFVP Calgary	6030do			
1300-1400	Canada, CHNX Halifax	6130do			
1300-1400	Canada, CKZN St John's	6160do			
1300-1400	Canada, CKZU Vancouver	6160do			
1300-1400 mtwhf	Canada, R Canada Intl	9640am	11855am	13650am	
1300-1400 s	Canada, R Canada Intl	11855am	13650am		
1300-1400	China, China Radio Intl	7385na	7410as	9715as	11660pa
1300-1400	Costa Rica,RF Peace Intl	6205am	7385am		
1300-1330	Czech Rep, Radio Prague	13580eu	17485af		
1300-1400	Ecuador, HCJB	12005am	15115am	21455am	
1300-1330	Egypt, Radio Cairo	17595as			
1300-1400 as	Eqt Guinea, R East Africa	15186af			
1300-1400	Eqt Guinea, Radio Africa	9530as			
1300-1330 vl	Italy, IRRS	7125va			
1300-1400	Jordan, Radio	11690eu			
1300-1310	Liberia,LCN/R Liberia Int	5100do			
1300-1400	Malaysia, Radio	7295do			
1300-1400 vl	Malaysia, RTM Kuching	7160do			
1300-1400 vl	Malaysia,RTM KotaKinabalu	5980do			
1300-1400 occsnal	New Zealand, R NZ Intl	6070pa			
1300-1350	North Korea, R Pyongyang	9345as	9640eu	11740as	15230as
1300-1400 vl	Papua New Guinea, NBC	4890do			
1300-1400	Philippines, FEBC/R Intl	11995as			
1300-1356	Romania, R Romania Intl	9690eu	11885eu	15365eu	17720eu
1300-1400	Russia,Voice of Russia WS	15430as	15460as	15560as	17610as
		17795as			
1300-1400	S Africa, Investment Ch	15165af	17665af	21745af	
1300-1400	Singapore,R Singapore Int	6105as	6155as		
1300-1400 mtwhf	Sri Lanka, Sri Lanka BC	9730as			
1300-1330	Switzerland, Swiss R Intl	7230as	7480as	13635as	15120as
1300-1330	Turkey, Voice of	13695eu	13750va	15290as	
1300-1400	United Kingdom, BBC WS	5990as	6190af	6195va	9410eu
		9515am	9740va	11750as	11760as
		11865am	11940af	12095eu	15220am
		15310as	15420af	15485va	15565as
		15575va	17640va	17705af	17830af
		17885af	21470af	21660af	
1300-1400	USA, KAIJ Dallas TX	13815am			
1300-1400	USA, KNLS Anchor Point AK	7365as			
1300-1400	USA, KTBN Salt Lk City UT	7510am			
1300-1400	USA, KWHR Naalehu HI	9930as			
1300-1400	USA, Monitor Radio Intl	6095na	9355as	9455am	13840as
1300-1330	USA, Voice of America	6160as	9645as	9760as	11715as
		15160as	15425as		
1300-1400	USA, WEWN Birmingham AL	7425na	11875na	15375sa	15745eu
1300-1400	USA, WGTG McCaysville GA	9400am			
1300-1400	USA, WHRI Noblesville IN	6040am	15105am		
1300-1400	USA, WJCR Upton KY	7490na			
1300-1400 mtwhf	USA, WRMI/R Miami Intl	9955am			
1300-1400	USA, WRNO New Orleans LA	7355am			
1300-1400 as	USA, WVHA Greenbush ME	15745na			
1300-1400	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1300-1400	USA, WYFR Okeechobee FL	5950na	11830na	17760eu	
1300-1400	Zambia, Christian Voice	6065af			
1300-1400 vl	Zambia, R Zambia/ZNBC 1	7220do			
1330-1400	Canada, R Canada Intl	9535as	11795as	11935eu	15325me
		17820af			
1330-1400	China, Heilongjiang PBS	4840do			
1330-1400	Guam, AWR/KSDA	9650as			
1330-1400	India, All India Radio	9545as	11620as	13710as	
1330-1400 vl	Italy, IRRS	3985va			
1330-1400	Netherlands, Radio	9890as	12090as	15585as	
1330-1400	Sweden, Radio	11650na	13740pa	15240na	
1330-1355	UAE, Radio Dubai	15395eu	17630eu	21605me	
1330-1400	Uzbekistan, R Tashkent	7285as	9715as	15295as	
1330-1400	Vietnam, Voice of	5940eu	7270eu	7400eu	9840as
		12020eu	15010as		
1335-1345	Greece, Voice of	9375eu	15175na	15630na	
1345-1400	Vatican State, Vatican R	11625as	13765au		
1350-1400	South Korea, KBS-1	3930do			

Selected Programs

Sundays

1300 USA, KWHR Naalehu HI: Christ Gospel Broadcast. BR Hicks with a Bible lesson.
1300 USA, WWCR #1 Nashville TN: Wings of Healing. Evelyn Wyatt directs this international broadcast from Los Angeles.
1300 USA, WWCR #3 Nashville TN: Answers for Life. Gospel music and a sermon by Pastor Hoover of Wichita, Kansas.
1300 WHRI (Angel 1/2): Gospel Crusade Ministries. Scripture teachings by Roger Headrick and free bible correspondence courses.
1330 India, All India Radio: News and Commentary.
1330 USA, KWHR Naalehu HI: The Call to Worship. Bernie Timmerman with services from Zion Chapel, Holland, Michigan.
1330 USA, WWCR #1 Nashville TN: Wayne Avenue Church of God. J.C. Wilber preaches from Columbus, Ohio.
1330 WHRI (Angel 1): Beginning of the End. George Washington.
1330 WHRI (Angel 2): The Banner of Truth Broadcast. See S 0630.
1345 India, All India Radio: Program Preview.
1345 WHRI (Angel 2): Bible Pathway. Rick Hash with five minutes of Bible readings.
1346 India, All India Radio: Musical Interlude.

Mondays

1300 USA, WWCR #1 Nashville TN: Powerline. Southern Baptists.
1300 USA, WWCR #3 Nashville TN: The Overcomer Broadcast (live). Brother R. G. Stair preaches about the last days.
1300 WHRI (Angel 1/2): UPI News. See S 0400.
1305 WHRI (Angel 1/2): Music. See S 0200.
1330 India, All India Radio: News and Commentary.
1330 USA, WWCR #1 Nashville TN: Pro Life Perspective. Anti-abortion message from the National Right-to-Life Committee.
1335 USA, WWCR #1 Nashville TN: The Bright Spot Hour. Music and meditation by Harold Sightler of Greenville, South Carolina.
1345 India, All India Radio: Program Preview.

Tuesdays

1300 USA, WWCR #1 Nashville TN: MasterControl. A magazine program of current topics, lifestyle issues, and Christian themes.
1300 USA, WWCR #3 Nashville TN: The Overcomer Broadcast (live). See M 1300.
1300 WHRI (Angel 1/2): UPI News. See S 0400.
1305 WHRI (Angel 1/2): Music. See S 0200.
1330 India, All India Radio: News and Commentary.
1330 USA, WWCR #1 Nashville TN: Pro Life Perspective. See M 1330.
1335 USA, WWCR #1 Nashville TN: The Bright Spot Hour. See M 1335.
1345 India, All India Radio: Program Preview.

Wednesdays

1300 USA, WWCR #1 Nashville TN: Country Crossroads. Country Crossroads provides you with 30-minutes to kick back, relax, and enjoy the finest in country music entertainment.
1300 USA, WWCR #3 Nashville TN: The Overcomer Broadcast (live). See M 1300.
1300 WHRI (Angel 1/2): UPI News. See S 0400.
1305 WHRI (Angel 1/2): Music. See S 0200.
1330 India, All India Radio: News and Commentary.
1330 USA, WWCR #1 Nashville TN: Pro Life Perspective. See M 1330.
1335 USA, WWCR #1 Nashville TN: The Bright Spot Hour. See M 1335.
1345 India, All India Radio: Program Preview.
1346 India, All India Radio: Indian Music.
1354 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (4th). See W 1254.
1354 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (11th/18th/25th). See A 2354.

Thursdays

1300 USA, WWCR #1 Nashville TN: On Track. Good comtemporary music and helpful thoughts.
1300 USA, WWCR #3 Nashville TN: The Overcomer Broadcast (live). See M 1300.
1300 WHRI (Angel 1/2): UPI News. See S 0400.
1305 WHRI (Angel 1/2): Music. See S 0200.
1330 India, All India Radio: News and Commentary.
1330 USA, WWCR #1 Nashville TN: Pro Life Perspective. See M 1330.
1335 USA, WWCR #1: The Bright Spot Hour. See M 1335.
1345 India, All India Radio: Program Preview.
1346 India, All India Radio: Listeners' Choice.

Fridays

1300 USA, WWCR #1 Nashville TN: The Baptist Hour. A half-hour of sermon and song from Fort Worth, Texas.
1300 USA, WWCR #3 Nashville TN: The Overcomer Broadcast (live). See M 1300.
1300 WHRI (Angel 1/2): UPI News. See S 0400.
1305 WHRI (Angel 1/2): Music. See S 0200.
1330 India, All India Radio: News and Commentary.
1330 USA, WWCR #1 Nashville TN: Pro Life Perspective. See M 1330.
1335 USA, WWCR #1 Nashville TN: The Bright Spot Hour. See M 1335.
1345 India, All India Radio: Program Preview.
1346 India, All India Radio: Indian Music.

Saturdays

1300 USA, KWHR Naalehu HI: Spirit of Truth. Don Young offers words of encouragement and joy.
1300 USA, WWCR #1 Nashville TN: World of Radio. See S 2330.
1300 USA, WWCR #3 Nashville TN: Hour of Truth. William Bonner preaches from New York City.
1300 WHRI (Angel 1): Listen to Jesus. See M 0630.
1315 USA, KWHR Naalehu HI: Grace and Truth Gospel Hour. Bill Jones.
1330 India, All India Radio: News and Commentary.
1330 USA, KWHR Naalehu HI: Christ Gospel Broadcast. See S 1300.
1330 USA, WWCR #1 Nashville TN: Hour of Reasoning. P. Mobley preaches to his congregation in Oakland, California.
1330 WHRI (Angel 1): Eternal Good News. Germaine Lockwood teaches from the Old Testament.
1330 WHRI (Angel 2): Biblical Studies Institute. See S 0300.
1345 India, All India Radio: Program Preview.
1345 USA, KWHR Naalehu HI: The Bread of Life Broadcast. Ron Kresge preaches from the Church of God at Norwalk, Connecticut.
1345 WHRI (Angel 1): Music. See S 0200.
1346 India, All India Radio: UN News Magazine.

Frequencies

1400-1500	Anguilla,Caribbean Beacon	11775am			
1400-1500	Australia, Radio	5995pa	9860pa	11800pa	
1400-1430	Australia, Radio	9770pa			
1400-1500 vl	Australia, VL8A Alice Spg	2310do			
1400-1500 vl	Australia, VL8K Katherine	2485do			
1400-1500 vl	Australia, VI8T Tent Crk	2325do			
1400-1500 vl	Canada, CBC N Quebec Svc	9625do			
1400-1500	Canada, CFCX Montreal	6005do			
1400-1500	Canada, CFRX Toronto	6070do			
1400-1500	Canada, CFVP Calgary	6030do			
1400-1500	Canada, CHNX Halifax	6130do			
1400-1500	Canada, CKZN St John's	6160do			
1400-1500	Canada, CKZU Vancouver	6160do			
1400-1500 s	Canada, R Canada Intl	11855am	13650am		
1400-1500	China, China Radio Intl	7405na	9535as	9785as	
1400-1500	Costa Rica,RF Peace Intl	6205am	7385am		
1400-1500	Ecuador. HCJB	12005am	15115am	21455am	
1400-1500 as	Eqt Guinea, R East Africa	15186af			
1400-1500	France, Radio France Intl	7110as	12030af	17560me	
1400-1500	India, All India Radio	9545as	11620as	13710as	
1400-1430	Israel, Kol Israel	12080na	15650na		
1400-1500 vl	Italy, IRRS	3985va			
1400-1500	Japan, R Japan/NHK World	7200eu			
1400-1500	Jordan, Radio	11690eu			
1400-1500	Malaysia, Radio	7295do			
1400-1500 vl	Malaysia, RTM Kuching	7160do			
1400-1500 vl	Malaysia,RTM KotaKinabalu	5980do			
1400-1430	Mexico, Radio Mexico Intl	9705na			
1400-1500	Netherlands, Radio	9890as	12090as	15585as	
1400-1500 occsnal	New Zealand, R NZ Intl	6070pa			
1400-1410	Pakistan, Radio	9645as	9900as	11570me	
1400-1500 vl	Papua New Guinea, NBC	4890do			
1400-1500	Philippines, FEBC/R Intl	11995as			
1400-1500	Russia,Voice of Russia WS	4740me	4940me	4975me	7345as
		9595me	11665me	11835me	11985me
		15350me	15430me	15540me	
1400-1500	S Africa, Investment Ch	11900af	15165af	17665af	21745af
1400-1500	Singapore,R Corp of Sing	6155do			
1400-1500	Sri Lanka, Sri Lanka BC	9730as			
1400-1430	Thailand, Radio	9655as	9830as	11905as	
1400-1500	United Kingdom, BBC WS	5990as	6190af	6195as	9410eu
		9515am	9740as	11750as	11865am
		11940af	12095eu	15220am	15485va
		15565as	15575va	17640va	17830af
		17840am	21470af	21660af	
1400-1500	USA, KAIJ Dallas TX	13815am			
1400-1500	USA, KJES Mesquite NM	11715na			
1400-1500	USA, KTBN Salt Lk City UT	7510am			
1400-1500	USA, Monitor Radio Intl	9355as			
1400-1500	USA, Voice of America	6160as	7125as	7215as	9645as
		9760as	15160as	15225va	15395as
		15425as			
1400-1500	USA, WEWN Birmingham AL	9455na	11875na	15375eu	15745eu
1400-1500	USA, WGTG McCaysville GA	9400am			
1400-1500	USA, WHRI Noblesville IN	13760am	15105am		
1400-1500	USA, WJCR Upton KY	7490na			
1400-1500	USA, WRMI/R Miami Intl	9955am			
1400-1500	USA, WRNO New Orleans LA	7355am			
1400-1500 as	USA, WVHA Greenbush ME	15745na			
1400-1500	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1400-1500	USA, WYFR Okeechobee FL	11550sa	11830na	17750ca	
1400-1405	Vatican State, Vatican R	11625as	13765au		
1400-1500	Zambia, Christian Voice	6065af			
1400-1500 vl	Zambia, R Zambia/ZNBC 1	4910do			
1415-1430 vl	Cyprus, BRT International	6150do			
1415-1427	Nepal, Radio	5005do			
1420-1500 as	Palau, KHBN/Voice of Hope	9985as			
1430-1500	Australia, Radio	5995pa	6060pa	6080pa	9580pa
		9615as	9850pa	9860pa	11660as
1430-1500 vl	China, China Radio Intl	6995as	8660as	9880as	11445as
1430-1440	India, All India Radio	3945do	6185do	9565do	9685do
1430-1440 mtwhf	Indonesia, RRI Uj Pandang	4753do			
1430-1500 mtwhf	Portugal, R Portugal Intl	21515as			
1430-1500	Romania, R Romania Intl	15335as	17720as		
1430-1500 vl	Zambia, R Zambia/ZNBC 2	6165do			
1440-1500	Myanmar, Voice of	5990do			

Selected Programs

Sundays

1400 India, All India Radio: Feature Program.
1400 USA, WWCR #1 Nashville TN: Foursquare Gospel Tidings. J.E. Cartier presents a half-hour of gospel music and meditation.
1400 USA, WWCR #3 Nashville TN: Church of the Harvest. Clarence McClendon preaches from Los Angeles.
1400 WHRI (Angel 1/2): Christian Center Church (live). Steve Sumrall preaches from Christian Center of Praise in Noblesville, Indiana.
1420 India, All India Radio: Press Review.
1430 USA, WWCR #1 Nashville TN: A Temple of Jesus Christ. Cleveland Waters preaches from Philadelphia.
1445 India, All India Radio: News.
1453 India, All India Radio: Program Preview.

Mondays

1400 India, All India Radio: Radio Newsreel.
1400 USA, WWCR #1 Nashville TN: The Nice Jewish Boy. Jonathan Cahn.
1400 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1400 WHRI (Angel 1/2): World Harvest (live). An hour of Christian music and information for WHRI supporters.
1402 USA, WWCR #1 Nashville TN: The Grace Hour (live). Carl Stevens of Baltimore answers listener questions about religion.
1405 USA, WWCR #3 Nashville TN: Prescription for Health (live). A program about natural health foods and diet supplements.
1420 India, All India Radio: Press Review.
1435 India, All India Radio: DX-ers Corner (2/4).
1445 India, All India Radio: News.
1453 India, All India Radio: Program Preview.

Tuesdays

1400 USA, WWCR #1 Nashville TN: The Nice Jewish Boy. See M 1400.
1400 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1400 WHRI (Angel 1/2): World Harvest (live). See M 1400.
1402 USA, WWCR #1 Nashville TN: The Grace Hour (live). See M 1402.
1405 USA, WWCR #3 Nashville TN: Prescription for Health (live). See M 1405.
1420 India, All India Radio: Press Review.
1445 India, All India Radio: News.
1453 India, All India Radio: Program Preview.

Wednesdays

1400 India, All India Radio: Radio Newsreel.
1400 USA, WWCR #1 Nashville TN: The Nice Jewish Boy. See M 1400.
1400 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1400 WHRI (Angel 1/2): World Harvest (live). See M 1400.
1402 USA, WWCR #1 Nashville TN: The Grace Hour (live). See M 1402.
1405 USA, WWCR #3 Nashville TN: Prescription for Health (live). See M 1405.
1420 India, All India Radio: Press Review.
1445 India, All India Radio: News.
1453 India, All India Radio: Program Preview.

Thursdays

1400 USA, WWCR #1 Nashville TN: The Nice Jewish Boy. See M 1400.
1400 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1400 WHRI (Angel 1/2): World Harvest (live). See M 1400.
1402 USA, WWCR #1 Nashville TN: The Grace Hour (live). See M 1402.
1405 USA, WWCR #3 Nashville TN: Prescription for Health (live). See M 1405.
1420 India, All India Radio: Press Review.
1445 India, All India Radio: News.
1453 India, All India Radio: Program Preview.

Fridays

1400 India, All India Radio: Radio Newsreel.
1400 USA, WWCR #1 Nashville TN: The Nice Jewish Boy. See M 1400.
1400 USA, WWCR #3 Nashville TN: USA Radio News. See S 0400.
1400 WHRI (Angel 1/2): World Harvest (live). See M 1400.
1402 USA, WWCR #1 Nashville TN: The Grace Hour (live). See M 1402.
1405 USA, WWCR #3 Nashville TN: Prescription for Health (live). See M 1405.
1420 India, All India Radio: Press Review.
1445 India, All India Radio: News.
1453 India, All India Radio: Program Preview.
1454 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (6th). See W 1254.
1454 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (13th/20th/27th). See A 2354.

Saturdays

1400 India, All India Radio: Feature.
1400 USA, WWCR #1 Nashville TN: Divine Temple Church. Robert Suell preaches.
1400 USA, WWCR #3 Nashville TN: The Great American Polka Show. An hour of polka favorites both old and new.
1400 WHRI (Angel 1): UPI News. See S 0400.
1400 WHRI (Angel 2): Bible Pathway. See S 1345.
1405 WHRI (Angel 1): Home Schooling (live). Terry and Vicki Brady of the Home Education network take calls about schooling.
1405 WHRI (Angel 2): The People's Lawyer. Legal advice for the average citizen as well as employers.
1415 WHRI (Angel 2): The Banner of Truth Broadcast. See S 0630.
1420 India, All India Radio: Press Review.
1430 WHRI (Angel 2): DXing with Cumbre. See S 0330.
1445 India, All India Radio: News.
1453 India, All India Radio: Program Preview.

Frequencies

1500-1600	Anguilla,Caribbean Beacon	11775am			
1500-1600	Australia, Radio	6060pa	6080pa	9615as	9850pa
		11660as	11800pa	12080pa	
1500-1600 vl	Australia, VL8A Alice Spg	2310do			
1500-1600 vl	Australia, VL8K Katherine	2485do			
1500-1600 vl	Australia, VL8T Tent Crk	2325do			
1500-1600 vl	Canada, CBC N Quebec Svc	9625do			
1500-1600	Canada, CFCX Montreal	6005do			
1500-1600	Canada, CFRX Toronto	6070do			
1500-1600	Canada, CFVP Calgary	6030do			
1500-1600	Canada, CHNX Halifax	6130do			
1500-1600	Canada, CKZN St John's	6160do			
1500-1600	Canada, CKZU Vancouver	6160do			
1500-1600 s	Canada, R Canada Intl	11855am	13650am		
1500-1600	China, China Radio Intl	7405na	9535as	9785as	
1500-1600	Costa Rica,RF Peace Intl	6205am	7385am		
1500-1600	Ecuador, HCJB	12005am	15115am	21455am	
1500-1600 as	Eqt Guinea, R East Africa	15186af			
1500-1600	Guam, TWR/KTWR	11580as			
1500-1600 a	Ireland,W Coast R Ireland	6175eu			
1500-1600 vl	Italy, IRRS	3985va			
1500-1600	Japan, R Japan/NHK World	7200af	7240af	9535na	9750as
		11730af	15355af		
1500-1600	Jordan, Radio	11690eu			
1500-1510	Liberia,LCN/R Liberia Int	5100do			
1500-1600	Malaysia, Radio	7295do			
1500-1600 vl	Malaysia, RTM Kuching	7160do			
1500-1600 vl	Malaysia,RTM KotaKinabalu	5980do			
1500-1530	Mexico, Radio Mexico Intl	9705na			
1500-1530	Mongolia, Voice of	9720as	12085au		
1500-1515 s	Myanmar, Voice of	5990do			
1500-1525	Netherlands, Radio	9890as	12090as	15585as	
1500-1600 occsnal	New Zealand, R NZ Intl	6070pa			
1500-1550	North Korea, R Pyongyang	9325eu	9640eu	9975na	13785me
1500-1530 s	Norway, Radio Norway Intl	9980as	11840as		
1500-1530 as	Palau, KHBN/Voice of Hope	9985as			
1500-1600 vl	Papua New Guinea, NBC	4890do			
1500-1600	Philippines, FEBC/R Intl	11995as			
1500-1526	Romania, R Romania Intl	15335as	17720as		
1500-1600	Russia,Voice of Russia WS	4740va	4940va	4975va	7325va
		7345as	9730va	11775va	11945va
		12025va	12035va	15350va	15430va
		15460va			
1500-1600	S Africa, Investment Ch	11870af	15165af	17665af	
1500-1600 mtwhfa	Seychelles, FEBA Radio	9810as			
1500-1545 sm	Seychelles, FEBA Radio	11600as			
1500-1600 mtwhfa	Seychelles, FEBA Radio	9810as			
1500-1530 mt fa	Seychelles, FEBA Radio	11870as			
1500-1600	Singapore,R Corp of Sing	6155do			
1500-1600	United Kingdom, BBC WS	5975as	5990as	6190af	6195as
		9410eu	9515am	9740as	11750as
		11865am	11940af	12095as	15220am
		15400af	15485af	15565va	15575va
		17705af	17830af	17840am	21470af
		21660af			
1500-1530	United Kingdom, BBC WS	11860af	15420af	17880af	21490af
1500-1600	USA, KAIJ Dallas TX	13815am			
1500-1600	USA, KTBN Salt Lk City UT	15590am			
1500-1600	USA, KWHR Naalehu HI	9930as			
1500-1600	USA, Monitor Radio Intl	9355as			
1500-1600	USA, Voice of America	6160as	7125as	7215as	9645as
		9700me	9760as	15205as	15255va
		15395as			
1500-1600	USA, WEWN Birmingham AL	15375na	15745na		
1500-1600	USA, WGTG McCaysville GA	9400am			
1500-1600	USA, WHRI Noblesville IN	13760am	15105am		
1500-1600	USA, WJCR Upton KY	7490na			
1500-1600 mtwhf	USA, WRMI/R Miami Intl	9955am			
1500-1600	USA, WRNO New Orleans LA	7355am			
1500-1600 as	USA, WVHA Greenbush ME	15745va			
1500-1600	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1500-1600	USA, WYFR Okeechobee FL	11830na	15215na	15695eu	17555eu
		17750ca	17760eu	21525af	
1500-1600	Zambia, Christian Voice	6065af			
1500-1600 vl	Zambia, R Zambia/ZNBC 1	4910do			
1500-1600 vl	Zambia, R Zambia/ZNBC 2	6165do			
1515-1530 mtwhf	Estonia, Radio	5925eu			
1530-1545	India, All India Radio	3945do	6185do	7140do	7410do
		9530do	9565do	9685do	9700do
		9910do	11740do		
1530-1600	Iran, VOIRI	7215as	9550as		
1530-1600 mtwhf	Sri Lanka, Sri Lanka BC	9730as			
1545-1600 sh	Bangladesh, Bangla Betar	4880do			
1545-1600	Israel, Kol Israel	12080va	15650va		
1545-1600	Pakistan, Radio	9425as	9515as	11570af	11955af
		13590af	15555af		
1550-1600	Vatican State, Vatican R	9940as	11635as		

Selected Programs

Sundays

1500 USA, KWHR Naalehu HI: Christian Center Church (live). Steve Sumrall preaches from Christian Center of Praise in Noblesville, Indiana.
1500 USA, WWCR #1 Nashville TN: Prophetic Word Program. A message of salvation from Dan Kubish of the House of Yaweh.
1500 USA, WWCR #3 Nashville TN: The Whole Truth. Anthonee Patterson conducts services from Pennsylvania.
1500 WHRI (Angel 1/2): Message to Israel. A program for Jewish listeners from Brooklyn, NY.
1515 WHRI (Angel 1/2): The Bread of Life Broadcast. Ron Kresge preaches from the Church of God at Norwalk, Connecticut.
1530 India, All India Radio: National News.
1530 USA, WWCR #1 Nashville TN: Cross Roads Baptist Church. Lloyd Ferguson preaches from Lawrenceville, Georgia
1530 WHRI (Angel 1): Call to Christ. Jimmy Surgeoner.
1530 WHRI (Angel 2): Sandra Davis Ministries. Sandra Davis evangelizes from Massachusetts.
1545 WHRI (Angel 1): Music. See S 0200.

Mondays

1500 USA, KWHR Naalehu HI: Reach Out. Pastor Jerry Lynn, Calvary Chapel of Albany, New York with Bible teaching.
1500 USA, WWCR #1/3: USA Radio News. See S 0400.
1500 WHRI (Angel 1): Bible Pathway. See S 1345.
1500 WHRI (Angel 2): UPI News. See S 0400.
1505 USA, WWCR #1 Nashville TN: Messianic Minutes. Ted Simon presents five minutes of scriptural interpretation for Jewish listeners.
1505 WHRI (Angel 1): Inside Pitch. See M 0555.
1505 WHRI (Angel 2): Bible Pathway. See S 1345.
1506 USA, WWCR #3: Freedom's Call (live). See M 0605.
1510 USA, WWCR #1 Nashville TN: Spiritual Awakening. Wisdom from the scriptures.
1510 WHRI (Angel 1): Music. See S 0200.
1510 WHRI (Angel 2): The Voice of Salvation. William Wilson of the Church of God of Prophecy presents music and inspiration.
1515 USA, KWHR Naalehu HI: Life in the Word. Joyce Meyer offers help by example for everyday living.
1515 USA, WWCR #1 Nashville TN: The Living Waters Broadcast. Father Bob Guste evangelizes from Louisiana.
1515 WHRI (Angel 2): Ever Increasing Faith. See M 1100.
1530 India, All India Radio: National News.
1530 USA, WWCR #1 Nashville TN: The Time of Deliverance. Benjamin Smith preaches from the Time of Deliverance Evangelistic Church in Philadelphia.
1530 WHRI (Angel 2): The Voice of Power. See S 0630.
1545 USA, WWCR #1 Nashville TN: Wisdom from the Word. From the New Covenant Church in Philadelphia.

Tuesdays

1500 USA, WWCR #1/3: USA Radio News. See S 0400.
1500 WHRI (Angel 2): UPI News. See S 0400.
1506 USA, WWCR #3: Freedom's Call (live). See M 0605.
1510 WHRI (Angel 1): Music. See S 0200.
1530 India, All India Radio: National News.

Wednesdays

1500 USA, WWCR #1/3: USA Radio News. See S 0400.
1500 WHRI (Angel 2): UPI News. See S 0400.
1506 USA, WWCR #3: Freedom's Call (live). See M 0605.
1510 WHRI (Angel 1): Music. See S 0200.
1530 India, All India Radio: National News.
1554 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (4th). See W 1254.
1554 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (11th/18th/25th). See A 2354.

Thursdays

1500 USA, KWHR Naalehu HI: Reach Out. See M 1500.
1500 USA, WWCR #1/3: USA Radio News. See S 0400.
1500 WHRI (Angel 2): UPI News. See S 0400.
1505 USA, WWCR #1: Messianic Minutes. See M 1505.
1506 USA, WWCR #3: Freedom's Call (live). See M 0605.
1510 WHRI (Angel 1): Music. See S 0200.
1530 India, All India Radio: National News.
1545 WHRI (Angel 2): Reach Out. See M 1215.

Fridays

1500 USA, KWHR Naalehu HI: Reach Out. See M 1500.
1500 USA, WWCR #1/3: USA Radio News. See S 0400.
1500 WHRI (Angel 2): UPI News. See S 0400.
1505 USA, WWCR #1: Messianic Minutes. See M 1505.
1506 USA, WWCR #3: Freedom's Call (live). See M 0605.
1510 WHRI (Angel 1): Music. See S 0200.
1515 USA, KWHR Naalehu HI: Life in the Word. See M 1515.
1530 India, All India Radio: National News.
1530 USA, WWCR #1: The Time of Deliverance. See M 1530.
1545 WHRI (Angel 2): Reach Out. See M 1215.

Saturdays

1500 USA, WWCR #1 Nashville TN: Let the Bible Speak. James Hickey with a program from New Testament Christianity in Oklahoma.
1500 USA, WWCR #3 Nashville TN: The Real World. Evangelizing from Ohio.
1500 WHRI (Angel 1): UPI News. See S 0400.
1500 WHRI (Angel 2): The Message of Love and Victory. Jan Graybill of Tulsa, Oklahoma with music and a Bible lesson.
1505 WHRI (Angel 1): Music. See S 0200.
1515 USA, WWCR #1 Nashville TN: Eternal Good News. Germaine Lockwood teaches from the Old Testament.
1530 India, All India Radio: National News.
1530 USA, KWHR Naalehu HI: Rhema Radio Church. Kenneth Hagin, Jr. preaches from Tulsa, Oklahoma.
1530 USA, WWCR #1 Nashville TN: The Showers of Blessings Broadcast. Ed McAbee sermonizes before a live congregation.
1530 USA, WWCR #3 Nashville TN: Reasoning from Scripture. Jamey Tucker preaches from Swainsboro, Georia.
1530 WHRI (Angel 2): Bible Enrichment. Beverly Crawford.

FREQUENCIES

1600-1700	Algeria, R Algiers Intl	11715af	15160me		
1600-1700	Anguilla,Caribbean Beacon	11775am			
1600-1700	Australia, Radio	5995pa	6060pa	6080pa	9580pa
		9615pa	9850pa	9860pa	11660pa
		11800pa	12080pa		
1600-1700 vl	Australia, VL8A Alice Spg	2310do			
1600-1700 vl	Australia, VL8K Katherine	2485do			
1600-1700 vl	Australia, VL8T Tent Crk	2325do			
1600-1610	Bangladesh, Bangla Betar	4880do	15520do		
1600-1700 vl	Canada, CBC N Quebec Svc	9625do			
1600-1700	Canada, CFCX Montreal	6005do			
1600-1700	Canada, CFRX Toronto	6070do			
1600-1700	Canada, CFVP Calgary	6030do			
1600-1700	Canada, CHNX Halifax	6130do			
1600-1700	Canada, CKZN St John's	6160do			
1600-1700	Canada, CKZU Vancouver	6160do			
1600-1700	China, China Radio Intl	15110af	15130af		
1600-1627	Czech Rep, Radio Prague	5930eu	17485af		
1600-1700	Ethiopia, Radio	7165af	9560af	11800af	
1600-1700	France, Radio France Intl	6175eu	9485af	11615me	11700af
		12015af	15210af	15460af	15530af
1600-1650	Germany, Deutsche Welle	6170as	7185af	7225as	9735af
		9875as	11810af	13690as	17800af
1600-1700	Guam, AWR/KSDA	7400as			
1600-1700	Guam, TWR/KTWR	11580as			
1600-1630	Iran, VOIRI	7215as	9550as		
1600-1700 vl	Italy, IRRS	3985va			
1600-1630	Jordan, Radio	11690eu			
1600-1610	Lesotho, Radio Lesotho	4800do			
1600-1700	Malaysia, Radio	7295do			
1600-1650 occsnal	New Zealand, R NZ Intl	6070pa			
1600-1630	Pakistan, Radio	4790as	5027as	7211as	9485as
		11565as	15555af		
1600-1700 vl	Papua New Guinea, NBC	4890do			
1600-1700	Russia,Voice of Russia WS	7345as	7440eu	9440af	9595af
		9615af	9635af	9675eu	9730af
		9765af	9775eu	9880af	9975af
		11665me	11675af	11685me	11725me
		11775va	11835va	11850va	11945va
		11985va	12025va	15350va	15400eu
		15430eu	15540va	17875va	
1600-1630	S Africa, Channel Africa	6120af	9685af		
1600-1700	S Africa, Investment Ch	3230af	5955af	9455af	11870af
		15170af	17665af		
1600-1700	Singapore,R Corp of Sing	6155do			
1600-1700	Slovakia, Adv World Radio	13590as			
1600-1700	South Korea, R Korea Intl	5975eu	9515af	9870af	
1600-1700	Swaziland, Trans World R	9500af			
1600-1630	Switzerland, Swiss R Intl	12075as	13635as	15530as	
1600-1640	UAE, Radio Dubai	15395me	17630eu		
1600-1700	United Kingdom, BBC WS	3255af	3915as	5975as	6190af
		7160as	9410eu	11750as	12095eu
		15400af	15485eu	15565me	15575va
		17830af	17840am	21470af	21660af
1600-1615	United Kingdom, BBC WS	5990as	6195as	9515am	9740as
1600-1700	USA, KAIJ Dallas TX	13815am			
1600-1700	USA, KTBN Salt Lk City UT	15590am			
1600-1700	USA, KVOH Los Angeles CA	17775na			
1600-1700	USA, KWHR Naalehu HI	9930as			
1600-1700	USA, Monitor Radio Intl	9385af	11550eu	18930af	
1600-1700	USA, Voice of America	6035af	6110as	6160as	7125as
		7215as	9645as	9700me	9760as
		13600af	13710af	15205va	15225af
		15255va	15395as	15410af	15445af
		17895af			
1600-1700	USA, WEWN Birmingham AL	11875na	13615na	15375sa	15745eu
1600-1700	USA, WGTG McCaysville GA	9400am			
1600-1700	USA, WHRI Noblesville IN	13760am	15105am		
1600-1700	USA, WJCR Upton KY	7490na			
1600-1700 smtwhf	USA, WMLK Bethel PA	9465eu			
1600-1700 mtwhf	USA, WRMI/R Miami Intl	9955am			
1600-1700	USA, WRNO New Orleans LA	7355am			
1600-1700	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1600-1700	USA, WYFR Okeechobee FL	11705na	11830na	15695eu	17750eu
		21525af			
1600-1610	Vatican State, Vatican R	9940as	11635as		
1600-1630	Vietnam, Voice of	9840af	15010af		
1600-1700	Zambia, Christian Voice	3330af	4965af		
1600-1700 vl	Zambia, R Zambia/ZNBC 1	4910do			
1600-1700 vl	Zambia, R Zambia/ZNBC 2	6165do			
1610-1615	Bangladesh, Bangla Betar	4880do			
1615-1700 as	United Kingdom, BBC WS	9515am	11860af	15420af	
1615-1630	Vatican State, Vatican R	4005eu	5882as	7250as	9645au
		11810pa			
1630-1655	Austria, R Austria Intl	6155eu	9655eu	11855me	13710as
		13730af			
1630-1657	Canada, R Canada Intl	7150as	9550as		
1630-1700	Egypt, Radio Cairo	15255af			
1630-1700	Slovakia, Adv World Radio	15620af			
1630-1700	Slovakia, R Slovakia Intl	5915eu	6055eu	7345eu	
1645-1700 irreg	Afghanistan, Radio	7200as			
1645-1700	Tajikistan,Radio Dushanbe	7245as			
1650-1700	Eqt Guinea, Radio Africa	15186af			
1650-1700 mtwhf	New Zealand, R NZ Intl	6070pa			

SELECTED PROGRAMS

Sundays

1600 USA, KWHR Naalehu HI: Music. Contemporary christian music and inspiration.
1600 USA, WWCR #1 Nashville TN: Latin Catholic Mass. Father Gommar De Pauw conducts the traditional Latin Mass.
1600 USA, WWCR #3 Nashville TN: Apostolic Assembly. Lonnie Wollard preaches from Milltown, Connecticut.
1600 WHRI (Angel 1): The Water of Life Broadcast. Doyle Davidson preaches from Plano, Texas.
1600 WHRI (Angel 2): The Treasure of Truth Broadcast. Joe Gray under the sponsorship of the United Churches of Christ.
1630 WHRI (Angel 2): Witness of Power. See S 1200.

Mondays

1600 USA, KWHR Naalehu HI: Music. See S 1600.
1600 USA, WWCR #1 Nashville TN: World Wide Country Radio (live). See M 1100.
1600 USA, WWCR #3 Nashville TN: The Intelligence Report (live). A patriot radio program with John Statmiller.
1600 WHRI (Angel 1): The Voice of Power. See S 0630.
1600 WHRI (Angel 2): Lester Sumrall Teaching Series. The head of the Christian Center Church teaches.
1615 WHRI (Angel 1): The Radio Bible Hour. See M 0600.
1630 WHRI (Angel 1): Midnight Cry. C. Parker Thomas evangelizes from Southern Pines, North Carolina.
1645 USA, WWCR #1 Nashville TN: The Living Word Broadcast. An evangelization by Bobby Hoover of Bethel Church, Mitchellville, Maryland.
1645 WHRI (Angel 1): Abundant Life. See M 1115.
1645 WHRI (Angel 2): The Radio Bible Hour. See M 0600.

Tuesdays

1600 USA, KWHR Naalehu HI: Music. See S 1600.
1600 USA, WWCR #1 Nashville TN: World Wide Country Radio (live). See M 1100.
1600 USA, WWCR #3: The Intelligence Report (live). See M 1600.
1600 WHRI (Angel 1): The Voice of Power. See S 0630.
1600 WHRI (Angel 2): Lester Sumrall Teaching Series. See M 1600.
1615 WHRI (Angel 1): The Radio Bible Hour. See M 0600.
1630 WHRI (Angel 1): Midnight Cry. See M 1630.
1645 USA, WWCR #1 Nashville TN: The Living Word Broadcast. See M 1645.
1645 WHRI (Angel 1): Abundant Life. See M 1115.
1645 WHRI (Angel 2): The Radio Bible Hour. See M 0600.

Wednesdays

1600 USA, KWHR Naalehu HI: Music. See S 1600.
1600 USA, WWCR #1 Nashville TN: World Wide Country Radio (live). See M 1100.
1600 USA, WWCR #3 Nashville TN: The Intelligence Report (live). See M 1600.
1600 WHRI (Angel 1): The Voice of Power. See S 0630.
1600 WHRI (Angel 2): Lester Sumrall Teaching Series. See M 1600.
1615 WHRI (Angel 1): The Radio Bible Hour. See M 0600.
1630 WHRI (Angel 1): Midnight Cry. See M 1630.
1645 USA, WWCR #1: The Living Word Broadcast. See M 1645.
1645 WHRI (Angel 1): Abundant Life. See M 1115.
1645 WHRI (Angel 2): The Radio Bible Hour. See M 0600.

Thursdays

1600 USA, KWHR Naalehu HI: Music. See S 1600.
1600 USA, WWCR #1 Nashville TN: World Wide Country Radio (live). See M 1100.
1600 USA, WWCR #3: The Intelligence Report (live). See M 1600.
1600 WHRI (Angel 1): The Voice of Power. See S 0630.
1600 WHRI (Angel 2): Lester Sumrall Teaching Series. See M 1600.
1615 WHRI (Angel 1): The Radio Bible Hour. See M 0600.
1630 WHRI (Angel 1): Midnight Cry. See M 1630.
1645 USA, WWCR #1: The Living Word Broadcast. See M 1645.
1645 WHRI (Angel 1): Abundant Life. See M 1115.
1645 WHRI (Angel 2): The Radio Bible Hour. See M 0600.

Fridays

1600 USA, KWHR Naalehu HI: Music. See S 1600.
1600 USA, WWCR #1 Nashville TN: World Wide Country Radio (live). See M 1100.
1600 USA, WWCR #3: The Intelligence Report (live). See M 1600.
1600 WHRI (Angel 1): The Voice of Power. See S 0630.
1600 WHRI (Angel 2): Lester Sumrall Teaching Series. See M 1600.
1615 WHRI (Angel 1): The Radio Bible Hour. See M 0600.
1630 WHRI (Angel 1): Midnight Cry. See M 1630.
1645 USA, WWCR #1 Nashville TN: The Living Word Broadcast. See M 1645.
1645 WHRI (Angel 1): Abundant Life. See M 1115.
1645 WHRI (Angel 2): The Radio Bible Hour. See M 0600.

Saturdays

1600 USA, KWHR Naalehu HI: UPI News. See T 0300.
1600 USA, WWCR #1 Nashville TN: A Brighter Day. Jane Rogowski evangelizes from Maryland.
1600 USA, WWCR #3 Nashville TN: A Glimpse of Heaven (live). Nathaniel Best.
1600 WHRI (Angel 1/2): UPI News. See S 0400.
1604 USA, KWHR Naalehu HI: Turn Your Radio On. See M 0400.
1605 WHRI (Angel 1): Music. See S 0200.
1605 WHRI (Angel 2): Lifetime Commentary. AD Sturm evangelizes from Minnesota.
1615 USA, WWCR #1 Nashville TN: End Day Prophecy Broadcast. Brother Sharpe evangelizes from Georgia.
1615 WHRI (Angel 2): Christ Gospel Broadcast. BR Hicks with a Bible lesson.
1630 USA, WWCR #1 Nashville TN: The Word of Victory. Joyce Corbitt preaches.
1630 WHRI (Angel 2): Jesus to the World Mission. A plea for funds from Germany.
1635 WHRI (Angel 2): The People's Lawyer. See A 1405.
1645 USA, WWCR #1 Nashville TN: Hope for Today. J. Otis Yoder.
1645 WHRI (Angel 2): Heartfelt Ministries. Advice from the heart.

Frequencies

1700-1800	Anguilla,Caribbean Beacon	11775am			
1700-1800	Australia, Radio	6060pa	6080pa	9580pa	9615as
		9860pa	11880pa	12080pa	
1700-1800 vl	Australia, VL8A Alice Spg	2310do			
1700-1800 vl	Australia, VL8K Katherine	2485do			
1700-1800 vl	Australia, VL8T Tent Crk	2325do			
1700-1800 vl	Canada, CBC N Quebec Svc	9625do			
1700-1800	Canada, CFCX Montreal	6005do			
1700-1800	Canada, CFRX Toronto	6070do			
1700-1800	Canada, CFVP Calgary	6030do			
1700-1800	Canada, CHNX Halifax	6130do			
1700-1800	Canada, CKZN St John's	6160do			
1700-1800	Canada, CKZU Vancouver	6160do			
1700-1800	China, China Radio Intl	5220af	7150af	7405af	
1700-1730	China, China Radio Intl	6965af	7335af		
1700-1800 as	Costa Rica, Adv World R	13750am			
1700-1727	Czech Rep, Radio Prague	5930eu	15640af		
1700-1800	Egypt, Radio Cairo	15255af			
1700-1800	Eqt Guinea, Radio Africa	15186af			
1700-1730	France, Radio France Intl	9485af	11615af	12015me	
1700-1800	Japan, R Japan/NHK World	6035na	7110na	7200na	7225na
		9535na	9835na	11730as	11880as
1700-1752 mtwhf	New Zealand, R NZ Intl	6070pa			
1700-1750	North Korea, R Pyongyang	9325eu	9640af	9975af	13785me
1700-1800 vl	Papua New Guinea, NBC	4890do			
1700-1755	Poland, Polish R Warsaw	6000eu	6095eu	7285eu	
1700-1800	Russia,Voice of Russia WS	7440eu	9440af	9615af	9675eu
		9765eu	9775eu	9890af	9975af
		11675af	11685me	11725me	11775va
		11850va	11945va	12025va	15350va
		15400va	17525va	17875va	
1700-1730	S Africa, Channel Africa	11900af			
1700-1800	S Africa, Investment Ch	3230af	5955af	7225af	11870af
1700-1730	Spain, R Exterior Espana	9620eu			
1700-1800	United Kingdom, BBC WS	3255af	5975as	6090va	6190af
		6195eu	7160as	9410eu	9510as
		11750as	12095eu	15400af	15420af
		15485eu	15575va	17830af	17840af
1700-1745	United Kingdom, BBC WS	3915as	9630af	11860af	
1700-1800	USA, KAIJ Dallas TX	13815am			
1700-1800	USA, KTBN Salt Lk City UT	15590am			
1700-1800	USA, KWHR Naalehu HI	6120as			
1700-1800	USA, Monitor Radio Intl	9385eu	11550eu	18930af	
1700-1800	USA, Voice of America	6110as	6160as	7125as	7170as
		9645as	9700me	9760af	15255va
		15395as	15445af	17895af	
1700-1800 mtwhf	USA, Voice of America	5990as	6045as	7150as	9550as
		9770as	11870as	11870as	
1700-1800	USA, WEWN Birmingham AL	11875na	13615na	15375sa	15745eu
1700-1800	USA, WGTG McCaysville GA	9400am			
1700-1800	USA, WHRI Noblesville IN	9495am	13760am		
1700-1800	USA, WINB Red Lion PA	15715af			
1700-1800	USA, WJCR Upton KY	7490na			
1700-1800 smtwhf	USA, WMLK Bethel PA	9465eu			
1700-1800 mtwhf	USA, WRMI/R Miami Intl	9955am			
1700-1800	USA, WRNO New Orleans LA	7355am			
1700-1800 mtwhf	USA, WVHA Greenbush ME	11580af			
1700-1800	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1700-1800	USA, WYFR Okeechobee FL	15695eu	17555eu		
1700-1745	USA, WYFR Okeechobee FL	15695eu			
1700-1800	Zambia, Christian Voice	3330af	4965af		
1700-1800 vl	Zambia, R Zambia/ZNBC 1	4910do			
1700-1800 vl	Zambia, R Zambia/ZNBC 2	6165do			
1700-1800 vl	Zimbabwe, Zimbabwe BC	4828do			
1730-1800 vl	Cyprus, BRT International	6150do			
1730-1800 mtwhf	Georgia, Radio	6080eu			
1730-1800	Guam, AWR/KSDA	9370as			
1730-1800	Netherlands, Radio	6020af	7120af	11655af	
1730-1756	Romania, R Romania Intl	9550af	11940af	15340af	
1730-1800	Sweden, Radio	6065eu	13800va		
1730-1800 s	Sweden, Radio	9590eu	13800va		
1730-1759	Vatican State, Vatican R	11625af	15570af	17550af	
1745-1800	Bangladesh, Bangla Betar	7190as	9570eu	15520do	
1745-1800	India, All India Radio	7410eu	9650eu	9950af	11620af
		11935af	13770as	13780do	15075me
1745-1800	Swaziland, Trans World R	3200af			

1800 UTC

1800-1900	Anguilla,Caribbean Beacon	11775am			
1800-1900	Australia, Radio	6080as	7240pa	7330as	9580pa
		9615as	9860pa	11880pa	12080pa
1800-1900 vl	Australia, VL8A Alice Spg	2310do			
1800-1900 vl	Australia, VL8K Katherine	2485do			
1800-1900 vl	Australia, VL8T Tent Crk	2325do			
1800-1900	Bangladesh, Bangla Betar	7190eu	9570as	15520do	
1800-1825 mtwhfa	Belgium, R Vlaanderen Int	5910eu	13645af		
1800-1900	Brazil, Radio Bras	15265eu			
1800-1900	Canada, CFCX Montreal	6005do			
1800-1900	Canada, CFRX Toronto	6070do			
1800-1900	Canada, CFVP Calgary	6030do			
1800-1900	Canada, CHNX Halifax	6130do			
1800-1900	Canada, CKZN St John's	6160do			
1800-1900	Canada, CKZU Vancouver	6160do			
1800-1830	Egypt, Radio Cairo	15255af			
1800-1900	Eqt Guinea, Radio Africa	15186af			
1800-1900	Georgia, Voice of Hope	9315eu			
1800-1900	India, All India Radio	7410eu	9650eu	9950af	11620af
		11935me	13770as	13780as	15075as
1800-1900 vl	Italy, IRRS	3985va			
1800-1900	Kuwait, Radio	11990na			
1800-1900 s	Morocco, RTVM Marocaine	17815af			
1800-1900	Mozambique, Radio Maputo	3265af	4855af		
1800-1825	Netherlands, Radio	6020af	7120af	11655af	
1800-1815 mtwhf	New Zealand, R NZ Intl	6070pa			
1800-1830 s	Norway, Radio Norway Intl	7485eu	9590me	15220af	
1800-1900 vl	Papua New Guinea, NBC	4890do			
1800-1900	Russia,Voice of Russia WS	7290af	7350af	7440eu	9440af
		9775af	9785af	9880eu	9945eu
		9975eu	11675eu	11775va	15400eu
		17875eu			
1800-1900	S Africa, Investment Ch	3230af	5955af	7225af	9475af
1800-1900	Sudan, Radio Omdurman	9200af			
1800-1900	Swaziland, Trans World R	3200af			
1800-1830	Swaziland, Trans World R	9500af			
1800-1900	United Kingdom, BBC WS	3255af	6180eu	6190af	6195eu
		9410va	12095eu	15400af	15420af
		15485va	15575va	17830af	
1800-1830	United Kingdom, BBC WS	5975as	6090va	9510as	21490af
1800-1900	USA, KAIJ Dallas TX	13815am			
1800-1900	USA, KJES Mesquite NM	15385na			
1800-1900	USA, KTBN Salt Lk City UT	15590am			
1800-1900	USA, KWHR Naalehu HI	13625au			
1800-1900	USA, Monitor Radio Intl	9355eu	9385af	13770eu	18930af
1800-1900	USA, Voice of America	7415af	9760af	11975af	15410af
		15580af	17895af		
1800-1900	USA, WEWN Birmingham AL	11875na	13615na	15375sa	15745na
1800-1900	USA, WGTG McCaysville GA	9400am			
1800-1900	USA, WHRI Noblesville IN	9495am	13760eu		
1800-1900	USA, WINB Red Lion PA	15715af			
1800-1900	USA, WJCR Upton KY	7490na			
1800-1900 smtwhf	USA, WMLK Bethel PA	9465eu			
1800-1900 as	USA, WRMI/R Miami Intl	9955am			
1800-1900	USA, WRNO New Orleans LA	7355am			
1800-1900 smtwhf	USA, WVHA Greenbush ME	15715af			
1800-1900	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1800-1845	USA, WYFR Okeechobee FL	15695eu	17555eu		
1800-1827	Vietnam, Voice of	9840eu	15010eu		
1800-1900	Yemen, Yemeni Rep Radio	9780do			
1800-1900	Zambia, Christian Voice	3330af	4965af		
1800-1900 vl	Zambia, R Zambia/ZNBC 1	4910do			
1800-1900 vl	Zambia, R Zambia/ZNBC 2	6165do			
1800-1900 vl	Zimbabwe, Zimbabwe BC	4828do			
1805-1830	Malawi, MBC	5993do			
1825-1900 vl	Cyprus, BRT International	6150do			
1830-1900 t	Belarus, Radiosta Belarus	6010eu	7105eu	7205eu	7210eu
1830-1900	Georgia, Radio	11910eu			
1830-1900	Netherlands, Radio	6020af	7120af	9895af	11655af
		15315af	17605af		
1830-1900 w	Saipan, FEBC/KFBS	9465as			
1830-1900 a	Serbia, Radio Yugoslavia	6100eu	9720af		
1830-1900	Slovakia, R Slovakia Intl	5915eu	6055eu	7345eu	
1830-1835	Somalia, Radio Mogadishu	6732do			
1830-1900	Turkey, Voice of	9445eu	13695na		
1830-1900	United Kingdom, BBC WS	6005af	9630af		
1830-1900	USA, Voice of America	7170as	7330af	9860af	
1833-1900	Cote D' Ivoire, RDTV	11920do			
1840-1850	Greece, Voice of	11645af	15150af		
1845-1900	Albania, R Tirana Intl	7270eu	9570eu		
1845-1900 mtwhf	Armenia, Voice of	4810me	4990eu	7480me	
1845-1900 irreg s	Mali, RDTV Malienne	4783do	4835do	5995do	
1852-1900	New Zealand, R NZ Intl	9795pa			

Hauser's Highlights

Poland: Polish Radio Warsaw

Z-97 in English:

1200-1255	11815, 9525, 7270, 7145, 6095
1700-1755	7285, 6095, 6000
1930-2025	7285, 6095, 6035

(Wojtek Zaremba, Poland)

FREQUENCIES

1900-2000	Anguilla,Caribbean Beacon	11775am			
1900-2000 m-f/vl	Argentina, RAE	15345eu			
1900-2000	Australia, Radio	6080pa	7240pa	7330as	9580pa
		9615as	9860pa	11880pa	12080pa
1900-2000 vl	Australia, VL8A Alice Spg	2310do			
1900-2000 vl	Australia, VL8K Katherine	2485do			
1900-2000 vl	Australia, VL8T Tent Crk	2325do			
1900-1920	Brazil, Radio Bras	15265eu			
1900-2000	Bulgaria, Radio	9700eu	11720eu		
1900-2000	Canada, CFCX Montreal	6005do			
1900-2000	Canada, CFRX Toronto	6070do			
1900-2000	Canada, CFVP Calgary	6030do			
1900-2000	Canada, CHNX Halifax	6130do			
1900-2000	Canada, CKZN St John's	6160do			
1900-2000	Canada, CKZU Vancouver	6160do			
1900-2000	China, China Radio Intl	6955af	9440af		
1900-2000	Costa Rica, Adv World R	13750am	15460am		
1900-1930	Cote D' Ivoire, RDTV	11920do			
1900-2000 vl	Cyprus, BRT International	6150do			
1900-2000	Ecuador, HCJB	12015am	21455am		
1900-2000	Eqt Guinea, Radio Africa	15186af			
1900-1930 m	Estonia, Radio	5925eu			
1900-2000	Georgia, Voice of Hope	9310eu			
1900-1950	Germany, Deutsche Welle	7250af	9640af	9670af	9735af
		11785af	11810af	13790af	
1900-2000	Guatemala, Adv World R	5980am			
1900-1930	Hungary, Radio Budapest	3975eu	7155eu	9755eu	
1900-1945	India, All India Radio	7410eu	9650eu	9950me	11620eu
		11935af	13770as	13780as	15075as
1900-2000 h	Ireland,W Coast R Ireland	15625af			
1900-1925	Israel, Kol Israel	7465na	9435na	11605va	15640au
1900-2000 vl	Italy, IRRS	3985va			
1900-2000 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
1900-2000	Kuwait, Radio	11990eu			
1900-1930 as	Latvia, Radio	5935eu			
1900-1915	Liberia,LCN/R Liberia Int	5100do			
1900-1930	Mexico, Radio Mexico Intl	9705na			
1900-2000	Netherlands, Radio	6020af	7120af	9895af	11655af
		15315af	17605af		
1900-1951 smtwh	New Zealand, R NZ Intl	9795pa			
1900-1958 fa	New Zealand, R NZ Intl	9795pa			
1900-2000 vl	Papua New Guinea, NBC	4890do			
1900-2000	Romania, R Romania Intl	7105af	7195eu	9550eu	9690eu
		11810eu	11940af		
1900-2000	Russia,Voice of Russia WS	7250af	7295af	7350af	7370eu
		7440eu	9440af	9620af	9665af
		9710eu	9740af	9775af	9795eu
		9880af	9890eu	9945af	11675eu
		11765va	13670af	15400eu	17875va
1900-2000	S Africa, Investment Ch	5955af	7225af	9475af	11870af
1900-2000	South Korea, R Korea Intl	5975eu	7275as		
1900-2000	Swaziland, Trans World R	3200af			
1900-2000	Thailand, Radio	7210eu	9535eu	9655eu	11905eu
1900-1930	Turkey, Voice of	9445eu	13695na		
1900-2000	United Kingdom, BBC WS	3255af	6005af	6180eu	6190af
		6195va	9410af	9630af	9740as
		12095eu	15400af	15485va	15575va
		17830af			
1900-2000	USA, KAIJ Dallas TX	13815am			
1900-2000	USA, KTBN Salt Lk City UT	15590am			
1900-2000	USA, KWHR Naalehu HI	13625au			
1900-2000	USA, Monitor Radio Intl	9355eu	9385af	13770eu	17510af
1900-2000	USA, Voice of America	6035af	7325af	7415af	9525pa
		9760af	11870pa	11975af	15180pa
		15410af	15445af	15580af	
1900-1930 s	USA, Voice of America	4950af			
1900-2000	USA, WEWN Birmingham AL	15375sa	15745na		
1900-2000	USA, WGTG McCaysville GA	9400am			
1900-2000	USA, WHRI Noblesville IN	9495am	13760eu		
1900-2000	USA, WINB Red Lion PA	15715eu			
1900-2000	USA, WJCR Upton KY	7490na			
1900-2000 smtwhf	USA, WMLK Bethel PA	9465eu			
1900-2000	USA, WRMI/R Miami Intl	9955am			
1900-2000	USA, WRNO New Orleans LA	7355am			
1900-2000 mtwhfa	USA, WVHA Greenbush ME	15715af			
1900-2000	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1900-2000	USA, WYFR Okeechobee FL	5810eu	7355af	17555af	
1900-1927	Vietnam, Voice of	9840eu	15010eu		
1900-2000	Zambia, Christian Voice	3330af	4965af		
1900-2000 vl	Zambia, R Zambia/ZNBC 1	4910do			
1900-2000 vl	Zambia, R Zambia/ZNBC 2	6165do			
1900-2000 vl	Zimbabwe, Zimbabwe BC	4828do			
1930-2000	Georgia, Radio	11760eu			
1930-2000	Iran, VOIRI	7260af	9022eu		
1930-2000	Poland, Polish R Warsaw	6035eu	6095eu	7285eu	
1930-2000	Sweden, Radio	6065eu			
1930-2000	United Kingdom, BBC WS	11835af			
1935-1955	Italy, RAI Intl	6015eu	7230eu	9670eu	
1950-2000	Vatican State, Vatican R	4005eu	5882eu	7250eu	9645eu
1952-2000 smtwh	New Zealand, R NZ Intl	11735pa			
1959-2000 fa	New Zealand, R NZ Intl	11735pa			

2000-2100	Angola, Radio Nacional	3355do	9535do		
2000-2100	Anguilla,Caribbean Beacon	11775am			
2000-2100	Australia, Radio	6080pa	7240pa	7330as	9580pa
		9860pa	11880pa	12080pa	
2000-2100 vl	Australia, VL8A Alice Spg	2310do			
2000-2100 vl	Australia, VL8K Katherine	2485do			
2000-2100 vl	Australia, VL8T Tent Crk	2325do			
2000-2100	Canada, CFCX Montreal	6005do			
2000-2100	Canada, CFRX Toronto	6070do			
2000-2100	Canada, CFVP Calgary	6030do			
2000-2100	Canada, CHNX Halifax	6130do			
2000-2100	Canada, CKZN St John's	6160do			
2000-2100	Canada, CKZU Vancouver	6160do			
2000-2100	Canada, R Canada Intl	5995va	7235eu		
2000-2100 as	Canada, R Canada Intl	11690af	13650af	13670af	15150af
		15325af	17820af	17870af	
2000-2100	China, China Radio Intl	5220eu	6950eu	9440af	9920eu
		11715af	15110af		
2000-2100 vl	Cyprus, BRT International	6150do			
2000-2027	Czech Rep, Radio Prague	5930eu	11600au		
2000-2100	Ecuador, HCJB	11960eu	21455am		
2000-2100	Eqt Guinea, Radio Africa	15186af			
2000-2030	Finland, YLE/R Finland	6120eu	9855eu		
2000-2050	Germany, Deutsche Welle	7170eu			
2000-2030	Ghana, Ghana Broadc Corp	3366do	4915do		
2000-2010	Greece, Voice of	7430eu	9380eu		
2000-2100	Guatemala, Adv World R	5980am			
2000-2100	Indonesia, Voice of	9525as			
2000-2030	Iran, VOIRI	7260af	9022eu		
2000-2100 vl	Italy, IRRS	3955va			
2000-2100 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
2000-2100	Kuwait, Radio	11990eu			
2000-2100	Malta, VO Mediterranean	7440eu	12060eu		
2000-2030	Mexico, Radio Mexico Intl	9705na			
2000-2025	Netherlands, Radio	6020af	7120af	9895af	11655af
		15315af	17605af		
2000-2100 fa	New Zealand, R NZ Intl	11735pa			
2000-2100 smtwh	New Zealand, R NZ Intl	11735pa			
2000-2005	Nigeria, FRCN/Radio	3326do	4770do	4990do	
2000-2050	North Korea, R Pyongyang	6575eu	9345as	9640af	9975as
2000-2100 vl	Papua New Guinea, NBC	4890do			
2000-2025	Poland, Polish R Warsaw	6035eu	6095eu	7285eu	
2000-2030 mtwhf	Portugal, R Portugal Intl	6140eu	7110eu	9780eu	9815eu
2000-2100	Russia,Voice of Russia WS	7350eu	7370eu	7440eu	9620eu
		9665eu	9775eu	9880eu	11675eu
2000-2100	S Africa, Investment Ch	5965af	7225af	9475af	11870af
2000-2015	Sierra Leone, SLBS	3316do			
2000-2100	Slovakia, Adv World Radio	6055eu			
2000-2015 irreg	Somalia, Radio Mogadishu	6870af			
2000-2100 mtwhf	Spain, R Exterior Espana	6125eu	11775af		
2000-2015	Swaziland, Trans World R	3200af			
2000-2030	Switzerland, Swiss R Intl	9885af	12075af	13635af	
2000-2015	Uganda, Radio	4976do			
2000-2100	United Kingdom, BBC WS	3255af	5975as	6005af	6180eu
		6190af	6195va	9410eu	9630af
		11750am	11835af	12095eu	15400af
		15485af	15575va	17830af	
2000-2100	USA, KAIJ Dallas TX	13815am			
2000-2100	USA, KTBN Salt Lk City UT	15590am			
2000-2100	USA, KWHR Naalehu HI	11815as			
2000-2100	USA, Monitor Radio Intl	9355eu	11550eu	11860pa	
2000-2030	USA, Voice of America	4950af	6035af	7375af	7415af
		9760af	9770af	11855af	11975af
		15410af	15445af	15580af	17725af
		17755af			
2000-2100	USA, WEWN Birmingham AL	6890na	13615na	15375sa	15745na
2000-2100	USA, WGTG McCaysville GA	9400am			
2000-2100	USA, WHRI Noblesville IN	9495am	13760eu		
2000-2100	USA, WINB Red Lion PA	13790eu			
2000-2100	USA, WJCR Upton KY	7490na			
2000-2100 smtwhf	USA, WMLK Bethel PA	9465eu			
2000-2100	USA, WRMI/R Miami Intl	9955am			
2000-2100	USA, WRNO New Orleans LA	7355am			
2000-2100 mtwhfa	USA, WVHA Greenbush ME	13695va			
2000-2100	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
2000-2100	USA, WYFR Okeechobee FL	7355eu	11580eu	17555eu	17845af
		21525af			
2000-2010	Vatican State, Vatican R	4005eu	5882eu	7250eu	9645eu
2000-2030	Vatican State, Vatican R	7365af	9660af	11625af	
2000-2100	Zambia, Christian Voice	3330af	4965af		
2000-2100 vl	Zambia, R Zambia/ZNBC 2	6165do			
2000-2100 vl	Zimbabwe, Zimbabwe BC	4828do			
2005-2100	Syria, Radio Damascus	12085na	13610eu		
2015-2030	Namibia, NBC	3270do	3290do		
2025-2045	Italy, RAI Intl	7120na	9710na	11840na	
2025-2035 mtwhf	Latvia, Radio	5935eu			
2030-2100	Armenia, Voice of	7480eu	9965eu		
2030-2100	Egypt, Radio Cairo	15375af			
2030-2100	Germany,Adventist World R	9830eu			
2030-2100	Slovakia, Adv World Radio	9455af			
2030-2100	Sweden, Radio	6065as	13625as		
2030-2045	Thailand, Radio	9655eu	9680eu	11905eu	
2030-2100 as	USA, Voice of America	4950af			
2030-2057	Vietnam, Voice of	9840eu	12020eu	15010eu	
2045-2100	India, All India Radio	7150eu	7410eu	9910au	9950eu
		11620eu	11715pa		

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See *Monitor America* on page 4 (BOK 63-95) for trunked radio frequency lists!

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RELM (formerly Regency) has just released this advanced, wide-frequency-coverage scanner with super performance! Covers 26-54, 118-174, 406-520, 806-960 MHz (less cellular). Stores 200 memory channels in 10 banks and scans and searches at a lightning-fast 100 channels per second! All channels may be keyboard-programmed for PL/CTCSS (subaudible tone) or DPL/DCS (digital) squelch systems.

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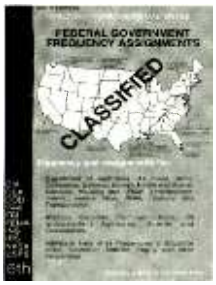

This new 6th edition provides the most comprehensive look at federal government frequencies in print. Over 100 agencies from the Central Intelligence Agency to the National Security Agency are listed; scanner and shortwave as well. Alphabetized by department and agency and their locations, then listed in frequency order, this compendium is the most authoritative reference for armchair monitoring of "forbidden" frequencies we've ever seen! Use shipping code B. Target Audience: general.

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If you are near a railroad system, you can hear their communications on an ordinary scanner—if you know how and where to listen! Railroad Radio begins with a history of railroad communications, complete with old photos, and develops into current systems. Learn how to recognize their lingo, find their frequencies, and understand their systems. Includes a master frequency list, glossary of railroad terms, and a guide to recommended monitoring equipment. Use shipping code B. Target Audience: general.

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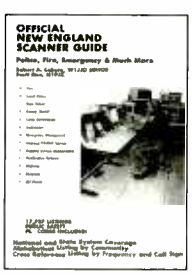
OFFICIAL NEW ENGLAND SCANNER GUIDE



By Robert Coburn

Nearly 18,000 listings for law enforcement, firefighting, hospital and ambulance, medical, road departments, railroads, emergency management, conservation, and weather. Listings include frequency, location, callsign, agency, use, and CTCSS (PL) tones where applicable. Even provides state bandplans and operational maps for key agencies in CT, ME, MA, NH, RI, and VT. Use shipping code B. Target Audience: general.

BOK 99 ..... $19.95 *New low price—while supplies last!*

AIR SCAN

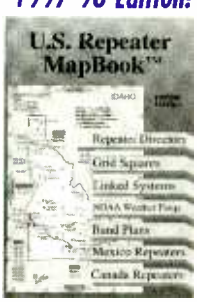
By Tom Kneitel

State-by-state listing of VHF civilian tower frequencies, air traffic control center frequencies, some military VHF operations. Includes list of special government/commercial frequencies and Canadian aircraft frequencies as well! Use shipping code B. Target Audience: general.

BOK 7 ..... $18.95

U.S. REPEATER MAPBOOK

1997-98 Edition!



By John Smith and John Mitchell

This new 1997/98 edition shows input/output frequencies, mapped locations and access tone codes for thousands of ham radio repeaters through-out the United States, Canada and Mexico, from 29-1300 MHz! Bandplans included. Exhaustive and accurate. A must for hams and scanner listeners alike. CD ROM version available (1996-97); see software section. Use shipping code A. Target Audience: general.

BOK 101 ..... $9.95 (1997-98 Edition)
BOK 101CD .. $29.95 (1996-97 Edition)

THE ARRL REPEATER DIRECTORY

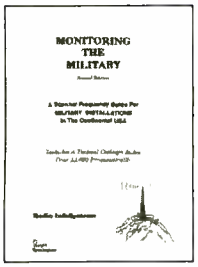
1997-98 Edition! (ARRL)

New Edition!

Thousands of VHF/UHF amateur repeaters are in use throughout the U.S., Canada and Mexico, operating in the 29, 50, 144, 222, 420, 902, and 1240 MHz bands. This comprehensive pocket guide lists all that are registered, including many South American and European countries as well. Frequencies, callsigns, locations, sponsor names, and modes are included. Use shipping code A. Target Audience: general.

BOK 103 ..... $8.00

MONITORING THE MILITARY



Second Edition **by Darryl Symington**

Over 130,000 frequencies plus a tactical callsign index highlight this updated military scanning guide. Hundreds of Air Force, Navy and Army bases as well as ammunitions and supply depots nationwide are listed alphabetically, covering fire/crash, security, medical, command posts, military police, tactical, maintenance and security communications. Use shipping code B. Target Audience: general.

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MONITOR AMERICA

By Richard Barnett

This 3rd edition contains over 800 pages of frequencies for federal, state, county, and city public safety agencies all across the United States! Includes channelization plans and usages, maps, ten codes, trunked systems, and unit designators. Also lists many amusement, sport, railway, aircraft, and national park frequencies. Use shipping code A. Target Audience: general.

BOK 63-95 ... $29.95

COMPENDIUM OF AMERICAN RAILROAD RADIO FREQUENCIES

By Gary L. Sturm and Mark J. Landgraf

Avid rail fans have long awaited this revised 14th edition of our most popular railroad frequency directory! 200 pages offer comprehensive listings of all frequencies used by U.S. and Canadian railroads, arranged alphabetically by name. Maps are included to show route details. Use shipping code A. Target Audience: general.

BOK 48 ..... $16.95

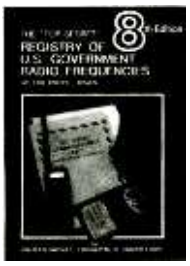
MASTER FREQUENCY FILE

By James Tunnell and Robert Kelty

Over 530 pages of top notch information on federal government HF, VHF and UHF communications. Thousands of frequencies, uses, locations, callsigns, repeater pairs, and squelch tones for FBI, ATF, DEA, Secret Service, State Department, Interior, National Parks, Forestry, Capitol Police, Smithsonian, FCC, EPA, Energy, Commerce, Congress, Customs, Prisons, Border Patrol, VA, and more. Use shipping code B. Target Audience: general.

BOK 78 ..... $29.95

TOP SECRET REGISTRY



By Tom Kneitel

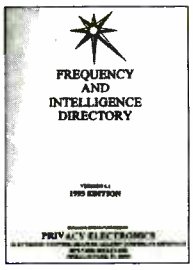
This 8th edition continues the tradition of having the largest amount of federal frequency data ever compiled into a single volume.

Concentrating on VHF and UHF scanner frequency ranges, agencies include Secret Service, Customs, DEA, CIA, NSA, White House, Border Patrol, ATF, and dozens of other government bureaus. Use shipping code B. Target Audience: general.

BOK 8 ..... $21.95

FREQUENCY AND INTELLIGENCE DIRECTORY

By Jay Harris



For south Florida scanner buffs, this book is a bonanza with its regionalized listings of business, public safety, cellular, cordless, tourist attractions, aircraft, press, marine, broadcasting, medical, railroad, sports, and transportation frequencies. And for nationwide federal/military VHF/UHF monitors, this may well be the most accurate frequency listing ever published. Use shipping code B. Target Audience: general.

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while supplies last!

AERONAUTICAL FREQUENCY DIRECTORY

Third Edition **by Robert A. Coburn**

This most-comprehensive aeronautical frequency directory, arranged alphabetically by state and city, lists both civilian and military air-to-ground frequencies throughout the spectrum, including location, name, callsign, frequency, and use. Includes traffic control centers, Civil Air Patrol, military, and civilian HF SSB tower frequencies as well. Use shipping code B. Target Audience: general.

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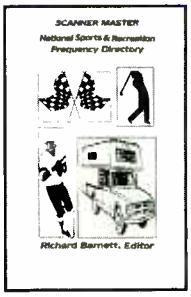
NATIONAL SPORTS AND ENTERTAINMENT FREQUENCY GUIDE!



Richard Barnett, well-known scanner frequency expert, has released this exhaustive directory of frequencies used by racing teams, sports events, parks and recreational areas, game and wildlife agencies, TV news teams, security forces, theme parks, colleges, and museums. Common frequencies used by GMRS, itinerants, public safety, federal government, cordless phones, wireless mikes, railroads, and marine are listed as well. Use shipping code A. Target Audience: general.

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THE WORLDWIDE AERONAUTICAL COMMUNICATIONS FREQUENCY DIRECTORY

Second Edition by Robert E. Evans. The most complete and up-to-date aeronautical frequency guide in publication! Over 2,350 frequencies in the commercial and military air services, including voice and digital modes in the HF, VHF and UHF ranges.

RTTY, SSB, ACARS, and VOLMET services worldwide along with glossary of terms, source list, extensive codes, designators, waypoint data, and sector maps. Explanatory text reveals how to decipher the contents of messages. Use shipping code A. Target Audience: general.

BOK 86 ..... $19.95

INTERNATIONAL CALLSIGN DIRECTORY

By Gayle Van Horn

The most exhaustive list of tactical callsigns and their identifications ever assembled for shortwave and scanner listeners in a massive 250 page directory!
Codes from the US Air Force, Navy, Customs, Secret Service, Marine Corps, and foreign military as well as internationally registered callsigns and their users around the world, plus many more.
Use shipping code B. Target Audience: general.

BOK 51 ..... $9.95

M STREET RADIO DIRECTORY

Sorry—1997 Cover photo not yet available. 1996 cover shown.

1997 Edition Edited by Robert Unmacht

Considered by experts as the most authoritative and comprehensive guide to AM and FM broadcasting stations in the US and Canada, this latest edition by the publishers of the prestigious M Street Journal is packed with program formats, frequencies, Arbitron (and other) ratings, market information, and addresses of thousands of licensees. Use shipping code B. Target Audience: advanced.

BOK 53-97 ... $48.95

New 1997 Edition! WORLD RADIO TV HANDBOOK

Valued by its readers for 50 years, **World Radio TV Handbook** is a "must have" resource for radio buffs and broadcasting professionals. This annual publication shows what's on the airwaves anywhere in the world at any time. It features country-by-country listings of long, medium, and shortwave stations by frequency, time and language. Also, an hour-by-hour guide to broadcasts in English, a survey of high-frequency broadcasting reception conditions for the year and much more. Use shipping code B.

BOK 3-97 ..... $24.95

3rd Edition! SPECTRUM GUIDE

By Bennett Z. Kobb

This is the most current and accurate description of radio services between 30 MHz and 300 GHz in existence; it is the official government version of our communications spectrum, arranged by frequency and fully annotated in easy-to-understand English just who is using what parts of the spectrum, and for what. Use shipping code B.

BOK 97 .....$29.95

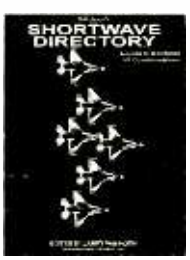
New 17th Edition! FM ATLAS

By Bruce Elving

This is the authoritative reference on U.S., Canadian and Mexican FM broadcasting stations for FM DXers. All mapped by state and province with cross-reference by frequency, callsign and city.
Use shipping code A. Target Audience: general.

BOK 64 ..... $14.95

SHORTWAVE DIRECTORY



8th Edition by Bob Grove

Edited by MT's own Larry Van Horn, the 8th edition Shortwave Directory is the consummate DXer's bible for the first 30 MHz of radio spectrum. Completely revised and updated, the 256 page, loose-leaf, three-hole punched edition features every HF listening target. Worldwide military organizations are featured and include all new U.S. and foreign listings. Now includes RTTY, FAX and other digital listings, coastal stations, non-directional beacons, and much more! A matching, professional, 2" slant D-ring binder is available for only $5! Use shipping code B. Target Audience: general.

BOK 14-94...$9.95 With Binder..$14.95

New 1997 Edition! CONFIDENTIAL FREQUENCY LIST

By Geoff Halligey

This 9th edition is the latest update to an excellent reference on 4-28 MHz communications.
Listings by frequency include ship and shore stations, embassy communications, aeronautical radio, INTERPOL, spy numbers stations, military tactical communications, and more.

Thousands of utilities (two-way communications) frequencies, conveniently arranged in numeric order. If you hear it on the air, it is probably listed in this edition of the famous CFL. Use shipping code B. Target Audience: general.

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Recognized worldwide for their thoroughness and objectivity, Lawrence Magne's White Papers tell you everything you want to know about the receiver of your choice before you buy.

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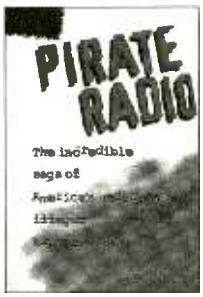
WP01	ICOM R71	**WP06**	FRG-100
WP02	ICOM R9000	**WP07**	Lowe HF 150
WP04	Sony ICF2010	**WP09**	"How to Interpret Receiver Specifications and Lab Tests"
WP05D	Drake R8	**WP10**	Drake SW8

PIRATE RADIO



By Andrew Yoder

Yoder's reputation as an authority of pirate radio broadcasters is legend, and his newest book takes readers on a walk on radio's wild side!" Containing historical perspectives as well as insightful views into modern pirate broadcasting, we also learn of pirates' probable future. Included is an excellent CD recording of actual broadcasts from the most famous—and notorious—pirates of the Past. Use shipping code B. Target Audience: general.

BOK 47 ..... $29.95

Closeout!

PASSPORT TO WORLD BAND RADIO, 1997

Pre-publication special on 1998 Passport: Only $19.95 with free shipping!

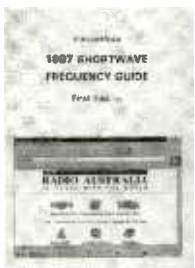
Edited by Lawrence Magne

Over 500 pages, features a listener's program guide, arranged both by frequency (2-26 MHz) and easy-to-follow time chart. Listings show transmitter output power, language, favored listening times for North America, and program contents. Reviews of the most popular shortwave receivers and listening accessories. Special alphabetized section of station addresses, contact personnel, phone/fax numbers. Use shipping code B. Target Audience: general.

BOK 18-97 ..... $12.95

New!

1997 SHORTWAVE FREQUENCY GUIDE



By Joerg Klingenfuss

Whether you are an international broadcast monitor or a utilities DXer, this massive new frequency guide is an indispensable reference. Arranged by frequency from VLF through shortwave, its worldwide listings include station location, mode, name, callsign, and broadcasting times. An extensive introduction of listening hints and a glossary of abbreviations complete this essential volume. Use shipping code B. Target Audience: general.

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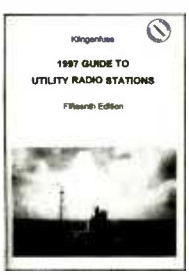
New 1997 Edition!

KLINGENFUSS GUIDE TO UTILITIES



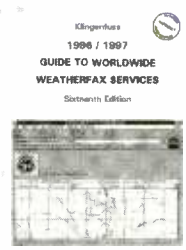
New CD-ROM available!

By Joerg Klingenfuss

The most comprehensive directory of worldwide utilities ever produced for the first 30 MHz of the spectrum. Lists SSB, RTTY, Fax, CW and other modes as well. Extremely accurate; nearly 20,000 frequencies with callsigns, station name, location and mode. Military, diplomatic, maritime, air, federal, press, etc. Includes glossary of Q and Z signals, terms and definitions. CD-ROM, sold separately, contains the Klingenfuss database plus other useful data! Use shipping code B. Target Audience: general.

BOK 54-97 ... $39.95
SFT 3 (CD) ... $34.95

GUIDE TO WORLDWIDE WEATHERFAX SERVICES



By Joerg Klingenfuss 16th Edition

Monitoring of weather facsimile is a growing interest among listeners. This guide lists Internet sites, telefax services, satellites, and radiofacsimile stations along with schedules, frequencies, callsigns, sample charts and images, abbreviations codes, and much more. If you are interested in downloading worldwide meteorological imagery, this is the key to understanding. Use shipping code B.

BOK45 ..... $29.95

15th Edition

RADIO DATA CODE MANUAL

By Joerg Klingenfuss

Digital communications now monopolize the shortwave spectrum. Excellent decoders are available, but when the text is revealed, the listener is bewildered by the acronyms, abbreviations, terms, and other codes that are sent for brevity and efficiency. The Manual's 600 pages are indispensable for identifying headers and addresses and decoding weather, maritime, aeronautical, government, and many other services. Use shipping code B.

BOK 43 ..... $34.95

SHORTWAVE RADIO LISTENING FOR BEGINNERS

By Anita Louise McCormick

This publication provides excellent insight into shortwave radio—its history, its intrigue, its players. Broadcasters, pirates and clandestines, utility communicators, hams, and even scanner topics are covered in this easy-to-read, liberally illustrated work by a veteran listener. Informative, fun reading with source lists for equipment, publications and clubs. Use shipping code A. Target Audience: beginner.

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THE ARRL 1997 HANDBOOK FOR RADIO AMATEURS

New Edition!

Lavishly illustrated, the Handbook's 1200 pages cover basic and advanced theory of radio communications, from low frequencies through microwave. A Windows software design package includes a directory of more than 1000 parts suppliers.

How-to articles instruct readers to build transmitters, receivers, antennas, test equipment, power supplies, and accessories. Advanced topics include moonbounce, repeaters, satellites, interference, and direction finding. Use shipping code B. Target Audience: advanced.

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THE ARRL ANTENNA BOOK

(ARRL)

Experts agree, if there's one book that covers virtually every aspect of antenna design, theory and construction—with eminent authority and accuracy—it's the ARRL Antenna Book!

Included at no extra charge is a new software disk for Yagi design, propagation forecasting and transmission line analysis along with many other antenna utilities. Use shipping code B. Target Audience: advanced.

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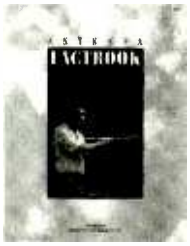
THE ANTENNA FACTBOOK



By Bob Grove

Is a tuner really necessary? How important is the choice of coax? Are all connectors the same? Which accessories are most valuable and which *don't* I want? What is antenna resonance and is it really necessary? What determines an antenna's efficiency? The answers to these and dozens more questions are found in this new book, meticulously researched and well illustrated. Written for hams, shortwave listeners and scanning enthusiasts. Get the best performance out of the most valuable accessory you can own—your antenna! Use Shipping Code A. Target Audience: general.

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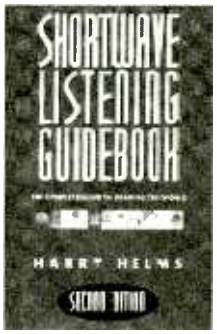
SHORTWAVE LISTENING GUIDEBOOK



Second Edition by Harry Helms

Excellent information for the beginner and experienced listener alike. Receivers, antennas and accessories are discussed in considerable detail, and in easy-to-read language.

Shortwave broadcasters—legitimate, clandestine and pirate—are presented extensively, along with a brief overview of utilities, the two-way users of the spectrum. Use shipping code B. Target Audience: general.

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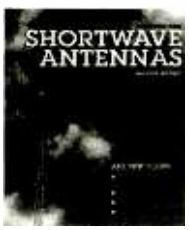
BUILD YOUR OWN SHORTWAVE ANTENNAS



2nd Edition by Andrew Yoder

No other accessory can add so much to your listening satisfaction as the proper antenna. With the expertise that comes only from experience, Yoder presents this highly informative, profusely-illustrated handbook on how to design and install indoor, limited space, portable and directional antennas as well as tuners and couplers, providing optimal reception throughout the shortwave frequencies. Use shipping code A. Target Audience: general.

BOK 89 ..... $16.95

RECEIVING ANTENNA HANDBOOK

By Joe Carr

This handy guide to home-brew shortwave antennas is the best in recent history. Authoritative and comprehensive, Carr's treatment of receiving antennas is first rate. Basic theory is easy to understand. Construction articles cover random wire, dipoles, multiband designs, disguise antennas, verticals, loops, longwires, direction finding, arrays, loops, and more. Use shipping code B. Target Audience: general.

BOK 74 ..... $19.95

New!

RADIO MONITORING

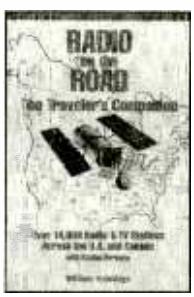
By T.J. "Skip" Arey

MT readers will recognize the byline of one of its most revered columnists, respected for his ability to explain the monitoring hobby. His new book covers the spectrum from medium wave through UHF, and addresses topics like antennas, frequency allocations, the Internet, hobby publications and clubs, logging, equipment suppliers, accessories, listening techniques, and more. An excellent guide for the newcomer to the radio hobby. Use shipping code B.

BOK50 ..... $19.95

New!

RADIO ON THE ROAD

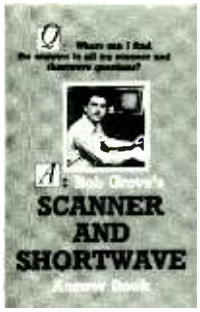


By William Hutchings

If you are a frequent interstate traveler, or even a medium wave or FM DXer, this directory of AM and FM broadcasters across the country—including Canada—will come in handy. Alphabetized by state and city, the "Traveler's Companion" lists virtually every domestic radio broadcaster you will be likely to hear, and classifies them by format (country, pop, classical, etc.), and includes callsigns for ready identification. Use shipping code B.

BOK 33 ..... $12.95

SCANNER AND SHORTWAVE ANSWER BOOK



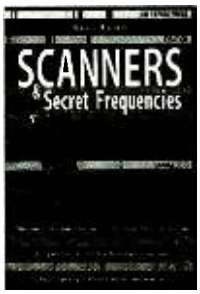
By Bob Grove

What is the best antenna for your requirements? When do you need a preselector rather than a preamp? What is the difference between "meter band," "megahertz" and "kilohertz"?

These are samples of the hundreds of questions expertly answered by Bob Grove's guide to monitoring. Liberally illustrated and professionally printed. Affordably priced for hobbyists, new and experienced. Use Shipping Code A. Target Audience: beginner.

BOK 5 ..... $12.95

SCANNERS AND SECRET FREQUENCIES



By Henry Eisenson

This giant (320 page), comprehensive guide to monitoring the VHF/UHF communications spectrum is loaded with useful information, from basics of radio and choosing a scanner to learning about the radio spectrum and where to find the most interesting frequencies. Use shipping code B. Target Audience: beginner.

BOK 77 .....$19.95

SCANNER MODIFICATION HANDBOOK VOL. 1 & 2

By Bill Cheek

Although concentrating on mods for Realistic® scanners, excellent hints are included for scanners in general. Cellular telephone frequency plans, adding S meters, squelch improvements, voltage protection, cellular restoration, increasing memory capacity, portable power supplies, choosing antennas and coax, and more!

Vol. 2 covers the PRO-2006, PRO-34, PRO-2022, Uniden BC200/205XLT, BC100XLT, and BC760/950XLT. Many of the techniques may be applied to other scanners as well. Use shipping code B. Target Audience: advanced.

BOK 2/BOK 2V $17.95 ea. Both for only $29.95

THE ULTIMATE SCANNER

By Bill Cheek

This indispensible bench manual includes memory enhancements, up to 25,600 channels, cellular restoration, simple ways to automate arduous scanning tasks, signal discrimination, computer interfaces, plus generic and specific information on improving scanner performance. You may already own the better part of a "next generation scanner!" Shipping Code B. Target Audience: advanced.

BOK 83 ..... $29.95

New low price— while supplies last!

TRAFFIC RADAR HANDBOOK

By Don Sawicki

This most exhaustive book ever written on the subject explains every kind of traffic speed measuring system in use, along with scientific proof of errors and misreadings which commonly occur.

Over 100 pages include how to fight a ticket in court, laser radar, biological effects of radar beams, radar countermeasures, and much more, loaded with illustrations and tables for documentation. Use shipping code B. Target Audience: general.

BOK 75 ..... $14.95

TUNE IN ON TELEPHONE CALLS

By Tom Kneitel

No listener's book in recent history has caused so much consternation as Kneitel's expose on where to listen to cellular, new and conventional cordless, air to ground, ship to shore, military, satellite, and wilderness radio phones—even pagers and baby monitors!
160 information-packed pages let you know just how vulnerable your calls are! Use shipping code A. Target Audience: general.

BOK 41 ..... $16.95

1997 Edition

INTERNET & WEB YELLOW PAGES

Edited by Harley Hahn

This guide, now in its 4th Edition, makes exploring the Internet quicker, easier, and more fun. Internet guru Harley Hahn has updated this resource to include hundreds of new resources—from agriculture to authors to U.S. politics to zoology. Also includes Hahn's list of 25 Things to Do When You Should Be Working. Use shipping code B. Target Audience: general.

BOK 66 .....$29.95

THE GPS MANUAL: PRINCIPLES AND APPLICATIONS

NEW!

By Steven Dye with Dr. Frank Baylin

This book, written in a style understandable by any technically interested person, explores GPS technology and its applications. It serves as a useful guide for people wishing to familiarize themselves with GPS technology as well as those considering the purchase of a GPS receiver. Simple charts, clearly written text, and many concise diagrams help the reader easily understand this exciting new technology.

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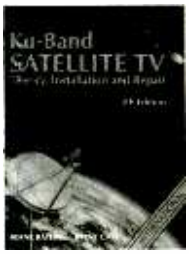
KU-BAND SATELLITE TV - THEORY, INSTALLATION AND REPAIR



4th Edition ***by Dr. Frank Baylin, Brent Gale and John McCormac***

A clear presentation and explanation of all aspects of worldwide Ku-band satellite television. Ku-band satellite communications systems are becoming commonplace throughout the world. This comprehensive manual provides do-it-your selfers, technicians and managers with the knowledge necessary to fully understand all technical aspects of this rapidly growing field. Use shipping code B. Target Audience: general.

BOK 93 ..... $29.95

1991 SATELLITE TELEVISION SOURCEBOOK

By Ken Reitz

This ultimate reference to TV satellites provides more information than anything else on the market. Lists of dealers, manufacturers and publishers, including addresses and phone numbers, for magazines, books and equipment. Detailed chapters on how satellite TV works. C band, Ku band, weather, amateur and even international satellites are covered. **A free update sheet is included.** Use shipping code B. Target Audience: general.

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HIDDEN SIGNALS ON SATELLITE TV

By Thomas P. Harrington

This expanded third edition is the ultimate reference for information on how to hear and watch those mystery signals on TV satellites. Everything from teletype press news to stock market reports, business teleconferencing to long distance telephones, international broadcasting relays to music services.

Loaded with charts, illustrations and instructions.Use shipping code B. Target Audience: advanced.

BOK 42 ..... $19.95

TUNE TO SATELLITE RADIO ON YOUR SATELLITE SYSTEM

By Thomas P. Harrington

Very few TV satellite dish owners are aware of the myriad other services available--if you know where to look! Sports events, classical and ethnic music, international broadcasters, special news services, weather satellite imagery, facsimile press photos, and more. Harrington tells you, in non-technical terms, just what you need to tune it in. Use shipping code B. Target Audience: advanced.

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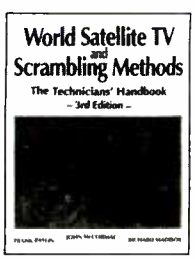
WORLD SATELLITE TV AND SCRAMBLING METHODS, THE TECHNICIAN'S HANDBOOK



3rd Edition ***by Dr. Frank Baylin, Richard Maddox and John McCormac***

This thorough text is a must buy for technicians, satellite professionals and do-it-yourselfers. The design, operation and repair of satellite antennas, feeds, LNBs and receivers/modulators are examined in detail. An in-depth study of scrambling methods and broadcast formats is the backdrop to a discussion of all current American and European satellite TV technologies. Use shipping code B. Target Audience: advanced.

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INSTALL, AIM AND REPAIR YOUR SATELLITE TV SYSTEM

2nd Edition ***by Dr. Frank Baylin***

This booklet, a shortened version of *The Home Satellite TV - Installation and Troubleshooting Manual* (BOK 94), explores how to install a satellite TV system, aim the dish at the arc of satellites, as well as how to trouble-shoot and repair the system if a problem arises. It also covers the periodic maintenance work that is required to keep a system tuned up and aligned onto the arc of satellites. Use shipping code B. Target Audience: general.

BOK 95 ..... $9.95

MINIATURE SATELLITE DISHES, THE NEW DIGITAL TELEVISION

2nd Edition ***by Dr. Frank Baylin***

Direct broadcast satellite technology is hot and this new release by Baylin Publications covers all aspects of the DBS industry. Nine chapters delve into the DBS technology, corporations offering the service, programming, installation, and more. Illustrated and written for the laymen this is essential reading for anyone considering purchasing a DBS system. Use shipping code B. Target Audience: general.

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THE "HOW TO" OF SATELLITE COMMUNICATIONS

By Dr. Joseph Pelton

Communications satellites represent a powerful technology that can do many things well. This excellent book by a seasoned veteran in the satellite industry thoroughly explores the world of satellite communications. Learn what makes up a satellite system, where this technology came from and what we can expect or hope for in the future. Use shipping code B. Target Audience: general.

BOK 92 ..... $24.95

1997 SATELLITE BROADCASTERS GUIDE

1996 cover shown

By Bart Kuperus

As more and more people become fed up with cable TV services, they are turning to the option of satellite dishes. Learn how to set up your own home satellite system and receive hundreds of TV and radio stations that you probably didn't know existed! This book also reveals how dishes work and provides a guide to satellite broadcasters, maps of satellite locations, and a directory of reputable dealers. Use shipping code B. Target Audience: general.

BOK 79-97 ... $24.95

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WEATHER SATELLITE HANDBOOK

By Ralph E. Taggart

Weather satellite reception is becoming quite popular. Ralph Taggart's 5th edition handbook is filled with useful information, charts, photos, and diagrams. Concentrating on the 137 and 1691 MHz birds, Taggart's handbook includes construction details on antennas and rotators, tracking devices and programs, computer control, receivers, monitors and printers, converters and demodulators--both simple and sophisticated. Use shipping code B. Target Audience: advanced.

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HOME SATELLITE TV INSTALLATION & TROUBLESHOOTING MANUAL

New 4th Edition!

By Dr. Frank Baylin, Brent Gale and Ron Long

This new fourth edition is an invaluable sourcebook for owners of home satellite TV systems and professional installers alike. An excellent working tool, it presents all the details anyone needs to install, operate and maintain a home TV satellite system. Use shipping code B. Target Audience: general.

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THE SATELLITE EXPERIMENTER'S HANDBOOK

By Martin Davidoff

With the launching of Satellite Times magazine, more listeners are focusing their antennas overhead! Get in on this exciting, new aspect of monitoring with projects and information from Davidoff's authoritative, easy-to-read handbook. Antenna design, construction and tracking; amateur, TV and weather satellites; computer programs; graphs, tables and overlays. A great reference collection for beginners and experienced space enthusiasts alike. Use shipping code B. Target Audience: general.

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THE ZENITH TRANSOCEANIC ... THE ROYALTY OF RADIOS

By John Bryant and Harold Cones

No manufacturer has drawn more recent attention from the vintage radio collector than Zenith, maker of the legend Trans-Oceanic series. Flea markets are being combed for this popular collectible. This lavishly illustrated, glossy, historical essay is the most complete work ever done on the fabled Zenith. Fascinating to read, beautiful to admire. Ideal as a gift for the collector and the radio hobbyist. Use shipping code B. Target Audience: general.

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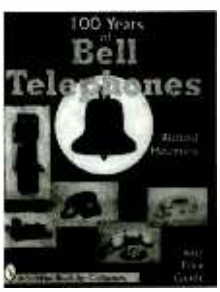
New! SHORTWAVE RECEIVERS, Past and Present

By Fred Osterman, 2nd Edition

Collectors and flea market addicts will covet this new, glossy, photo essay of more than 500 receivers from 70 manufacturers since 1945. Receivers are identified by type, date of manufacture, size and weight, features and specifications, circuit description and tube identifications, value, and even a commentary overview. Includes text on buying, repairing, and restoring used radios. By far the best reference of its type available. Use shping code B.

BOK59 ..... $19.95

100 YEARS OF BELL TELEPHONES



by Richard D. Mountjoy

From the coffin sets of the late 1870s through the Princess phones of the 1960s and beyond, This definitive, new publication contains 350 color photos and exhaustive historical and technical information for telephone collectors, technical historians, and restorers. Use shipping code B.

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by Michael Prosise

Just a glance through this nostalgic collection evokes warm thoughts of families in front of the fireplace, listening to Fibber McGee and Molly, Jack Benny, and the myriad radio programs that populated the unspoiled airwaves of radio's Golden Age. Over 800 illustrations, most in color, highlight this year-by-year chronology of the most popular home radio ever made. Use shipping code B.

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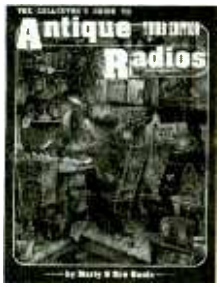
UPS Second Day Air at Ground Rates on ALL PRODUCTS!

COLLECTOR'S GUIDE TO ANTIQUE RADIOS



Fourth Edition by Marty and Sue Bunis

If you're among the rapidly-growing number of antique radio collectors, this book is a must! Hundreds of full-color photos, thousands of listings of tube-type radios from America's yesteryear. Includes a brief description, model number, date of manufacture, and average market value. Shipping code B. Target Audience: general.

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COLLECTOR'S GUIDE TO TRANSISTOR RADIOS

New Second Edition!

By Marty and Sue Bunis

That AM-only transistor radio you passed up at the yard sale could be worth money! Transistor radios are fast becoming collector's items, some worth tens or even hundreds of dollars! A jade-green Regency TR-1 brings $600! Enjoy reminiscing through the hundreds of early transistor radios, as well as learning about their values, in this well-illustrated collector's guide. Shipping code B. Target Audience: general.

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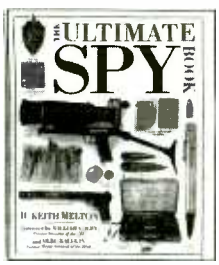
THE ULTIMATE SPY BOOK



by H. Keith Melton

The consummate spy memorabilia collector has finally published his extensive catalog of museum pieces from hot and cold wars, more than 600 glossy color photos, from the Civil War to the present, documented with gripping anecdotal accounts. Examples: suitcase radios, ciphering equipment, spy cameras, microdots, and fanciful concealments. Use shipping code B.

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This colorful collection of more than 200 photographs and graphic illustrations shows the fantastic tools of America's OSS, Britains SOE, and many other super-secret insurgent forces since the beginning of World War II. Pencil bombs and other exotic weapons, covert communications and code machiines, survival and sabotage kits, spy cameras and special vehicles—they're all in this eye-opening, hard-cover collection. Use shipping code B.

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by Emyl Jenkins

How much is that old silverware worth? Have you insured your family treasures adequately? How old is that furniture? Is that an original, a fake, or a reproduction? What are the identifying marks on glass and silver? This well-illustrated book lets you in on the collectors' and appaisers' secrets. Use shipping code B.

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RADIO FREQUENCY INTERFERENCE... How to Find it and Fix it! (AARL)

This popular ARRL publication is welcome in an age of overwhelming interference problems. TV, ham radio, telephones, power lines, vehicles, CB, computer, appliance, and many other devices causing and affected by radio frequency interference (RFI) are covered along with preventive measures and even direction-finding antennas and methods. Extensively illustrated. Shipping Code B. Target Audience: general.

BOK 32 ..... $14.95

COMMUNICATIONS RECEIVERS The Vacuum Tube Era

by Raymond S. Moore

Truly a collector's delight, this richly-illustrated compilation of shortwave receivers from 1932-1981 is an indispensible reference for flea market addicts and hamfest devotees! Hundreds of models, civilian and military, from dozens of manufacturers like Hammarlund, National, Hallicrafters, Drake, Collins, Heathkit, Lafayette, and Howard are described, dated and pictured for identification. Use shipping code B.

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RADIO'S FIRST 75 YEARS

New!

by B. Eric Rhoads

A Blast From the Past...A Pictorial History of Radio's First 75 Years! This superb pictorial essay of broadcasting contains nearly 1000 archival photos of the historical greats—Tesla, Sarnoff, Edison, KDKA, DeForest, Orson Welles, George Burns, Spike Jones, One Man's Family, the American School of the Air—the list is endless. A superb gift, and an equally superb reference for the radio room or library. A pleasant voyage back in time. Use shipping code B.

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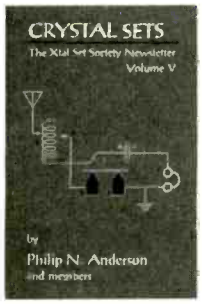
CRYSTAL SETS, Volume V



by Philip N. Anderson

Nothing evokes the nostalgic memories of old time radio like the crystal set; a long wire aerial and a chunk of galena bringing in music and voices for hundreds of miles. Phil Anderson tells us how to do it in this compilation of newsletters and correspondence of the Xtal Set Society—88 pages of hints and kinks for antennas, headsets, choosing crystal materials, detecting whistlers, grounding, and more. Use shipping code A.

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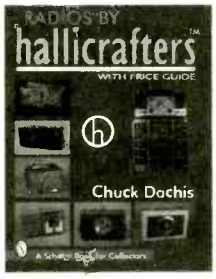
RADIOS BY HALLICRAFTERS



by Chuck Dachis

Contains over 1000 photos of Hallicrafters receivers, transmitters, TVs, accessories and literature, this new, informative directory includes descriptions of every known model made by Hallicrafters, including dates, accessories and pricing. Use shipping code B.

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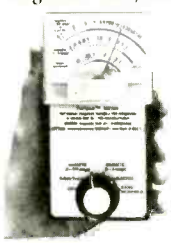
Measure Electrostatic Discharge and RF Fields for Under $200!

Instruments normally used by the electronics industry for measuring electrostatic discharge (ESD) and RF environmental fields can cost between $2,000 and $3,000. But these great Trifield meters have been shown to accomplish the same tasks for under $200!

HAMS: *Get ready now for the new RF exposure guidelines!*

These meters were recently demonstrated to industrial, government and military officials in preparation for an important missile launch at Vandenburg AFB. The TST-2 (above) detects electric and magnetic fields and is so sensitive it will respond to the electric disturbance produced by someone—or something—moving in an adjacent room! A built-in tone provides audible indication of these phenomena.

It can detect the earth's magnetic field in the magnetic mode, and it can operate as an excellent field strength meter in the radio/microwave mode.



The TST-1 (left) takes readings of home appliances, computers, microwave ovens, TV sets, electric blankets, fluorescent lights,and other sources of electromagnetic energy.

ORDER TST 1
$119.95

ORDER TST 2
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Spinning Vane Radiometer!

Probably every science museum finds its briskest sales in these eye-catching glass bulbs with their spinning white and black vanes. Demonstrating kinetic energy from light photons, this "perpetual motion" device will continue to spin as long as enough light is present. A conversation piece for the desk and a superb gift for the science enthusiast.

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The Edison Bulb!

Functional reproduction of the original carbon-filament Edison electric lamp is a rare find. Its warm glow provides a nostalgic reminder of simpler times past. A delightful highlight for the radio room. Standard brass screw base, 60W (nom.). Porcelain fixture not included.

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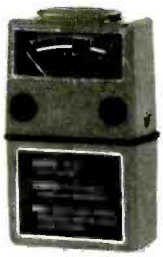
Personal Radiation Detector

A Relic from the Cold War



Nuclear winter—the Red Menace—pressing issues in the 1960s-70s, and this personal **Radiac meter** was worn by military personnel attending our nuclear missile silos or exposed to high levels of gamma rays (.02-200r/hr). Originally costing nearly $150 each, these few remaining relics were just uncovered in a military warehouse. Used, these meters may or may not work and are sold for display or experimentation only. Measures 2-1/4" x 3-3/4". Batteries and nuclear missile not included.

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Edison Wall Plaque

Its origin lost to the pages of history, this all-metal, 5" x 7" replica is a charming addition to any monitoring post or ham shack—a unique memento of the 19th century when electric lighting began to replace the gaslight. Satin brass-look finish and four corner holes lend authenticity to this plaque.

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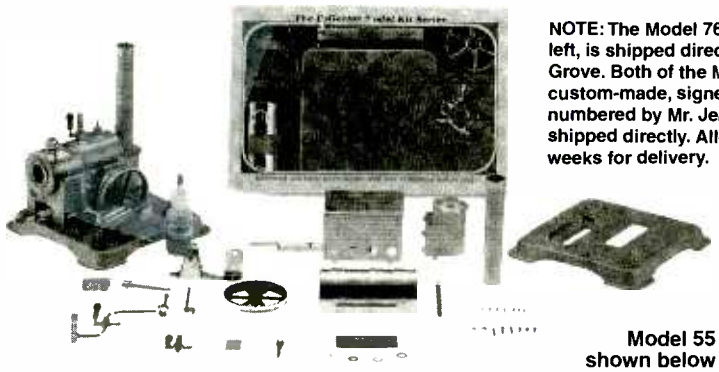
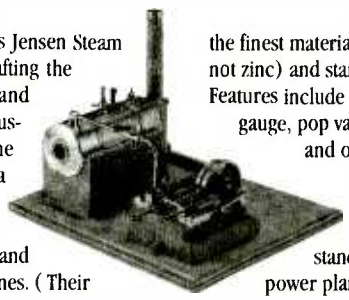
Real, Working Jensen Steam Engines!



NOTE: The Model 76 kit, shown at left, is shipped directly from Grove. Both of the Model 55's are custom-made, signed and numbered by Mr. Jensen, and shipped directly. Allow 6 to 8 weeks for delivery.

Model 55 shown below



Since 1932, Pennsylvania's Jensen Steam Engine Co. has been hand-crafting the finest model steam engines and power generating plants for industry, schools and collectors. The Jensen family works 7 days a week, still using the actual tooling & dies from the 1930's & 40's, to keep up with the demand for their high quality steam engines. (Their engines even saw action in WWII, powering small air pumps!)

Whether you want the popular #76-kit or the rugged, deluxe cast iron #55 twin cylinder high speed steam engine, all Jensens are crafted using the finest materials: solid brass, (nickel plated, not zinc) and stainless steel—no plastic! Features include silver soldered boilers, water gauge, pop valve, whistle, throttle, lube oil and operator's manual.

The much larger Model #55 twin has a reversing lever and cast iron flywheel as standard and is also available in a power plant version, the #55-G, complete with two brass exhaust stacks, unique A/C generator/multi-speed line shaft combo, providing 9 different PTO's, (power take offs.) Reserve your piece of American history and order your Jensen today. Satisfaction guaranteed.

Order COL 7/Model 76 kit:

(Helps in Math, science & physics education, plus it's FUN!)

This unique oscillating cylinder engine, includes a $40 value package of accessories & upgrades, plus a certificate for free engraved owner's plaque. Powered with safe, dry fuel tablets. Easily asssembles in about an hour. (Size 7"x7"x8") For ages 9 and over. Shipped directly from Grove.

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This twin-cylinder monster is truly awe-inspiring! Features a 1/2"bore, 5/8" stroke and water recovery system. Measures an impressive 10" x 15" x 10" and weighs a hefty 12 pounds!

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The Power Plant version of the Model 55 features two brass exhaust stacks, unique A/C generator/multi-speed line shaft combo, providing 9 different PTO's (power take offs).

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Scancat-Gold for PCs

Use your 640k (or better) computer to control your AOR, Drake, Kenwood, ICOM, Yaesu, JRC, Lowe, WJ, and Radio Shack PRO-2005/6/35/42 with this fast, all-new software program! Operates from the RS-232 port. Just check the features listed below:

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- Integrates multiple data sources and removes duplicates
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- Scan frequencies from up to 15 disk files and 4500 freqs
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Works with any IBM compatible system.

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Scancat Gold for Windows®

Windows® version places a controllable scanner/receiver panel on your computer screen!

Now you can get all the Scancat Gold features plus:

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SCAN MANAGER PRO v.1.1

Now shortwave listeners and hams can have the same computer control power used by serious scanner enthusiasts by installing this powerful KC4ZGL Ham Software. If you have a modern IBM compatible computer equipped with Windows 3.1 or higher, you can edit databases and control all Kenwood, Icom, Drake R8A (R8 not supported) and Yaesu (except FT-767) transceivers and receivers! Display your data in powerful spreadsheet style, controlled and edited by keyboard or mouse.

Your database size is limited only by your hard disk space. Scan at 10 channels per second with selectable delay, choosing any standard mode (AM, FM, USB, LSB, CW, FSK/RTTY) throughout the typical 100 kHz-30 MHz frequency range. You can even select a service (CB, amateur, aeronautical, maritime, AM broadcast, etc.) For automatic band scanning.

Factory-loaded database lists hundreds of broadcast times and frequencies from dozens of countries worldwide with provision to add, edit and delete listings as schedules change. Colorful world map displays location, national flag, local and universal time.

Scan Manager 1.1 Pro includes SWL Manager 2.0. Both programs are full integrated for one low price.*

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ScanStar™

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This powerful new software package, ready for Windows 95, 3.1, or WFW 3.11, will restore full 800 MHz coverage and allow you to customize the band plan on theAR8000, as well as display spectrum analysis and support printing on the AOR AR3000A, Drake R8 and R8A, R7100, and the PRO-2006 and PRO-2035 or PRO-2042 when equipped withOptoElectronics OS456 or OS535. Scan-controls up to 10 radios at one time; dual-receiver priority handoff for window viewing; sub-list scanning for split channels and trunk groups; monitoring assistant with frequency following for reception logging; user-defined database files. Blend up to 25 groups and search ranges; tactical display for all in "viewpicture;" scans, searches and logs PL/DPL/DTMF tones; provides alarm for high priority channels via wave files or PC speaker; opens multiple files at the same time with full-feature editor; browses and imports dBase files like the popular Grove FCC database; commercial logging features include air time, hit count andPL/DPL/DTMF loggings per channel; import/export from other formats like ASCIIand ScanCat. Order SFT9.*

■ ScanStar for Windows SE (Basic)

Has many of the incredible features of the SFT-9 described above, except the basic package has no support for the Drake R8 and R8A and certain others. Call our tech line for details. Order SFT10.*

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ScanStar Commercial offers all the features of the popular ScanStar Professional edition plus: Multi-radio scanning with search/save (handoff) and peer strategies; Use any combination of radio type or port, port sharing for CI-V devices; Graphical User Interface (GUI) command center shows activity, history and status of channels in real time; Quickly reconfigure as the action unfolds!; Priority system with 256 levels and selectable preemption; High resolution VGA/SVGA/S3 graphics modes: 32 bit code for maximum performance on 386, 486 and 586 processors.; 640X480, 800X600 & 1024X763; and much more! Order SFT11.*

** Requires IBM PC 386/486/586 with 4 MEG RAM, hard disk, VGA/SVGA, mouse, serial port(s), DOS 5/6 or OS/2 3.0. warp. Windows and 286 not supported. Supports: R7000, R7100, R9000, FRG9600, AR3000, AR8000, NRD535, R8, and MR8100 and Optoelectronic's OS456, OS535 and DC440. Because software is easily copied, it is not refundable. Defective copies will be replaced at no charge.*

SFT09: **$159.95**
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Grove has great values on all the latest software for scanner enthusiasts, hams and shortwave listeners. Please call for additional information or availability on items not shown on these pages.

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THE SUPER DX EDGE (Determines best DX conditions, max. usable freq.)	SFT 5	$29.95

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Choose the Message Tracker Pro if you would also desire text search capability (looking for key words or numbers), handle groups of up to 100 CAP codes and addresses, or display split screen to display target messages.*

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Through a special distributor-direct arrangement, we can offer you for a limited time high-quality RAM expansion at INCREDIBLE savings! Adding 4 more mb to your computer's 4 mb RAM will virtually double Windows speed! These 72 pin, double sided SIMMs feature gold contacts and offer 60-70 nanosecond access speed (check your computer specifications for speed and parity requirements). These are standard replacement units—at a great price which includes FREE first class shipping!

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**EDO For use with Pentium processor only.*
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Enhanced Grove FCC Database v6.0

The entire FCC Master File, available on both CD-ROM and high density diskette

The new Grove FCC Database is a spectacular compendium of the licensees in the FCC Master File! Public safety, railroad, business, industrial, broadcast, paging, maritime and many, many others. You can sort through fields like city, service, state, callsign, name, antenna height, output power, county, and even latitude and longitude! This fast, menu-driven program makes you an expert soon after you log-on. Simply choose from either the CD-ROM or High Density Disk versions.

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— *CA, TX, FL* $49.95
— *All Other States* $39.95
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Magellan GPS Units Are Tops!

These compact Magellan navigational satellite receivers earned their renown for reliability during Desert Storm. Now this accurate position-determining instrument can be yours at a fraction of its original cost. Ruggedly built and waterproof, yet barely more than 6" high and weighing only 10 ounces, this pocket precision receiver homes in on 1.2-1.5 GHz global positioning satellites, using their signals to establish your exact location to within 100 yards in as little as 2-1/2 minutes from a cold start (35 seconds warm start), even your altitude, and allows you to plot and track your motion as well, so you can find your way back if necessary.

Ideal for pinpointing campsites, fishing holes, boating, travelers, trailheads, map locations, landmarks. Selectable graphic screens assist you in tracking and plotting where you've been, where you're going, and where you *ought* to be going! Shows distances, directions, times, speed, course corrections, latitude/longitude coordinates, all on a backlit LCD display.

Up to 17 hours of continuous use on one set of standard alkaline AA cells. Operates over a 14 to 140 degree Fahrenheit temperature range. Lanyard strap inlcuded.

All these features make the GPS 2000 Satellite Navigator an incredible value. Or select the upgraded GPS 3000 and get two additional navigation screens, a data port (RTCM 104 in, NMEA out), OSGB coordinates, 100 additional waypoints, 5 more routes, external antenna capability, celestial calculations, swivel mounting bracket, batteries, manuals, and a carrying case.

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CAS 7	Carrying case (GPS 2000 only)	$9.95
BAT 1	AA Alkaline Batteries	$.79
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GP 3000 EXTRA Accessories

ACC 11	Power/ Data Module and External Antenna Kit, 20' Coax	$149.95

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SHIPPING FOR EACH
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$15 Canadian APP
$16.50 Canadian UPS

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Pull in Hundreds of SCPC Radio Channels On Your Standard TVRO Home Dish Satellite System!

Universal SCPC-200

Replacing the ever-popular SCPC-100, this flexible, new, microprocessor controlled receiver has automatic LNB drift compensation and offers direct frequency tuning with frequency readout on a high contrast LCD, and direct transponder tuning as well. Its large memory bank of 50 channels, wide/narrow bandwidth selection and automatic tuning indicators add to the feature list which also includes digital frequency lock-on, service name readout, and standard 70 MHz baseband output (tunable 50-90 MHz).

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Based upon the Supreme Court rulings of McLeod vs. Dillworth (1944), Bellas Hess (1967) and the proposed Brooks legislation (H.R. 2230), effective September 1, 1990, Grove Enterprises will no longer collect sales or use taxes apparently invalidly levied by states against residents when they purchase from us in North Carolina. We have neither economic presence nor nexus in these states as established by the U.S. Supreme Court.

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* Two-year subscription to *Monitoring Times*, $45.95; Three years, $67.95. Canadian surface, one year $36.50; Foreign surface, one year $55.45; Foreign air mail, one year $85.95

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FREQUENCIES

2100-2130	Albania, R Tirana Intl	7110eu	9515eu		
2100-2200	Anguilla,Caribbean Beacon	11775am			
2100-2200	Australia, Radio	7240pa	9660pa	9850pa	11695pa
		11855as	12080pa	13605pa	
2100-2130	Australia, Radio	6080pa	9860as	11880pa	
2100-2130 vl	Australia, VL8A Alice Spg	2310do			
2100-2130 vl	Australia, VL8K Katherine	2485do			
2100-2200 vl	Australia, VL8K Katherine	5025do			
2100-2130 vl	Australia, VL8T Tent Crk	2325do			
2100-2200 vl	Australia, VL8T Tent Crk	4910do			
2100-2125	Belgium, R Vlaanderen Int	5910eu			
2100-2200	Bulgaria, Radio	9700eu	11720eu		
2100-2115 vl	Cameroon, Radio Cameroon	4850do			
2100-2200 vl	Cameroon, Radio Garoua	5010do			
2100-2200 vl	Canada, CBC N Quebec Svc	9625do			
2100-2200	Canada, CFCX Montreal	6005do			
2100-2200	Canada, CFRX Toronto	6070do			
2100-2200	Canada, CFVP Calgary	6030do			
2100-2200	Canada, CHNX Halifax	6130do			
2100-2200	Canada, CKZN St John's	6160do			
2100-2200	Canada, CKZU Vancouver	6160do			
2100-2130 as	Canada, R Canada Intl	11690af	13650af	13670af	15150af
		15325af	17820af		
2100-2130 mtwhf	Canada, R Canada Intl	5995eu	7235eu		
2100-2200	China, China Radio Intl	5220eu	6950eu	9920af	
2100-2130	China, China Radio Intl	11715af	15110af		
2100-2130	China, China Radio Intl	3985eu			
2100-2200	Cuba, Radio Havana	9585eu	9620eu		
2100-2200 vl	Cyprus, BRT International	6150do			
2100-2200	Ecuador, HCJB	11990eu	21455am		
2100-2200	Egypt, Radio Cairo	15375af			
2100-2200	Eqt Guinea, Radio Africa	15186af			
2100-2150	Germany, Deutsche Welle	7115au	9670as	9735af	9765as
		11785au	11865af	15135af	
2100-2130	Hungary, Radio Budapest	3975eu	7250eu	9835eu	
2100-2200	India, All India Radio	7150eu	7410eu	9910eu	9950eu
		11620au	11715au		
2100-2200 vl	Italy, IRRS	3955va			
2100-2200	Japan, R Japan/NHK World	6035as	9535na	13630as	
2100-2107 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
2100-2200	Lebanon, Voice of Hope	9960va			
2100-2115	Liberia,LCN/R Liberia Int	5100do			
2100-2107	Namibia, NBC	3270do	3290do		
2100-2200 smtwh	New Zealand, R NZ Intl	11735pa			
2100-2200	Nigeria, FRCN/Radio	3326do	4770do	4990do	
2100-2200 vl	Papua New Guinea, NBC	4890do			
2100-2156	Romania, R Romania Intl	7105eu	7195eu	9690eu	11810eu
2100-2200	Russia,Voice of Russia WS	7250eu	7350eu	7370eu	7440eu
		9620eu	9655eu	9665eu	9710eu
		9740eu	9765eu	9775eu	9880eu
		11840eu			
2100-2200	S Africa, Investment Ch	5965af	7225af	9475af	11870af
2100-2130	Serbia, Radio Yugoslavia	6100eu	6185eu		
2100-2200	South Korea, R Korea Intl	6480eu	15575eu		
2100-2130	South Korea, R Korea Intl	3970eu			
2100-2105	Syria, Radio Damascus	12085na	13610eu		
2100-2110	Uganda, Radio	4976do			
2100-2200	Ukraine, R Ukraine Intl	5905eu	6010eu	6020eu	6090eu
		7180eu	7240eu	7280eu	7380na
		9550na	9560na	9640na	9905na
		12040na	13590na	13720sa	
2100-2200	United Kingdom, BBC WS	3255af	3915as	3955eu	5965as
		5975as	6005af	6180eu	6190af
		6195va	7325va	9410eu	9630va
		11750sa	11835af	11945as	12095eu
		15400af			
2100-2130	United Kingdom, BBC WS	9630af	15485af		
2100-2145	United Kingdom, BBC WS	11680sa			
2100-2200	USA, KAIJ Dallas TX	13815am			
2100-2200	USA, KTBN Salt Lk City UT	15590am			
2100-2200	USA, KWHR Naalehu HI	11815as			
2100-2200	USA, Monitor Radio Intl	9355am	11550eu	13840au	
2100-2200	USA, Voice of America	6035af	6040me	7375af	7415af
		9535af	9760eu	11870pa	11975af
		15185as	15410af	15445af	15580af
		17725af	17735as		
2100-2200	USA, WEWN Birmingham AL	13615na	15375sa	15745eu	
2100-2200	USA, WGTG McCaysville GA	9400am			
2100-2200	USA, WHRI Noblesville IN	9495am			
2100-2200	USA, WINB Red Lion PA	13790eu			
2100-2200	USA, WJCR Upton KY	7490na			
2100-2200	USA, WRMI/R Miami Intl	9955am			
2100-2200	USA, WRNO New Orleans LA	7355am			
2100-2200 smtwhf	USA, WVHA Greenbush ME	13695af			
2100-2200	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
2100-2145	USA, WYFR Okeechobee FL	15565af	17555eu	17845af	21525eu
2100-2200	Zambia, Christian Voice	3330af	4965af		
2100-2200 vl	Zambia, R Zambia/ZNBC 1	4910do			
2100-2200 vl	Zambia, R Zambia/ZNBC 2	6165do			
2100-2200 vl	Zimbabwe, Zimbabwe BC	4828do			
2115-2200	Egypt, Radio Cairo	9900eu			
2115-2130	United Kingdom, BBC WS	6175am	15390am	17715am	
2130-2200	Australia, Radio	13755pa	17795pa	17860pa	
2130-2155	Austria, R Austria Intl	5945eu	6155eu	13730af	
2130-2157	Czech Rep, Radio Prague	11600af			
2130-2200	Ghana, Ghana Broadc Corp	3366do			
2130-2200	Guam, AWR/KSDA	15310as			
2130-2200	Iran, VOIRI	6165au	6175au		
2130-2200	Sweden, Radio	6065eu	9430af		
2145-2200 a	Greece, Voice of	7480au	9425au		

2200 UTC

2200-2300	Anguilla,Caribbean Beacon	6090am			
2200-2300	Australia, Radio	11695pa	11855as	13755pa	15365pa
		17795pa	17860pa		
2200-2300 vl	Australia, VL8K Katherine	5025do			
2200-2300 vl	Australia, VL8T Tent Crk	4910do			
2200-2300	Canada, CBC N Quebec Svc	9625do			
2200-2300	Canada, CFCX Montreal	6005do			
2200-2300	Canada, CFRX Toronto	6070do			
2200-2300	Canada, CFVP Calgary	6030do			
2200-2300	Canada, CHNX Halifax	6130do			
2200-2300	Canada, CKZN St John's	6160do			
2200-2300	Canada, CKZU Vancouver	6160do			
2200-2230	Canada, R Canada Intl	5960eu	9755am	13670am	13740am
		15305am			
2200-2230	Canada, R Canada Intl	11705as			
2200-2300	China, China Radio Intl	7110eu	7170eu		
2200-2300	Costa Rica,RF Peace Intl	7385am			
2200-2300	Cuba, Radio Havana	6180na			
2200-2245	Egypt, Radio Cairo	9900eu			
2200-2300	Eqt Guinea, Radio Africa	15186af			
2200-2215	Ghana, Ghana Broadc Corp	4915do			
2200-2230	India, All India Radio	7150eu	7410eu	9910eu	9950eu
		11620au	11715au		
2200-2230	Iran, VOIRI	6165au	6175au		
2200-2225	Italy, RAI Intl	6150as	9565as	11815pa	
2200-2300	Lebanon, Voice of Hope	9960va			
2200-2215	Liberia,LCN/R Liberia Int	5100do			
2200-2300	Malaysia, Radio	7295do			
2200-2230	Moldova, R Moldova Intl	7520eu			
2200-2300 smtwh	New Zealand, R NZ Intl	11735pa			
2200-2215	Nigeria, FRCN/Radio	3326do	4770do	4990do	
2200-2230 s	Norway, Radio Norway Intl	9405sa			
2200-2300 vl	Papua New Guinea, NBC	9675do			
2200-2300	Russia,Voice of Russia WS	7105na	7250na	9620na	9655na
		9665na			
2200-2300	S Africa, Investment Ch	7225af	9475af	11870af	
2200-2215	Sierra Leone, SLBS	3316do			
2200-2300	Slovakia, Adv World Radio	6055af			
2200-2300 as	Spain, R Exterior Espana	6125eu	11775af		
2200-2300	Taiwan, VO Free China	15600eu	17750eu		
2200-2300	Turkey, Voice of	6135eu	7280eu	9560na	9655na
2200-2300	United Kingdom, BBC WS	5965as	5975am	6175am	6180eu
		6195as	7325va	9410va	9590am
		9660as	9890as	9915am	11750am
		11835af	11955as	12080as	15400af
2200-2230	United Kingdom, BBC WS	12095eu			
2200-2300	USA, KAIJ Dallas TX	13815am			
2200-2300	USA, KTBN Salt Lk City UT	15590am			
2200-2300	USA, Monitor Radio Intl	7510eu	13770sa	15665as	
2200-2300	USA, Voice of America	7215as	9705as	9770as	11760as
		15185as	15290as	15305as	17735as
		17820as			
2200-2230 mtwhf	USA, Voice of America	6035af	7340af	7375af	7415af
		11975af			
2200-2300	USA, WEWN Birmingham AL	6890na	9975eu	13615na	15375sa
		15745eu			
2200-2300	USA, WGTG McCaysville GA	5085am			
2200-2300	USA, WHRI Noblesville IN	5745am			
2200-2300	USA, WINB Red Lion PA	13790am			
2200-2300	USA, WJCR Upton KY	7490na			
2200-2300	USA, WRMI/R Miami Intl	9955am			
2200-2300	USA, WRNO New Orleans LA	7355am			
2200-2300 s	USA, WVHA Greenbush ME	5850eu			
2200-2300	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
2200-2300	USA, WYFR Okeechobee FL	21525af			
2200-2300 vl	Zambia, R Zambia/ZNBC 1	4910do			
2203-2210	Croatia, Croatian Radio	5895eu	7165eu	13830eu	
2230-2300	Canada, R Canada Intl	5960am	9755am	13670am	
2230-2227	Czech Rep, Radio Prague	7345na	11600na		
2240-2250	Greece, Voice of	7480au	9425au		
2245-2300	Ghana, Ghana Broadc Corp	3366do	4915do		
2245-2300	India, All India Radio	7170as	9705as	9950as	11620as
2245-2300	Vatican State, Vatican R	7305as	9600as	11830au	

Frequencies

2300-0000	Anguilla,Caribbean Beacon	6090am			
2300-0000	Australia, Radio	9660pa	11695as	12080pa	13755as
		15365pa	17795pa	17860pa	
2300-0000 vl	Australia, VL8K Katherine	5025do			
2300-0000 vl	Australia, VL8T Tent Crk	4910do			
2300-0000	Bulgaria, Radio	7480na	9435na		
2300-0000	Canada, CBC N Quebec Svc	9625do			
2300-0000	Canada, CFCX Montreal	6005do			
2300-0000	Canada, CFRX Toronto	6070do			
2300-0000	Canada, CFVP Calgary	6030do			
2300-0000	Canada, CHNX Halifax	6130do			
2300-0000	Canada, CKZN St John's	6160do			
2300-0000	Canada, CKZU Vancouver	6160do			
2300-2330 mtwhf	Canada, R Canada Intl	11940am	15305am		
2300-0000 as	Canada, R Canada Intl	5960am	9755am	11940am	13670am
		15305am			
2300-0000	Costa Rica, Adv World R	5030am	6150am	7375am	9725am
		13750am	15460am		
2300-0000	Costa Rica,RF Peace Intl	7385am			
2300-2310	Croatia, Croatian Radio	5895eu	7165eu		
2300-0000	Egypt, Radio Cairo	9900na			
2300-2350	Germany, Deutsche Welle	5980as	7235as	9690as	
2300-0000	Guam, AWR/KSDA	11775as			
2300-0000	Guatemala, Adv World R	11775am			
2300-0000	India, All India Radio	7170as	9705as	9950as	11620as
2300-0000	Lebanon, Voice of Hope	9960va			
2300-2315	Liberia,LCN/R Liberia Int	5100do			
2300-0000	Malaysia, Radio	7295do			
2300-0000 as	New Zealand, R NZ Intl	15115pa			
2300-2306 smtwh	New Zealand, R NZ Intl	11735pa			
2300-2315	Nigeria, FRCN/Radio	3326do	4770do	4990do	
2300-2325	North Korea, R Pyongyang	11700na	13650na		
2300-0000 vl	Papua New Guinea, NBC	9675do			
2300-2356	Romania, R Romania Intl	5990na	6155na	9510na	9570na
		11940na			
2300-0000	Russia,Voice of Russia WS	7105na	7125na	9665na	
2300-0000	S Africa, Investment Ch	7225af	9475af	11870af	
2300-0000	Turkey, Voice of	6135na	7280eu	9655na	
2300-0000	United Kingdom, BBC WS	3915as	5965as	5975am	6175am
		9580as	9590na	9915am	11750sa
		11945as	11955as	15380as	
2300-2315	United Kingdom, BBC WS	15400af			
2300-0000	USA, KAIJ Dallas TX	13815am			
2300-0000	USA, KTBN Salt Lk City UT	15590am			
2300-0000	USA, KWHR Naalehu HI	17510as			
2300-0000	USA, Monitor Radio Intl	7510af	13625as	13770sa	
2300-0000	USA, Voice of America	7215as	9705as	9770as	11760as
		15185as	15290as	15305as	17735as
		17820as			
2300-0000	USA, WEWN Birmingham AL	6890na	9975na	13615na	
2300-0000	USA, WGTG McCaysville GA	9400am			
2300-0000	USA, WHRI Noblesville IN	5745am	7315am		
2300-0000	USA, WINB Red Lion PA	13790am			
2300-0000	USA, WJCR Upton KY	7490na			
2300-0000	USA, WRMI/R Miami Intl	9955am			
2300-0000	USA, WRNO New Orleans LA	7355am			
2300-0000 mtwhf	USA, WVHA Greenbush ME	9900af			
2300-0000	USA, WWCR Nashville TN	5070am	7435am	9475am	13845am
2300-2315	Vatican State, Vatican R	7305as	9600as	11830na	
2307-0000	New Zealand, R NZ Intl	15115pa			
2330-0000	Australia, Radio	13605pa	17880pa		
2330-2355	Belgium, R Vlaanderen Int	9925sa	11690am		
2330-0000 vl	Ghana, Ghana Broadc Corp	4915af			
2330-0000	Iraq, Radio Iraq Intl	6050eu	11890eu		
2330-0000	Netherlands, Radio	6020na	6165na	9845na	
2335-2345	Greece, Voice of	9395sa	9425sa	9935sa	11595sa
2335-2345	Sierra Leone, SLBS	3316do			

Selected Programs

Sundays

2300 India, All India Radio: News and Commentary.
2300 USA, WWCR #1 Nashville TN: The Down Home Gospel Program. Brother Gary and Sister Wanda evangelize.
2300 USA, WWCR #3 Nashville TN: Harvest Time. Gospel music and inspiration from the United Pentecostal Church International.
2300 WHRI (Angel 2): Music. See S 0200.
2315 India, All India Radio: Program Preview.
2315 USA, WWCR #3 Nashville TN: Ask WWCR. A mailbag program that answers listener questions about the business of shortwave and radio propagation.
2330 USA, WWCR #1 Nashville TN: Breath of Life. Nathan Halton preaches.
2330 USA, WWCR #3 Nashville TN: World of Radio. Glenn Hauser's communications program for shortwave radio listeners.
2330 WHRI (Angel 2): The Prophecy Club. Stan Johnson discusses bible prophecy from Topeka, Kansas.

Mondays

2300 India, All India Radio: News and Commentary.
2300 USA, KWHR Naalehu HI: The Prophecy Club. Stan Johnson discusses bible prophecy from Topeka, Kansas.
2300 USA, WWCR #1 Nashville TN: Freedom Now (live). Irwin Schiff.
2300 USA, WWCR #3 Nashville TN: The Kurt Saxon Show (live). Kurt Saxon.
2300 WHRI (Angel 1): UPI News. See S 0400.
2300 WHRI (Angel 2): USA Radio News. See S 0400.
2305 WHRI (Angel 1): Music. See S 0200.
2305 WHRI (Angel 2): People to People (live). A program offering practical scriptural insights with Bob George.
2315 India, All India Radio: Program Preview.
2345 USA, KWHR Naalehu HI: Reach Out. See M 1500.

Tuesdays

2300 India, All India Radio: News and Commentary.
2300 USA, KWHR Naalehu HI: The Prophecy Club. See M 2300.
2300 USA, WWCR #1 Nashville TN: Freedom Now (live). See M 2300.
2300 USA, WWCR #3 Nashville TN: Newswatch Magazine. See T 0000.
2300 WHRI (Angel 1): UPI News. See S 0400.
2305 WHRI (Angel 1): Music. See S 0200.
2305 WHRI (Angel 2): People to People (live). See M 2305.
2315 India, All India Radio: Program Preview.
2340 India, All India Radio: DX-ers Corner (2/4).
2345 USA, KWHR Naalehu HI: Reach Out. See M 1500.

Wednesdays

2300 India, All India Radio: News and Commentary.
2300 USA, KWHR Naalehu HI: The Prophecy Club. See M 2300.
2300 USA, WWCR #1 Nashville TN: Freedom Now (live). See M 2300.
2300 USA, WWCR #3 Nashville TN: The Kurt Saxon Show (live). See M 2300.
2300 WHRI (Angel 1): UPI News. See S 0400.
2300 WHRI (Angel 2): USA Radio News. See S 0400.
2305 WHRI (Angel 1): Music. See S 0200.
2305 WHRI (Angel 2): People to People (live). See M 2305.
2315 India, All India Radio: Program Preview.
2345 USA, KWHR Naalehu HI: Reach Out. See M 1500.

Thursdays

2300 India, All India Radio: News and Commentary.
2300 USA, KWHR Naalehu HI: The Prophecy Club. See M 2300.
2300 USA, WWCR #1 Nashville TN: Freedom Now (live). See M 2300.
2300 USA, WWCR #3 Nashville TN: Newswatch Magazine. See T 0000.
2300 WHRI (Angel 1): UPI News. See S 0400.
2300 WHRI (Angel 2): USA Radio News. See S 0400.
2305 WHRI (Angel 1): Music. See S 0200.
2305 WHRI (Angel 2): People to People (live). See M 2305.
2315 India, All India Radio: Program Preview.
2345 USA, KWHR Naalehu HI: Reach Out. See M 1500.

Fridays

2300 India, All India Radio: News and Commentary.
2300 USA, KWHR Naalehu HI: The Prophecy Club. See M 2300.
2300 USA, WWCR #1 Nashville TN: Freedom Now (live). See M 2300.
2300 USA, WWCR #3 Nashville TN: The Kurt Saxon Show (live). See M 2300.
2300 WHRI (Angel 1): UPI News. See S 0400.
2300 WHRI (Angel 2): USA Radio News. See S 0400.
2305 WHRI (Angel 1): Music. See S 0200.
2305 WHRI (Angel 2): People to People (live). See M 2305.
2315 India, All India Radio: Program Preview.
2345 USA, KWHR Naalehu HI: Reach Out. See M 1500.
2354 Radio Netherlands: Documentary. 50th Anniversary Celebrations: Wim Kok (6th). See W 1254.
2354 Radio Netherlands: Documentary. Cities (Parts 1, 2, and 3) (13th/20th/27th). See A 2354.

Saturdays

2300 India, All India Radio: News and Commentary.
2300 USA, WWCR #1 Nashville TN: Light of Life Hour. Clement Bogle evangelizes from California.
2300 USA, WWCR #3 Nashville TN: The Hour of Courage. See M 0530.
2300 WHRI (Angel 1): Music. See S 0200.
2300 WHRI (Angel 2): The Prophecy Club. See S 2330.
2315 India, All India Radio: Program Preview.
2315 USA, WWCR #1 Nashville TN: The Blessed Word of Life. Perry L. Johnson preaches in Spanish and English from Washington, DC.
2330 USA, KWHR Naalehu HI: A Temple of Jesus Christ. Cleveland Waters.
2330 USA, WWCR #1 Nashville TN: The People's Gospel Hour. From Nova Scotia, Canada, Perry Rockwood interprets scripture for Christian life.
2345 WHRI (Angel 2): Wind of the Spirit. Barbara Jennison.

Hauser's Highlights

Uzbekistan: R. Tashkent in English:

0100-0130 7190, 9530, 9715
1200-1230 7285, 9715, 15295
1330-1400 7285, 9715, 15295

(*PanIview*)
0100 heard on 9375
(Alok Das Gupta, India, *BC-DX*)

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THE A AND K INDICES

By Jacques d'Avignon
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Before we dive into the topic of the indices, let's wrap up one more aspect of sunspots. Last month we discussed the definition and significance of the solar flux and sunspot numbers. One question that I am asked very often is "what the relationship is between the flux and the sunspot numbers?"

Over the years some simple equations have been elaborated to relate these two values to each other. I will give you two simple equations that could be used for going back and forth between the two units.

For sunspot number to solar flux:

SF=73.4+0.62R

SF is the solar flux and R is the daily sunspot number. For example, an SSN of 5 should give you a flux of 67.

To convert from flux to sunspot number the equation is not as straightforward:

SSN=SQRT [{(85.12=flux) x (33.52)}] - 408.99

The square root (SQRT) of the final number. As a test: for a flux of 67 you should be getting a SSN of 5.

THE K AND A INDICES

Two more numbers that appear whenever we read or listen to shortwave propagation forecasts are the K and A indices.

What happens on the sun has an effect on how the Earth's magnetic field will react. Therefore, by monitoring how Earth reacts we can infer what is "really" happening out there! The measure of the Earth's magnetic field reaction is reported by the "K" index that is broadcast by WWV at 18 minutes past the hour.

The "K" index is a measure of the reaction of the earth's magnetic field to the sun's influence and this measurement is made every three hours. The unit of measure is the *nanotesla,* and the measurement is corrected for each station that measures this index — necessary since each station has its own varying "background count" of magnetism. The range of the "K" index is from 0 to 9.

Also registered every three hours at each station is a number related to the K index, called the "a" index. The daily average of eight "a" indices taken every three hours at a specific station is designated the "A" index. The range for the "A" index is from 0 to 400. Should you hear that the "A" index is in the 100 range, grab a good book and a cup of coffee — chances are that listening conditions will be horrible. Try another day!

OPTIMUM WORKING FREQUENCIES (MHz)

For the Period 15 June to 14 July 1997 Flux=80 SSN=16

UTC	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
TO/FROM US WEST COAST																								
SOUTH AMERICA	18	16	15	15	15	14	13	12	11	10	9	10	11	13	14	16	16	17	18	18	18	19	19	18
WESTERN EUROPE	12	11	10	10	10	10	11	10	9	0	0	0	0	11	13	15	16	16	15	15	15	16	16	14
EASTERN EUROPE (P)	11	12	13	14	14	15	13	0	0	0	0	0	0	12	14	14	15	15	15	15	14	13	12	0
MEDITERRANEAN	14	14	0	6	6	14	12	0	0	0	0	0	0	0	15	16	17	17	18	18	18	17	16	15
MIDDLE EAST (P)	13	13	15	16	16	16	13	0	0	0	0	0	0	12	14	15	17	18	17	15	0	0	0	13
CENTRAL AFRICA	12	11	10	9	8	8	12	11	0	0	0	0	0	0	15	17	18	19	19	19	16	14	0	12
SOUTH AFRICA	0	10	9	8	8	7	10	12	11	0	0	0	0	0	15	17	18	18	15	0	0	0	0	0
SOUTH EAST ASIA (P)	18	17	17	17	17	17	16	14	0	0	0	10	11	11	12	13	14	14	14	14	0	0	0	16
FAR EAST	16	15	15	15	16	16	15	13	11	10	10	10	10	10	11	12	12	12	12	12	14	15	16	17
AUSTRALIA	20	20	19	19	20	18	17	15	14	12	11	12	12	11	11	12	12	0	0	0	0	17	20	19
TO/FROM US MIDWEST																								
SOUTH AMERICA	16	14	14	14	13	12	11	11	10	9	9	10	11	13	15	16	17	18	18	18	17	18	17	17
WESTERN EUROPE	14	12	12	11	11	11	10	10	10	0	0	12	13	15	16	16	17	16	16	16	16	17	17	16
EASTERN EUROPE	11	11	12	13	13	11	0	0	0	0	0	0	12	13	14	15	15	15	15	15	15	14	12	11
MEDITERRANEAN	14	14	13	13	13	11	10	0	0	0	0	0	13	15	16	17	17	17	17	17	17	16	15	15
MIDDLE EAST (P)	13	13	14	16	15	0	0	0	0	0	0	0	0	14	16	17	18	19	18	16	14	14	13	13
CENTRAL AFRICA	12	11	10	9	8	8	11	11	0	0	0	0	0	15	17	18	19	19	19	19	16	13	12	12
SOUTH AFRICA	10	10	9	8	8	7	10	11	11	0	0	0	0	15	17	18	19	18	15	0	0	0	0	0
SOUTH EAST ASIA (P)	16	16	16	17	16	15	0	0	0	0	0	10	11	12	14	14	14	14	14	14	0	0	0	15
FAR EAST	16	16	16	16	16	15	13	11	10	9	9	10	11	12	13	13	13	13	13	13	14	15	16	16
AUSTRALIA	18	18	18	18	18	16	15	13	12	12	12	12	11	11	12	12	0	0	0	0	0	17	19	18
TO/FROM US EAST COAST																								
SOUTH AMERICA	14	12	12	11	11	10	10	9	9	8	8	9	12	13	15	16	16	16	16	16	16	15	16	15
WESTERN EUROPE	13	11	10	10	10	10	9	9	9	9	11	13	15	16	17	17	17	16	15	15	16	15	15	15
EASTERN EUROPE	11	11	11	12	10	9	0	0	0	0	11	13	14	16	16	15	15	16	16	17	16	14	12	11
MEDITERRANEAN	13	13	12	11	11	11	10	0	0	0	12	13	14	15	16	16	16	16	16	16	16	15	14	13
MIDDLE EAST (P)	13	13	14	13	11	0	0	0	0	0	13	14	15	16	17	17	18	18	17	16	15	14	14	13
CENTRAL AFRICA	12	12	11	10	8	8	12	11	0	0	13	15	16	17	18	18	19	19	19	19	17	14	13	13
SOUTH AFRICA	10	9	9	8	7	7	11	11	0	0	0	14	16	18	18	18	19	18	15	0	0	0	11	10
SOUTH EAST ASIA (P)	16	16	16	14	0	0	0	0	0	0	0	13	15	16	16	15	14	14	14	14	14	13	13	14
FAR EAST	16	16	16	16	14	0	0	0	0	10	11	12	13	14	13	13	13	13	13	14	15	15	16	16
AUSTRALIA	17	18	18	17	15	13	12	11	11	11	10	11	12	12	12	0	0	0	0	0	0	17	18	17

It would be difficult for me explain in minute details the SSN and the flux numbers, plus the K and the A indices in just a few pages. But if you are interested in finding more about these subjects, here are a few references that you could consult:

1. The NEW *Shortwave Propagation Handbook*; Jacobs, George, W3ASK; Theodore J. Cohen, N4XX; Robert B. Rose, K6GKU. CQ Communications Publishing, 1995. ISBN 0-943016-11-8. (Excellent reference book.)

2. *A Radio Frequency User's Guide To The Space Environment Services Center Geophysical Alert Broadcasts;* Rosenthal, David A., Joseph W. Hirman. National Oceanic and Atmospheric Administration, Space Environment Laboratory. June 1990, Revised May 1992. Technical Memorandum ERL SEL-80. (Everything you always wanted to know about the WWV/WWVH broadcasts for which you could not find a source.)

I hope that the last two columns have cleared up some to the mysteries surrounding these units. If you have more questions write to me at the magazine or at the e-mail address above.

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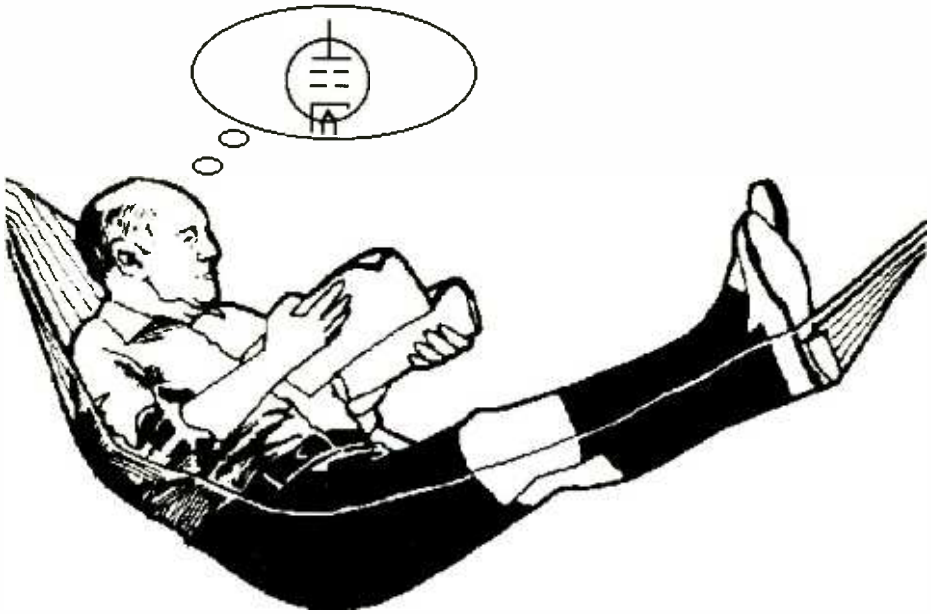
Random Summer Thoughts

This is the time of year we all tend to get a bit lazy. The temperatures rise and we all tend to look for a shady spot to relax. Well, there is no reason you can't relax and play radio, or at the very least devote some thought to it. Following are some loose notions I found on digging through my files which somehow never germinated into a full column.



■ Society for the Preservation of Radio

At a local hamfest crawl, I ran across a very old book published by the American Radio Relay League called *How to Become a Radio Amateur*. Certainly the League and several other sources have published many more modern and appropriate books since this one, copyrighted in 1974. However, the book caught my eye for another reason. In it were schematics and construction information for a basic but highly serviceable 80\40\15 meter receiver and a great little 10 watt, one tube 80\40 one tube transmitter rolled together around the venerable 6T9 vacuum tube.

I happened to come across this book about the same time as the August '96 issue of *MT* came out in which I mentioned the old W5LET one tube transmitter circuit that appeared in *Electronics Illustrated* back in 1968. I was surprised to receive a good deal of e-mail about that old circuit. This got me to thinking (always dangerous): We have a lot of folks in the radio monitoring hobby who are dedicated to the restoration of older and even antique radio receivers and transmitters. Maybe there is room in the hobby for a group dedicated to the preservation, construction, and active use of older design radio circuits, such as those that have appeared in years gone by in any one of a dozen radio hobby magazines. Maybe we could call it "The Society for the Preservation of Good Old Fashioned, Build at Home, and Used With Pride, Radio."

I don't have enough hours in the day to get something like this off the ground, but if anyone wants to take up the mantle, I would be happy to join and even contribute a few designs from my files. It could be an idea whose time has come. In this world of surface mount technology and equipment that can't be serviced at home with less than a few thousand dollars of test gear, it's refreshing to know you can still put a decent signal on the air for a few bucks and with a few tools. And since this is, in fact, a beginner's column, I would remind you that it's a lot easier to understand how radio works when you go over one of these older radio circuit designs. Heck, in many modern rigs all you can do is point to a chip and say "some kind of magic happens in there."

■ A Journey to the Junk Box

And in a related topic, let me ask you all a question. How does your junk box look these days? What, you don't have a junk box? Even beginners need a junk box! The junk box is the place you will likely find many of the components you will need to try out some of those circuits you will likely find in the SFTPOGOFBAHAUWPR club newsletter (if it ever gets off the ground).

It's never too early in the radio hobby to start a small collection of future useful electronic stuff. Especially be on the lookout for those things that are increasingly hard to find, such as air variable tuning capacitors and transformers with more than just a 12 volt secondary winding.

Be warned that as you grow in this hobby you will discover that junk boxes can easily grow into junk closets, junk rooms, and even junk floors. That's great if you have the space; however, if you just concentrate on keeping those few things that can't be found in either Radio Shack or one of the better parts catalogs such as Mouser or MCM, you should be able to keep your collection manageable.

■ Getting Wired

Related to the aforementioned topic: I keep a separate junk box these days for wire and cable. Just about every radio project from circuit construction to antenna design requires that you be in possession of some quantity of wire. Instead of running out to the local electronics outlet every time I need some wire, I first duck into my wire junk box. I can usually save quite a few pennies this way.

Again, a word of caution is in order: Never use a wire smaller than expected by the circuit design unless you know what you are doing. If the project calls for #6 (big) and you try to use #18 (small) wire, at the very least the circuit won't be as sturdy; at the worst, the wire may not be able to handle the amperage load and you may experience heating, failure, and even fire. So pay attention to such things as wire gauge in project construction.

Speaking of wire: Do you need a good source for nice heavy antenna wire that will last a long time without problems? Drive right past your electronics supply outlet to your

nearest hardware superstore (Builder's Square, Hechinger's, Home Depot, or Rickels, just to name a few). I have found the better stocked electrical sections of these stores routinely carry wire gauges all the way up to #4 (really nice and big) and stranded cable of even more monstrous gauges for full house wiring projects. These wires are usually sold by the foot and can be had with or without insulation.

I bought some of this stuff to construct dipoles that positively scare my neighbors, but I won't have to worry about them coming down in a big windstorm unless they snap their support trees off at the trunk! If you don't have a hardware superstore in your neck of the woods, just hit the yellow pages under Electrical or Electricians Supplies and you should be able to find similar stuff.

■ Signal Route Canal

While you're in that super-duper hardware store's electrical aisle, you can find some neat goodies that can really make for safe, neat antenna routing into your shack. I've long been partial to adapting common household clothes dryer vent outlets for routing wires into my radios. While these work just fine, invariably someone feels the need to ask, "Hey, how come you have your antennas hooked up to your dryer?"

After running out of sarcastic answers for this question, I realized that there might still be an even better way to get this job done, or at least reduce the number of times I would need to explain it to folks. Sure enough, while I was shopping for that serious gauge antenna wire, I came across an idea that may work for you in some applications.

As a beginner, you will discover that peace at home and with your neighbors can depend on making your antenna system look as neat and professional as possible. Getting the cables into the house is often a place where decorum dies in favor of expedience. This does not need to be the case. Let's think about what we are doing here: We are trying to bring wires into our house. Well, how do the professional electricians do this? They use a specially designed inlet called a "Weather Head." If you want to get an idea of what I'm talking about, go outside your humble abode and take a look at how the main electrical service comes into your home.

The weather head is usually made of metal with insulation, or more modern ones are made out of PVC. Using such an inlet, it is easy to route antenna cables into your house in a manner that will look neat, but will also protect you from leaks as well as those little creatures that tend to find every opening. I must admit that keeping the squirrels out of my old dryer vent system was a bit of a chore.

At my hardware outlet I found a couple of different weather head designs. These all coupled to PVC conduit pipe, so the installation could be made either vertically through the roof or horizontally through a wall. A few dollars and a little bit of imagination should yield a route for your wires that will be downright handsome. Now all you'll have to do is explain why you have two electrical services coming into your house, instead of why your dryer needs an antenna!

By the way, don't forget to install surge protectors into your outside cable runs, *before* the cables enter the weather head. Always route the ground wire for these surge protectors as directly as possible to a good earth ground. And remember that great big wire we talked about earlier? Use nothing less than #6 for your ground connection. Safety first! Always make sure your antennas and cables do not cross the path of other services coming into your home. Also, always check your local building codes to assure compliance.

Don't leave the hardware store or electronics supply house just yet. We still have to get the wires from the weather head to the rigs. Since it is not always possible to have your lead-ins come into the same place your radios are located, you may want to do a bit of thinking about running your wires through the walls. This is a bit scary if you've never done any work like this, but check your local library or the book section of that big hardware outlet. You'll find plenty of help in figuring out how to route wiring through walls, crawl spaces, and ceilings. Properly done, this can make your station look professional both inside and outside.

What I have done with my latest system is to bring my cable in through a weather head, through a wall, and into a common outlet box installed in the wall for just this purpose. All my cables route nicely through this box and, should I change my location, the now empty box can simply be blocked off with a cover plate. Neat, clean, and simple, using common electrician's supplies.

Well, there you have some random tangents that should give some food for thought as you relax this summer. The warm weather is the best time to rethink your antenna systems, so have at it. If the counter person at the hardware store gets a little confused, why not take a few minutes to tell them about the greatest hobby in the world? Maybe you can get them to join in on the fun. Of course, there's also the possibility of a discount on supplies if you can get them hooked, so it's worth the conversation, right?

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LDXA Returns

Veteran readers will remember the Longwave DX Award (LDXA) contests that we ran a few years ago. These events were extremely popular, and recently I've had several requests for a new longwave contest. Based on suggestions from several readers, I've put together a new event for '97. Everyone is invited to participate!

The object of LDXA '97 is to log the most miles-per-watt on 10 beacons of your choosing. The beacons used must be in the range of 190 to 530 kHz, and the *Aero/Marine Beacon Guide* will serve as the official source for determining transmitter output power and location.

To determine your "miles-per-watt" score, simply divide the distance (in miles) by the power output of the beacon. For example, suppose you log a station that is 525 miles away running 25 watts. Your score would be 21 points (525÷25W=21). Here are some other scoring examples: 800 miles/100 watts=8 points, 1000 miles/50 watts=20 points, 2000 miles/400 watts=5 points.

All participants are eligible for two levels of prizes as follows:

Beacon Chaser's Award—All participants earning at least 150 points will receive a numbered LDXA wall certificate (see Figure 1).

Grand Prize—The DXer earning the highest total points will also receive the grand prize—a free copy of *The Art of NDB DXing*, donated by Stephen P. McGreevy. (See the May issue for a brief review of this book.)

Proof of reception for the 10 beacons can be provided in two ways:

1. A signed QSL card or a verification letter dated after June 1, 1997.
2. A cassette tape recording of each beacon's ID. (Sorry, tapes cannot be returned.)

Entering the contest is simple: Write the IDs of your 10 best catches on a piece of paper. Be sure to indicate the "miles-per-watt" of each catch using the formula explained above. Below this, indicate your claimed total score .

Mail your entry along with proof of reception and two U.S. letter stamps (.32¢ each) to: Below 500 kHz —LDXA contest, P.O. Box 98, Brasstown, NC 28902. Entries must be received by July 20th, 1997. All award winners will be announced in "Below 500 kHz." Good luck!

FIGURE 1. *A score of at least 150 entitles you to this certificate.*

■ Loggings

We have an excellent turnout for loggings this month. The contributors are: Al Hemmalin (RI), Hank Holbrook (MD), Phil Gentile and John Storsberg (mobile—Eastern, PA), Allen Renner (PA), Perry Crabil (VA), and Dick Pearce (VT).

The logs from Phil Gentile and John Storsberg require some explanation. They were made during their southbound trek to the Winter SWL Fest in Kulpsville, Pennsylvania. (This is only the second time I've received mobile loggings, and the first time I've had them handed to me in person at a radio meet!) Thanks to all contributors.

■ End Notes

I guess I've known it all along, but at this year's Winter SWL Fest I rediscovered the camaraderie that exists between radio hobbyists. It became clear to me that there's something almost magical about radio that extends far beyond the sterile bounds of the Internet, computers, GPS, and other "high technologies."

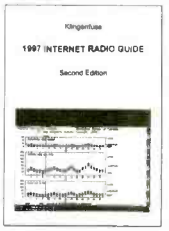
One listener put it this way: If his hobby is collecting rocks, and someone comes out with a synthetic rock, it poses little threat to his hobby. He'll go right on collecting the real thing. And so it is, I believe, with radio.

I plan to be at next year's Winter SWL Fest (March 13 & 14, 1998), and it would be a pleasure to meet you there. Stay tuned for more details.

Loggings

FREQ.	ID	LOCATION	BY	FREQ.	ID	LOCATION	BY
212	JX	Jackson, MI	P.C. (VA)	345	BGI	Bridgetown, Barbados	A.R. (PA)
212	UCF	Cienfuegos, Cuba	A.H. (RI)	360	KIN	Kingston, Jamaica	P.C. (VA)
221	RQM	Rangley, ME	P.C. (VA)	362	GND	Pt. Salinas, Grenada	A.H. (RI)
230	AQE	Alwood, NC	D.P. (VT)	363	RNB	Millville, NJ	P.G./J.S.*
232	GT	Grand Turk I., BWI	A.H. (RI)	366	HXM	Hazelton, PA	P.G./J.S.*
260	YAR	Yaritagua, Venezuela	A.H. (RI)	367	HA	Hao Atol, Fr. Polenesia	A.H. (RI)
264	PT	Pottstown, PA	P.G./J.S.*	385	UR	New York (La Guardia)	D.P. (VT)
269	EL	Wellsville, NY	P.C. (VA)	388	NXX	Willow Grove, PA	P.G./J.S.*
275	ING	Philadelphia, PA	P.G./J.S.*	397	LLJ	Challis, ID	P.C. (VA)
280	IPA	Isla De Pascua, Chile	A.H. (RI)	399	UP	Upernavik, Greenland	A.H. (RI)
281	CA	Cartwright, NFLD	A.R. (PA)	400	CAX	Rio De Janiero, Brazil	A.H. (RI)
284	TEH	Bogata, Columbia	A.H. (RI)	405	UTX	Jupiter, FL	D.P. (VT)
287	SMR	Santa Marta, Colombia	P.C. (VA)	414	HZE	Hazen, ND	A.R. (PA)
305	RO	Roswell, NM	D.P. (VT)	419	TX	Lawrenceville, GA	A.H. (RI)
307	LUX	Laurens, SC	D.P. (VT)	421	EF	McKinney, TX	A.R. (PA)
310	CN	Canivete, Brazil	A.H. (RI)	500	VFF†	Iqaluit, NWT	H.H. (MD)
311	TBG	Panama City, Panama	A.H. (RI)	500	WJLP†	New Orleans, LA (ship)	H.H. (MD)
327	FXC	Cayenne, Fr. Guiana	A.H. (RI)	500	WUQL†	Newark, NJ Pier (ship)	H.H. (MD)
335	CNK	Concordia, KS	A.R. (PA)	500	ZBM†	St. George's Bermuda	H.H. (MD)
338	BY	St. Barthelmy, Guadalope	A.H. (RI)	512	HMY	Lexington, OK	A.R. (PA)
338	LH	Lancaster, OH	D.P. (VT)	515	ONH	Jefferson City, MO	D.P. (VT)
339	LQX	Lehighton, PA	P.G./J.S.*	* Logged mobile in Eastern PA			
342	CXE	Chase City, VA	D.P. (VT)	† Maritime CW transmission			

1997 INTERNET RADIO GUIDE



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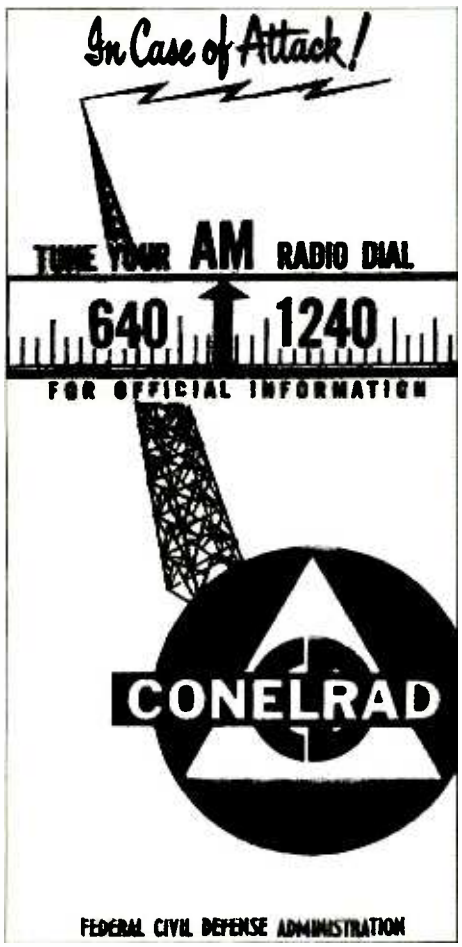
Expanded-band Special

The expanded 1610-1700 kHz AM band continues to be home to most of the big news in domestic-band radio. A couple of new stations have appeared, and the FCC has released yet another frequency assignment table. Warm up your receiver and sharpen your logging pencil; there's gold up there in the top end!

First, the new assignment table. This table was released on March 17 and appears to be final. It draws from the plan I mentioned in this column last June, but includes the response to several petitions for reconsideration. If you have Internet access, you can read the official Public Notice at **http://www.fcc.gov/Bureaus/Mass_Media/Public_Notices/pnmm7038.html**.

Stations listed in this table have until June 15 to file FCC Form 301 requesting a construction permit to change frequency. Once the Commission is convinced the applications are technically complete, they'll release a "cut-off list" allowing others to challenge the technical parameters. Assuming there are no such challenges, or that they don't succeed (in my opinion a reasonable assumption), construction permits will be granted. Once the new expanded-band facilities are licensed for regular operation, stations will be allowed to operate on both their new and old frequencies for as long as five years.



In February, I mentioned the Conelrad emergency broadcasting system, the "grandfather" of today's EAS. Stephen Jeske N0CRS of suburban Mineapolis sent this government pamphlet explaining the system.

The table is similar to the one released last year, but with a few important changes. You may remember that KXBT started its expanded-band career on 1640 kHz, then moved down to 1630 when the June 1996 table was released. They'll now move back to 1640. Also note that KALT-900 in Texas remains the only station to be assigned to 1610 kHz. While the Public Notice doesn't say so, I assume 1610 will continue to be reserved for tourist-information stations.

As you may remember, WJDM and KXBT owe their early presence in the expanded band to a special act of Congress requiring the assignment of an expanded-band frequency to any daytime-only station that's the only station licensed to a city of over 100,000 population. When the law was written, Elizabeth, NJ, was the only city qualifying, but population growth caused Vallejo, CA, to also qualify. Solid rumors on the Internet now suggest that Costa Mesa, CA, has also passed the 100,000 mark, qualifying KNNZ-540 for an automatic spot in the expanded band.

Reports are that KNNZ, KNNS-1260 (also in suburban Los Angeles), and XETIN-540 Tijuana, Mexico, will simulcast a classical-music format. Keep your ears open on 1650; there may already be a signal there by the time you read this.

The next news item involves two low-powered stations that are still being heard over a wide swath of the country. In mid-February, DXers began to notice two very loud and very obvious tourist-information stations on the expanded band. Both stations are using the calls WQO-767, and both are located at the Dallas-Fort Worth International Airport. The station on 1640 kHz carries information on American Airlines arriving flights, and the one on 1680 carries information on departing flights.

WOW-950 Omaha is not on the expanded-band list, for good reason. Its coverage on the 590 kHz frequency is already the envy of most of the 5 kW stations and many 50 kW operations!

Both stations have been heard on both coasts, and even in New Zealand! The signals are very strong. Believe it or not, they're only running 60 watts to 50-foot loaded whip antennas! (I told the engineer in charge I'd like one for my ham station — he advised me they cost $2,700..) Give these two a try; they should be easy additions to your log. John Mayson in eastern Florida and Dennis Elya in Jefferson City, Missouri, have both already landed these two. (John forwarded most of the technical and QSL information; thanks!) If you do log these stations, you can email for a QSL to **jblair@metronet.com**, or write to Mr. Joe Blair, c/o DFW International Airport, P.O. Box 619428, DFW Airport, TX 75261.

Another set of travelers-information stations have appeared in the Chicago area. There are three stations, operated by METRA, the commuter railroad in the northern suburbs. All three operate on 1630 kHz. They can be distinguished by a train whistle that's part of their tape loop. One station, at Lake-Cook Station (which I believe is in Northbrook, Illinois — can any Chicago-area readers confirm?) seems dominant at my location, but I can also hear the other two underneath. Yet another travelers-information station that's been around a bit longer, but is also widely heard in the East, is on 1620 kHz in Augusta County, Virginia (about 100 miles southwest of Washington, D.C.).

■ Bits and Pieces

Dropping back into the regular band, but sticking with the theme of travelers-information stations, Mike King forwarded an item on

NEW EXPANDED-BAND LIST

Call	City	Old freq.	New freq.	Call	City	Old freq.	New freq.
KALT	Atlanta, TX	900	1610	WCHQ	Camuy, PR	1360	1660
WGYJ	Atmore, AL	1590	1620	KRZI	Waco, TX	1580	1660
KAHI	Auburn, CA	950	1620	KSOS	Brigham City, UT	800	1660
KECN	Blackfoot, ID	690	1620	KHPY	Moreno Valley, CA	1530	1670
WHLY	South Bend, IN	1580	1620	KHTE	Redding, CA	600	1670
KHRT	Minot, ND	1320	1620	KCOL	Fort Collins, CO	1410	1670
KOIL	Bellevue, NE	1180	1620	WRCC	Warner Robins, GA	1600	1670
WJRZ	Toms River, NJ	1550	1620	WLVW	Salisbury, MD	960	1670
KENN	Farmington, NM	1390	1620	KBTN	Neosho, MO	1420	1670
WKZQ	Myrtle Beach, SC	1520	1620	KKEL	Hobbs, NM	1480	1670
WTAW	College Station, TX	1150	1620	WTDY	Madison, WI	1480	1670
WRRA	Frederiksted, VI	1290	1620	KXEX	Fresno, CA	1550	1680
KRIZ	Renton, WA	1420	1620	KBZS	Grand Junction, CO	620	1680
KWFM	Tucson, AZ	940	1630	WXTO	Winter Garden, FL	1600	1680
KQQQ	Clovis, CA	790	1630	KJCK	Junction City, KS	1420	1680
WRDW	Augusta, GA	1480	1630	KMLB	Monroe, LA	1440	1680
KCJJ	Iowa City, IA	1560	1630	WSFN	Muskegon, MI	1600	1680
KHVN	Fort Worth, TX	970	1630	KBRF	Fergus Falls, MN	1250	1680
KSHY	Fox Farm, WY	1530	1630	WHWH	Princeton, NJ	1350	1680
KBLU	Yuma, AZ	560	1640	WKTP	Jonesborough, TN	1590	1680
KXBT	Vallejo, CA	1190	1640*	KBNA	El Paso, TX	920	1680
WVMI	Biloxi, MS	570	1640	KLFE	Seattle, WA	1590	1680
WSYD	Mount Airy, NC	1300	1640	KRCX	Roseville, CA	1110	1690
KLXX	Mandan, ND	1270	1640	KQXI	Arvada, CO	1550	1690
WTRY	Troy, NY	980	1640	WBIT	Adel, GA	1470	1690
KCRC	Enid, OK	1390	1640	KILR	Estherville, IA	1070	1690
KPHP	Lake Oswego, OR	1290	1640	WDDD	Johnson City, IL	810	1690
KURV	Edinburg, TX	710	1640	WPTX	Lexington Park, MD	920	1690
KTKK	Sandy, UT	630	1640	KLAT	Houston, TX	1010	1690
WKSH	Sussex, WI	1370	1640	WGOD	Charlotte Amalie, VI	1090	1690
KWHN	Fort Smith, AR	1320	1650	WEUP	Huntsville, AL	1600	1690
KNNZ	Costa Mesa, CA	540	1650*	KNST	Tucson, AZ	790	1700
KRKS	Denver, CO	990	1650	KQKE	Soledad, CA	700	1700
WAOK	Atlanta, GA	1380	1650	WCMQ	Miami Springs, FL	1210	1700
KCFI	Cedar Falls, IA	1250	1650	KKSO	Des Moine, IA	1390	1700
KTMT	Phoenix, OR	880	1650	WZNN	Rochester, NH	930	1700
KSVE	El Paso, TX	1150	1650	KAST	Astoria, OR	1370	1700
WPMH	Portsmouth, VA	1010	1650	KKLS	Rapid City, SD	920	1700
WNTM	Mobile, AL	710	1660	KBOR	Brownsville, TX	1600	1700
KLOQ	Merced, CA	1580	1660	KDSX	Denison-Sherman, TX	950	1700
WMIB	Marco Island, FL	1480	1660	WSVA	Harrisonburg, VA	550	1700
WREN	Kansas City, MO	1250	1660*				
WQSN	Kalamazoo, MI	1470	1660				
WGIV	Charlotte, NC	1600	1660				
KQWB	West Fargo, ND	1550	1660				
WJDM	Elizabeth, NJ	1530	1660*				
KSLM	Salem, OR	1390	1660				

* WJDM and KXBT are already operating in the expanded band, though KXBT is currently on 1630. KNNZ's 1650 kHz operation may have begun operation in April. WREN is currently located at Topeka, Kansas, but has a construction permit to move (on their old frequency) to Kansas City.

a rather high-powered "TIS" in suburban Washington. WINX-1600 Rockville, Maryland, has never been a very successful station; its highly directional signal is basically restricted to coverage of Montgomery County.

That's just fine with county officials who recently purchased the station for $450,000. The county Department of Public Works has signed a contract to buy the radio station, and asked the FCC to approve transfer of its license. WINX (the call letters will be changed) will broadcast traffic and other emergency information to county residents, replacing a network of 12 low-power stations with limited coverage.

• Tom Bryant of Nashville recently visited the Cayman Islands and brought back some radio information from that tourist destination. The Caymans are a British dependency located in the western Caribbean, about midway between Havana, Cuba, and Kingston, Jamaica.

Radio Cayman is the government station here. They operated two AM frequencies, 1205 and 1555. Both transmitters were pretty old, and plans were to allow each frequency to go silent whenever its transmitter required repairs. 1555 kHz has, in fact, gone silent forever. However, there was enough demand for an AM service that upgrades have been made to the 1205 kHz transmitter. This frequency will remain on the air, and should be a potential DX target for listeners in Florida and the Gulf Coast area.

There are also four Radio Cayman FM stations. As listed in the *World Radio-TV Handbook*, these are on 89.9, 91.9, 93.9, and 105.3MHz, though the power on 89.9 is 3 kW rather than the 250 watts listed. Beyond the Radio Cayman stations, there are also two private FM stations in the islands: Z-99 on 99.9 MHz and ICC 1 on 101.1MHz. All six of these FMs should be audible in the southern USA by sporadic-E skip, and in fact DXers in Florida and Alabama have heard the 89.9 station. Incidentially, as you read this, we're at the peak of the sporadic-E season; some serious DX is possible on the FM and low (2-6) TV channels.

• With the various Internet addresses appearing in this month's column, maybe it's time for a few more. There are three "reflectors" — mailing lists for those interested in domestic-band DXing. A comprehensive list is the "AM/FM/TVDX" group at **amfmtvdx@grove.net**. For the "AM Newsflash," send your email address, name, and location to **bytheway@atk.com**. And for the "DX List" for FM/TV DXers, write **chernos@web.net**. And of course, be sure to check out the domestic-band clubs in Club Corner, in the back of this issue of *MT*.

Let us know what you're hearing on the domestic bands! Write P.O. Box 98, Brasstown NC 28901, or via the Internet to 72777.3143@compuserve.com. Good DX!

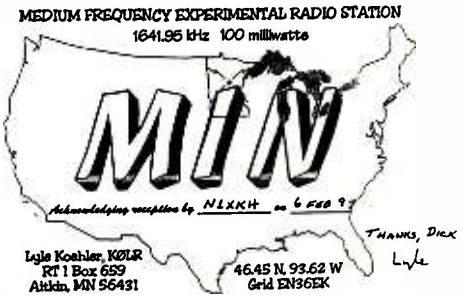
OUTER LIMITS

THE CLANDESTINE, THE UNUSUAL, THE UNLICENSED

George Zeller
George.Zeller@acclink.com

Pearce QSL's 100 Milliwatt Station

Longtime *Monitoring Times* contributor Dick Pearce of Brattleboro, Vermont, sent in the QSL that we see here from **MIN** on 1642 kHz in Altkin, Minnesota. Although MIN is unlicensed, its 100 milliwatt transmitter is legal under FCC regulations. Station operator Lyle Koehler, K0LR, reports that Dick's reception report is the first one that the station has ever received from New England. We certainly congratulate Dick on this outstanding DX catch. In the March issue we profiled the record breaking 15,000 watt Christmas Eve pirate transmission from **WJDI,** but Dick proves that it's possible to hear stations with a tiny fraction of that power level.



Dick Pearce's amazing 100 mW QSL

■ New Weiner Book

Allan Weiner, former operator of many prominent North American unlicensed stations such as **Radio New York International** and **KPF-941,** has written a book about his experiences. Co-authored by veteran DX author Anita McCormick, *Access to the Airwaves: My Fight for Free Radio* has been published by Loomponics Unlimited.

Weiner, certainly a controversial figure, is still the best known pirate operator in North American history. The 250 page book discusses his career in radio and his confrontations with the FCC. It's available for $17.95 plus $4.95 shipping and handling. You can use the toll free Loomponics number of (800) 380-2230; the book is also available from many *Monitoring Times* advertisers.

■ FRN/ACE Web Change

Last month we mentioned the new world wide web site of the Association of Clandestine radio Enthusiasts, operated in cooperation with John Cruzan and Kirk Trummel at the Free Radio Network. Before the ink was completely dry in the May *Monitoring Times*, both of these sites changed their addresses. The excellent Free Radio Network pirate site now has **http://www.frn.net/** as its URL, while **http://www.frn.net/ace/** is the address of the new ACE web page. If you want to search the web for pirate radio information, these sites are certainly the best place to start your surfing.

■ Mexican DX Conference

Jeff White of **WRMI** in Miami advises us that the Third National Meeting of Mexican DXers will be held August 1 and 2 in Veracruz, Mexico. This informal get together, sponsored jointly by four Mexican DX clubs, anticipates participation from shortwave stations in Mexico and the United States. USA DXers are welcome, although Jeff advises that it would help if you speak some Spanish. For additional information, registration forms, and hotel information, contact Jeff at Radio Miami International, PO Box 526852, Miami, FL 33152. The **wrmi@compuserve.com** e-mail address also works for messages to Jeff.

■ Micropirate Activity

Scores of low powered FM pirates are continually active in the USA, especially in urban areas. Jeff Ryan of Yardley, Pennsylvania, sends in a log of **WZZR** on 98.5 MHz. The station's announcer "Volcano" programmed rock music from an announced location in West Chester, Pennsylvania. He gave no address, but took phone calls at (610) 738-7030.

Radio Free Lenawee, which we have already mentioned twice this year, has made more news from southeastern Michigan. Station operator Rev. Rick Strawcutter received a tape from Heavens Gate just two days before the mass suicide of 39 cult members in California. Strawcutter's station remains on 97.7 MHz from Adrian, Michigan, despite an FCC bust, and his tape was aired by **WTOL-TV** in Toledo. Thanks go to *MT* reader Rob Holman of Flat Rock, Michigan, for this story that ran in *The Monroe Evening News.*

Accounts on other micropirates arrived from the *Austin American-Statesman* via Maury Mildo of Wimberley, Texas, where California's **KPFA** is relayed on 105.9 MHz, and from *The Dispatch and The Rock Island Argus*, which covered Mbanna Kantako's renamed **Human Rights Radio** in Springfield, Illinois. Kantako's long-running political station has moved from the John Hay Public Housing Project to a new site on North Sixth Street in Springfield.

■ What We Are Hearing

Your pirate loggings are always welcome via PO Box 98, Brasstown, NC 28902, or via the e-mail address at the top of the column. All frequencies are in kHz, with times in UTC.

North American pirate stations listed here use the following addresses: PO Box 1, Belfast, NY 14711; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 28413, Providence, RI 02908; PO Box 146, Stoneham, MA 02180; PO Box 11522, Huntsville, Alabama 35814; PO Box 88, Moline, MI 49335; PO Box 293, Merlin, Ontario N0P 1W0; Postfach 510, CH-4010 Basel, Switzerland; Box 99, 1st Floor Suite, 253 Selhurst Road, London SE25 6XT, England; and PO Box 3103, Napier, New Zealand. For return postage, enclose three 32¢ stamps in the envelope to USA addresses. $2 US or two International Reply Coupons go to foreign maildrops.

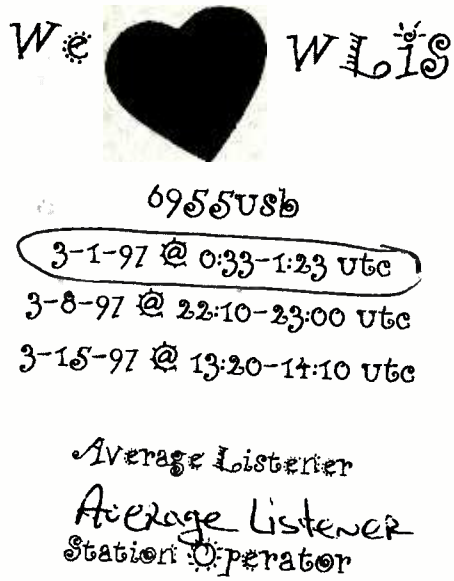
Anteater Radio- 6955 at 0200. Their comedy consists of skits on topics like White Trash Airlines. Barry reported a killer signal. Addr: Belfast. (Kenny Love, Columbia, SC; Barry Williams, Enterprise, AL; Pearce)

Cherokee Radio- 6955 at 2330. Apparently also using a slogan or ID of **Native American Radio,** this new classic rock station seems to identify with American Indian issues. Addr: None; said would QSL logs in *The ACE.* (Shawn Axelrod, Winnipeg, Manitoba; George Zeller, Cleveland, OH; Rich and Talea Jurrens, Katy, TX; Neil Wolfish, Toronto, Ontario)

Free Hope Experience- 6955 at 2215. Major Spook has a working transmitter again, so we can hear his offbeat mix of rock and unusual commentaries. Addr: Blue Ridge Summit. (Peter Lautzenheiser, Wooster, OH; Coatsworth; Williams)

FBI Radio- 6955 at 0230. "Females Broadcasting Interference" are back with their rock music, supplemented by commentary on cults and the comet. Addr: Huntsville. (Bill McLintock, Minneapolis, MN; Jerry Coatsworth, Merlin, Ontario; Lee Silvi, Mentor, OH; Mike Ryan,

Buena Park, CA; Jurrens)
K-2000- 6955 at 2300. Some have wondered if this extremely funny station is still verifying. Scott answered this question when he got a "5 Years of Hell" QSL card in 31 days. Addr: Stoneham. (Scott Krauss, Cleveland, OH)
KIWI- 7475 at 0715. This New Zealand pirate has been relaying South American pirates like **Radio Piraña** and **Radio Cochiguaz,** so be careful when listening for identifications. Nice catch, Harold! Addr: Napier. (Harold Frodge, Midland, MI)
Laser Hot Hits- 6955 at 1600. It's very rare to hear this Europirate rocker directly from a European transmitter, but it gets a boost occasionally from a transmitter in North America. Addr: Merlin. (Silvi)
Lounge Lizard Radio- 6955 at 0030. The programming on this new soft rock station is self-described as "Lounge Music." Addr: Providence. (William Hassig, Mt. Prospect, IL; McClintock; Silvi; Williams)
Mystery Radio- 6955 at 0000. After you listen for a while to their miscellaneous new age music, it's possible to recognize the station just from the mood it creates. Addr: Providence. (Basil Shelley, Blythe, CA; Mike Ryan; Silvi; Williams)
Omega Radio- 6955 at 1930. Kevin submitted this log as unidentified, but Dick Tator's "Spirit in the Sky" interval signal makes it probable that a show of weird phone calls was from this station. Addr: Moline, but Belfast still works. (Kevin Nauta, Grand Rapids, MI; Hassig)
Radio Azteca- 6955 at 2300. Bram Stoker's hilarious DX parody shows are one of the great attractions of pirate radio listening. Ranier was extremely pleased to report that this North American station has been heard in Europe! Addr: Belfast. (Ranier Brandt, Germany; Mike Prindle, New Suffolk, NY; Axelrod; Coatsworth; Jurrens; Love; Nauta; Pearce; Prindle; Silvi; Williams; Wolfish)
Radio Eurogeek- 6955 at 0200. This clever spoof of European broadcasters has returned, with a "Remedial Network" parody of Radio Netherlands featuring Andy Sennett and Harpo Marx. They've been heard on 11902 kHz as well. Addr: Providence. (Mike Ryan; Axelrod; Coatsworth; Jurrens; Williams; Wolfish)
Radio Free London- 3944.7 at 0200. Ranier Brandt heard Radio Azteca from Europe this month, but Mike Prindle returned the favor with a direct log of this European rock and pop music pirate. Congratulations, Mike! Addr: London. (Prindle)
Radio Free Speech- 6955 at 2315. Despite his announced retirement, some suspect that Bill O. Rights may return to the pirate bands later this year. In one bit he genuinely called the FCC to report a pirate station, but reached only a voice mail advising him to call the manufacturer of his electronic equipment. Addr: Belfast. (Brandon Arlman, West Chester, PA; Coatsworth; Hassig; Pearce; Silvi; Williams; Wolfish)
Radio KAOS- 6955 at 0100. Joe Mama's well produced rock and comedy shows are still with us, although Joe has announced a forthcoming retirement repeatedly. Addr: Belfast. (Randy Ruger, North Hollywood, CA; Mike Ryan; Axelrod; Coatsworth; Frodge; Hassig; Jurrens; Nauta; Prindle; Shelley; Silvi; Williams; Wolfish)
Radio Korak International- 3927 at 0030. Pirate broadcasting inside the amateur radio bands is a bad idea, but sometimes we hear stations like this one on 80 meters. Michael said that their big band music was followed by a Spanish language numbers station, so there are multiple sources of QRM in this frequency range. Addr: None. (Prindle)
Radio Sparks- 6955 at 1445. This Swiss Europirate sometimes supplements its relays via licensed European broadcasters with a North American pirate transmitter. Neil says this one was via **WREC.** Addr: Basel. (Silvi; Wolfish)
Radio Tellus- 6955 at 0100. Sometimes using a "Radio Tellus Earth Station" slogan, they mainly concentrate on rock music. Addr: Providence. (McClintock; Axelrod; Coatsworth; Silvi; Jurrens; Nauta; Ruger; Williams)
Radio Zero- 1640 at 0345. With a big band music format and a slogan of "Your TIS Alternative, this one reminds us to check the medium wave band from time to time. Addr: None, but asked for reports on the *alt.radio.pirate* newsgroup. (Axelrod; Wolfish)
Rocket 99- 6955 at 0500. Apparently this rock station is a different operation from Bennie Dingo's **Rock-It Radio,** but we don't know much about it yet. Addr: None. (Jurrens)
Stereo Sound Radio- 6955 at 0000. Colonel Billy Bob's rock music shows are not really in stereo, but his friendly chatter is getting good reviews. Addr: None; QSL's via the Free Radio Network Grapevine; see URL above. (Axelrod; Coatsworth; Frodge; Silvi; Jurrens; Prindle; Shelley; Williams; Wolfish)
Tangerine Radio- 6955 at 2130. Here's a real veteran old-timer. Raunchy Rick's anarchist station has blown the dust off its transmitter with a program of "Mennonite" music. Addr: Belfast. (Hassig; Silvi)
Up Your Radio Shortwave- 6955 at 1745. Production values are slick Woody B. Serious' political comedy station, which supports a liberal ideology. Addr: Blue Ridge Summit. (Hassig; Jurrens; Silvi; Williams; Wolfish)
VOXXX- 6950 at 0515. Barry says that reverb in their identifications makes for tough copy, but he did hear their comedy show. Addr: None; says will QSL logs in *The ACE.* (Williams)
WARR- 6955 at 0300. Captain Nobeard's rock music and marijuana advocacy have not impressed listeners; the station scored low in the 1997 Pirate Popularity Poll in *The ACE.* This may be because the operator has not been in contact with his maildrop, leading to unforwarded reports. Addr: Belfast, but unreliable. (Hassig; Nauta; Silvi; Wolfish)
WBIG- 6955 at 0430. Last month we pictured this station's QSL, but James received his this month. Addr: Belfast. (James Griswold, Dallas, TX)
WBNY- 6955 at 0030. The Voice of the Rodent Revolution seems to return every spring with its clever clandestine parody, but it unfortunately has not replaced its old maildrop. Addr: Washington, DC address defunct. (Axelrod; Williams)
WEED- 6955 at 0400. Johnny Smoke's rock music and drug advocacy station has been heard by listeners throughout North America. It often uses late time slots that support propagation to the West Coast. Addr: Huntsville. (Coatsworth; Jurrens; Wolfish)
WLIS- 6955 at 1700. Jack Boggan's unique format plays shortwave broadcast station interval signals as hit records. A recent show celebrated his 7th anniversary as a pirate. Addr: Merlin. (Coatsworth; Hassig; Love; Nauta; Silvi; Williams; Wolfish)
WLNZ- 6955 at 0300. WLIS may promote interval signals, but this new one promotes static



WLIS Loves Interval Signals: WLWLIS Loves WLIS!

with an "all static all the time" slogan. Addr: None. (Jurrens)
WLWLIS- 6955 at 2215. Don't confuse "We Love WLIS" with the real WLIS. The six letter station transmits guitar riffs as interval signals, saying it's a tribute to WLIS. Addr: Providence. (Axelrod; Hassig; Jurrens; Shelley; Silvi; Williams; Wolfish)
WMPR- 6955 at 2245. Lately they have been programming techno-pop dance music with ID's by synthesized voices. Addr: None. (Frodge; Jurrens; Pearce; Shelley; Williams; Wolfish)
WREC- 6955 at 1845. P. J. Sparks' rock music is spiced with comedy and novelty segments, such as the "Sold My Honda" song to the tune of "Help Me Rhonda." Addr: Blue Ridge Summit. (Coatsworth; Hassig; Pearce; Shelley; Silvi)
WTTN- 6955 at 0345. We don't know much about this new one yet, but it has been testing with rock music. Addr: None. (Frodge; Wolfish)
XEROX, Radio Duplicado- 6955 at 0000. Bart Sambo has resurfaced with pirate radio parodies. A recent show relayed the pirate talk from the 1997 Winter SWL Festival in Kulpsville, PA by Andrew Yoder and your editor George Zeller. Addr: Belfast. (Axelrod; Coatsworth; Frodge; Jurrens; Nauta; Williams; Wolfish)

Ike Kerschner, N3IK

Busting Loose

June is busting out all over, and it's definitely ham radio's fun month! Two of the most enjoyable contests occur this month. The first "funtest" is the ARRL VHF contest which takes place the second weekend of the month. During this period many individual hams and clubs take to the hills and set up super stations for the weekend — giving VHF operators the opportunity to work rare grid squares.

While most activity takes place on SSB and CW, there is considerable FM activity, too. Be aware, though: FM activity cannot be on repeaters or the national calling frequencies. All FM activity must be simplex. Use all VHF bands from 50 MHz up.

Join the Fun

Even if you do not belong to a group which is participating in the contest, you can join in the fun. All it takes is a VHF rig and some free time during the contest weekend. Most participants will operate from their home station and try to work as many grids as possible. If you have the time and want some adventure, pick out a high wilderness area to set up your station. If that area is a rare grid square, you may be surprised how others will seek you out.

Use the best antenna possible and get it in the clear. I like a four element quad on two meters and use a two element quad on six. If all you have is an HT, don't worry; a watt or two of power tied to a decent antenna and good location will provide contacts hundreds of miles away in most cases. No need to have rigs for all bands — pick your favorite and go for it.

This contest takes place at an ideal time of year; good weather usually prevails and propagation is often excellent.

You still have time to get complete rules, check sheets, and log sheets from the ARRL. Address your request for the June VHF contest to ARRL, 225 Main St., Newington, CT 06111 Attn: VHF contest. Include a large SASE with two units of postage.

Field Day

While writing for rules and logs for the VHF contest, you might consider writing to ARRL for Field Day logs, check sheets, and rules at the same time. Same address, but write to "attn. Field Day."

Many hams consider Field Day to be the premier operating activity of the year. Field Day is not really a contest, but rather an event. (For not being a contest, you will find this some of the hottest competition ever — some friendly, and some definitely not!)

Field Day is a testing of amateur radio's emergency preparedness. Activity takes place on all bands and all modes. Some clubs have extremely elaborate setups to take advantage of every point offered in this non-contest. Points for sending field day messages to ARRL officials, battery power, low power, OSCAR contacts etc. provide plenty of opportunity for inventiveness.

Clubs and individual hams take to the outdoors and set up stations running on emergency power. Often elaborate set-ups including mobile homes, generators, towers, and beams with rotors are the order of the day. On the other hand, others throw a wire in a tree and run off battery power.

Field Day is the event that often brings hams and non-hams into close relationship. Very frequently non-hams serve as cooks, loggers, equipment maintainers, and general go-fers. Each site has a friendship that brings the participants back year after year. And stories of field days past fuel gab fests all year long.

Again, if you can find a group going out for Field Day, and can join it, do so. If you prefer; go it alone or with a friend or two.

You can participate from home, but it's just not the same!

W5YI Report

Given the speed of events in amateur radio, it is difficult to keep up with the latest and greatest. One of the best ways to stay abreast of this fast-paced hobby is the *W5YI Report*. Every event concerning amateur radio and loads of information about the communications industry can be found in this fine publication. Publisher Fred Maia has been producing the *W5YI Report* twice a month for many years.

Subscription rate is $24.50 per year (24 issues). Address for orders is: W5YI REPORT, PO Box 565101, Dallas, Texas 75356. Or order via telephone at (817) 461-6443.

SAREX Frequencies

Want to work the space shuttle? The following frequencies are in use whenever the shuttle is in orbit.

Downlink (phone) 145.55 MHz

Uplink (phone) 144.91, 144.93, 144.95, 144.97, 144.99 MHz

Do not call the shuttle on 145.55! This is the downlink and must be kept open, it is the frequency earthbound humans receive the shuttle on. Transmit on one of the uplink frequencies.

Packet downlink is 145.55 MHz

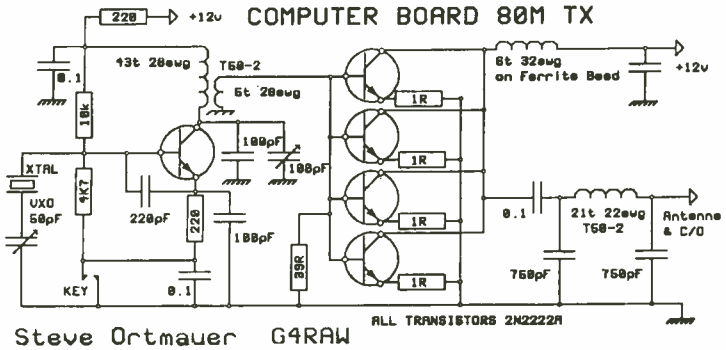
Packet uplink is 144.49 MHz

Cheep Cheep

For those readers who enjoy easy to build projects, we present the G4RAW Computer Board 80 Meter TX.

The following schematic is from our friends at SPRAT, the QRP club of England. The circuit is well laid out and easy to follow, making a good beginners project. Build it on perf board or Radio Shack project pc board.

The Computer Board 80 Meter TX puts out about 1.5 to 2 watts using five 2N2222 transistors. Total cost should be ten bucks or so; real cheep!



You will note the wire gauges are stated in SWG which are about one size smaller than AWG sizes. However, using the same gauge sizes in AWG will work just fine. Any of the given wire sizes can vary by as much as two sizes and still work without problem.

That's it for June, gang; now bust out of that rut and let's hear you on the air in June!

73 de
Ike, N3IK

Note on advertisement below: As of 4/26/94 it became unlawful to market cellular-capable receivers in the U.S. Atlantic Ham Radio assures us that it will give a full refund and hold customers harmless from shipping expenses if a purchased unit is returned to the vendor by US Customs

Monitoring the LF and VLF Frequencies

You are missing some fun if you have a receiver that doesn't tune below 510 kHz. Many older receivers lack that provision. A simple solution is to use a converter ahead of your receiver to make those additional frequencies available. This month we discuss a low cost home-made converter that provides reception from 0 to 500 kHz. We also examine the typical single-wire antenna system and describe a way to make it perform more effectively at LF and VLF.

A Low-Cost Converter

Only three transistors and a few ordinary parts are needed to build the circuit in figure 1. Most of the parts are available from electronics surplus dealers. Point-to-point wiring may be used instead of assembling the converter on a printed-circuit board if the leads are kept short and direct.

A low-pass filter (FL1) is used at the input of the converter. It passes all RF energy below 500 kHz, but attenuates signals that appear above 500 kHz. This helps to prevent overloading from strong, nearby AM broadcast stations, should you live near one of them.

VLF signal energy that passes through FL1 is amplified by Q1, which is a broadband linear amplifier that has 15 dB of gain. The amplified signal is routed to the mixer, Q2. A crystal-controlled oscillator, Q3, produces the second signal that is fed to the mixer. The combination of the two signal frequencies (i.e., 5.0 MHz minus 0.1 MHz = 4.9 MHz) produces an intermediate frequency (IF) in the 4-MHz range. The Q2 output matching transformer, T1, is a broadband toroidal type that permits uniform IF signal response from 4.5 to 4.9 MHz. It is this tuning range on your main receiver that allows you to copy signals from 100 to 500 kHz when using the converter. Actually, you can monitor VLF down to zero kHz by tuning your receiver higher than 4.9 MHz. However, most activity of interest is between 100 and 500 kHz.

A low-cost computer crystal is used at Y1. Generally, these crystals are listed at approximately $1 or less in the surplus catalogs. Q3 is a Pierce oscillator. C11 and C14 are feedback capacitors that enable the crystal to oscillate at 5 MHz. If you happen to obtain a sluggish (slow starting) crystal, you may experiment with the values of C11 and C14 to increase the feedback ratio.

A different tuning range on your receiver may be chosen if you change the frequency of Y1. For example, a 3-MHz crystal would change the main receiver tuning range to 2.5 to 2.9 MHz, if that was your pleasure. Then, 500 kHz would be heard at 2.5 MHz on your receiver and 100 kHz would be heard at 2.9 MHz, and so on. Changing the crystal frequency may require experimenting with the values of C11 and C13. No other changes are required.

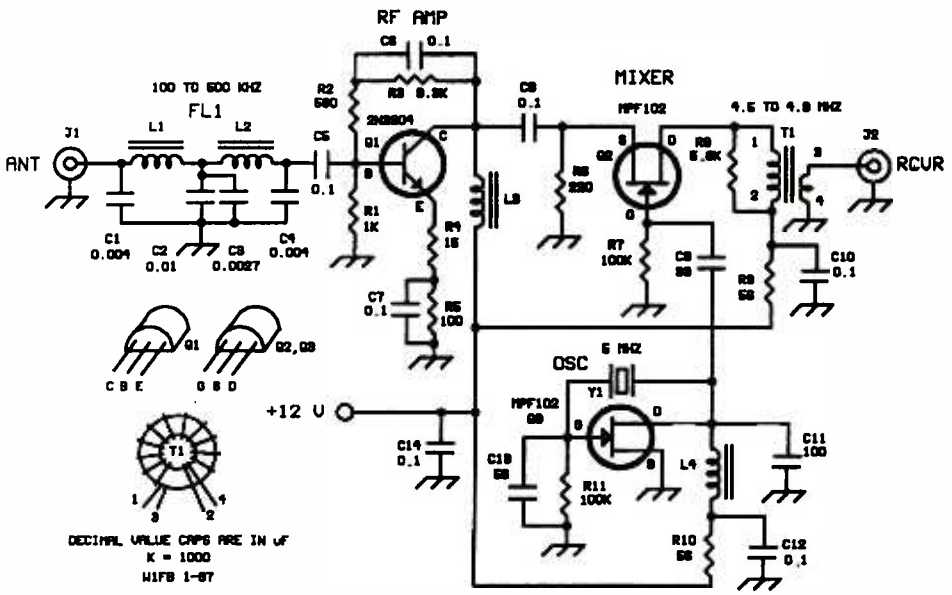


FIGURE 1 — *Schematic diagram of the LF/VLF converter for use with a general-coverage receiver. Capacitors other than C1-C4 are disc ceramic, 50 or 100 V. C1-C4 are high-Q polystyrene or silver mica. Resistors are 1/4-watt carbon. L1 and L2 are 25.7-μH toroidal inductors. Wind 41 turns of no. 26 enamel wire on Amidon T68-15 toroids.[2] L3 is a Mouser no. 434-03-333J 33-mH RF choke. L4 is a Mouser no. 434-17-272J 2.7-mH RF choke. For T1 wind 30 turns of no. 28 enam. wire on an Amidon FT-50-43 ferrite toroid. The secondary (output) winding has four turns of no. 28 enam. wire. Y1 is a Mouser 5-MHz crystal no. 520-HCA-500-20. Most JFETs are suitable for use at Q2 and Q3. MOSFETs are also suitable. Q1 can be a 2N5179, 2N2222A or 2N4400 with no circuit changes.*

Making the VLF Antenna Perform

Many SWLs use whatever antenna is at hand for monitoring below the broadcast band. Reception is generally poor when this is done. A typical antenna might be a short length of wire that is not very high above ground. It is important to realize, for example, that a quarter wavelength wire for 300 kHz, would need to be 780 feet long. This can be an impractical length. Our best bet is to make a shorter wire resonant as a quarter wave antenna by means of a tuner. Many dB of signal increase will result if we use a tuner to match the antenna to the receiver while resonating it at the operating frequency.

Figure 2 shows a circuit that uses a combination of inductance and capacitance to achieve the foregoing objectives. Two ferrite-rod or bar antennas from discarded BC band transistor radios are used as the core of the tuner. They are labeled Loop 1 and Loop 2 in the diagram. C1 is the tuning capacitor from a BC-band transistor radio. Both sections of the capacitor are wired in parallel to obtain roughly 200 pF of capacitance. A 365- or 400-pF variable capacitor would be better in the interest of greater tuning range. Old tube types of radios contain two-gang variable capacitors of that kind.

The Litz wire is removed from both ferrite rods. No. 26 enamel wire is close-wound over 2/3 of each rod. The windings on the two rods or flat bars are tapped every 25 or 30 turns to provide various amounts of inductance, as

seen in figure 2. Use as many taps as you wish. The more the better. Be careful when tapping the windings to ensure that no two turns of wire are short-circuited to one another. A shorted turn will ruin the Q of the coil. It is a good idea to put a small piece of bond paper or masking tape under and around each tap point. This will prevent a shorted coil turn.

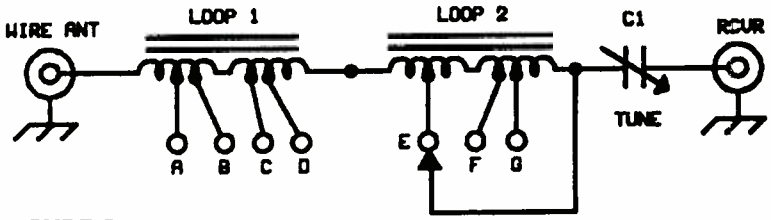


FIGURE 2 — *Circuit for an antenna tuner/matcher that works at LF and VLF with short end-fed wire antennas. Loop 1 and Loop 2 are ferrite rods or bars from transistor BC-band radios (see text for coil winding data). The taps permit selecting the required inductance for the operating frequency.*

A short length of stranded hookup wire and an alligator clip are used to select the coil taps. A multiposition rotary switch can be used in place of the alligator clip for tap selection if you want a fancier tuner. Mouser Electronics sells low cost wafer switches of this type, along with most of the parts for the figure 1 circuit.[1]

Figure 3 shows a suggested layout for the VLF antenna tuner. It can be housed in a wooden or metal box, but will work okay without being enclosed. Brass screws serve as terminals for selecting the coil taps. The tap wires are soldered to the screw heads.

■ Adjusting the Tuner

The figure 2 tuner will be effective no matter how long or short your end-fed wire antenna may be. The longer the wire the greater the signal strength, even when a tuner is used.

Tune in a weak signal between 100 and 500 kHz. Alternately adjust C1 and the coil taps until a sharp increase in signal strength is noted. The lower the receive frequency the greater the coil inductance required. A peak in signal strength indicates antenna resonance. Loop 1 and Loop 2 function as loading coils. C1 tunes out unwanted reactance to provide a reasonable impedance match for the 50-ohm converter input port. An earth ground should be attached to your converter ground bus and/or metal cabinet.

■ Final Remarks

When you tune your receiver to 5 MHz you will hear a strong beat note from the 5 MHz oscillator of figure 1. This is normal. It is a good idea to enclose the converter in a metal cabinet to minimize 5 MHz radiation and to prevent unwanted signal energy from entering the converter by any means other than the antenna.

You will be able to monitor the LOWfer band between 160 and 190 kHz with this converter. Experimenters operate beacon transmitters in that range. Signals elsewhere in the LF and VLF region come from airports, marine beacons, and other sources. There is a lot to hear below 500 kHz.

■ A Correction

Ken Cornell, WA2IMB, wisely pointed out that I had an error in my December 1996 column concerning "Be A Mini Broadcaster." I stated that 510 to 1600 kHz is available under Part 15 of the FCC rules for unlicensed transmitting with up to 100 mW of input power and an antenna that does not exceed 10 feet in length. Ken said that the FCC rules presently allow experimenters to use 510 to 1705 kHz for unlicensed transmissions.

■ Notes

1 — Mouser Electronics, Inc., 2401 Hwy. 287 N., Mansfield, TX 76063-4827. Phone: 1-800-346-6873 for catalog or to order. E-mail to sales@mouser.com or Internet at http://www.mouser.com

2 — Amidon Assoc., Inc., 250 Briggs Ave., Costa Mesa, CA 92626. Phone: (714) 850-4660 for catalog or to order.

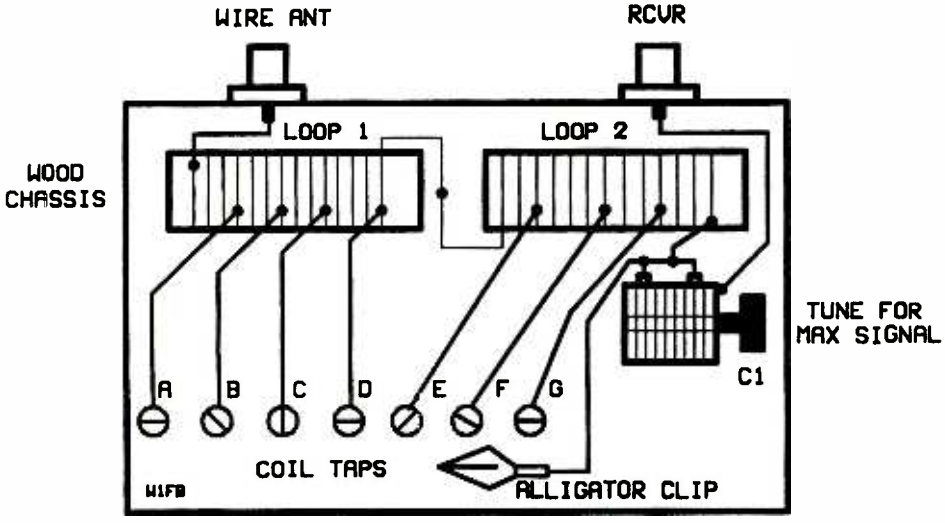


FIGURE 3 — *Pictorial representation of the figure 2 tuner circuit. A wooden base is used for the chassis. Loop 1 and Loop 2 can be affixed to the base with globs of sealant, such as Goop or silastic bathtub sealer. A rotary tap switch may be used as an alternative to the clip lead and screws for changing the inductance.*

Jean Baker, KIN9DD

Airline Company Frequencies

Welcome aboard, everyone! Today, our inflight entertainment will be a look at some airline company frequencies, and then we'll stop down in Australia for an update on monitoring, courtesy of Bob Bell, our Australian correspondent.

As a rule, most airlines utilize more than one frequency for their company usage within the U.S. Bear in mind that just because an airline uses a certain frequency at one airport, that doesn't mean the same frequency will be used everywhere. Here are some representative frequenciess for major airlines:

129.000: USAirways - New York LaGuardia (LGA)
129.050: British Airways - Chicago O'Hare (ORD)
129.075: United Ramp - ORD
129.100: TWA - New York Kennedy (JFK); Denver (DIA)
129.150: British Airways - (JFK); Miami (MIA); TWA - Hartford/Springfield (BDL)
129.200: American Airlines - Tampa (TPA); Salt Lake City (SLC); JFK; Nashville (BNA); Ft. Myers (RSW); American Eagle - Providence, RI (PVD)
129.225: American Airlines - Boston Ops (BOS); BNA; Indianapolis (IND) also for American Eagle on this freq.
129.300: United Ops - DIA; MIA; JFK; Pittsburgh (PIT)
129.325: American Airlines - BDL; (Maintenance - MIA); Pittsburgh (PIT)
129.350: ARINC - San Francisco Radio; Emory Dispatch - San Francisco (SFO)
129.400: ARINC - San Francisco Radio; United - DIA
129.425: United - DIA; UPS
129.500: Delta Radio - Atlanta; Delta - BOS; MIA; Tampa (TPA); United - DIA; SLC
129.550: Delta - IND, Orlando (MCO) DIA; Business Express - Flight Control; Northwest - PIT
129.600: Delta Radio - Atlanta; Delta - ORD; Sikorsky - BDL
129.625: TWA - St. Louis (STL)
129.650: Delta Ramp - JFK, West Palm Beach (PBI)
129.675: Delta - Atlanta Passenger Services (ATL); New York (LGA)
129.750: KLM - JFK; Aer Lingus - JFK; SAS - JFK; USAirways - BNA, TPA
129.775: TWA - STL
129.900: Delta Radio - Atlanta; Pakistan International - JFK; HF Check - ARINC, New York
129.925: Continental - ATL, DIA, MIA, SLC, IND
130.000: USAirways - BDL, (PIT)
130.100: USAirways - IND; BOS; LGA
130.125: Air France - JFK; FinnAir - JFK; United - ORD; Sabena - JFK
130.225: Swissair - JFK; TWA - Indianapolis
130.250: Continental - DIA; Signature Aviation - BOS
130.350: Continental - DIA
130.400: Continental - BOS & TPA
130.475: Air Nova - Halifax; American Eagle - BNA
130.500: Lufthansa - BOS; USAirways - PIT
130.525: Continental - RSW, BDL, PIT, POR, PVD; Valuejet dispatch - ATL
130.600: Business Express - JFK; Beechcraft East - Bedford, MA; Millionaire - BDL

We'll have more frequencies for you next month. In the meantime, if you find company frequencies for your area that are not listed here, please write to me with the frequency, company, and location information.

■ Touchdown in Australia

Here is Bob Bell's report on air traffic control (ATC) in Australia:

The whole country is controlled at high level airway level by only two centers — one located at Melbourne and one at Brisbane. Melbourne is in the state of Victoria (far southeastern state), and Brisbane is in Queensland (far northeastern state). The major airports (e.g., Sydney) still have tower, approach, departures, director (mid-downwind on approach until finals), clearance delivery, ground, etc. But all high level ATC is no longer called control as in "Sydney Control," but (as in the U.S.), is called a *center*.

Once a departing aircraft has reached 30 nautical miles on, for example, Sydney Departures, they transfer to either Brisbane center or Melbourne center, depending on whether they are north or south bound, or east or west bound. Brisbane controls all oceanic arrivals and departures, and has taken over all the international and domestic HF responsibilities from Sydney.

The typical frequency change sequence now for an aircraft YSSY (Sidney) to KLAX (Los Angeles) is as such:
Clearance Delivery - 127.500 ➪ Company (United) - 131.400 ➪ Sydney Apron - 126.500 ➪ Sydney Ground - 121.700 ➪ Sydney Tower - 120.500 (or 124.7) ➪ Sydney Departures - 123.0 ➪ Brisbane Center - 128.600 ➪ Digital Datalink satcoms or Brisbane HF Radio - 3467, 5643, 8867, 13261, 17904 ➪ Nadi Radio (Datalink or HF) ➪ Honolulu Radio (Datalink or HF) ➪ Honolulu Radio (Datalink or HF) ➪ Los Angeles Center ➪ So-Cal (Southern California) Approach ➪ Los Angeles Tower ➪ Los Angeles Ground.

Brisbane and Melbourne centers work through Australia's OPTUS satellites, but all aircraft transmit in airband VHF and the ground station receiver converts to Ku-band (12 GHz) to beam it either to Melbourne or Brisbane. The answer from the ground station gets converted from the 12 GHz frequency to local airband VHF, which the aircraft receives as well.

The aircraft don't need satellite equipment to work the centers. But with international digital datalink through Inmarsat, they transmit and receive from the aircraft on frequencies around 1.6 GHz, using "surfboard" shaped antennas atop the plane's fuselage.

Thanks, Bob: we enjoyed the visit!

■ Readers' Corner

George Grimes (PA) tells us about a new web site he discovered. It's live ATC action at the Dallas/Ft. Worth airport! You'll need the Real Audio player (free at **www.realaudio.com**) — go to **http://www.simuflite.com**, click on the Live ATC on the right of screen; have fun listening!

Shawn Horseley (NY) shares frequencies from the New York Area with us in Table 1. Thanks, Shawn!

That's all for this month: See you in July. Until then, happy landing!

TABLE 1 - NEW YORK AIRPORT FREQUENCIES - VIA S. HORSELEY

Approach	Departure	Clearance Delivery	Ground	Tower	ATIS
John F. Kennedy - JFK					
123.700	124.45	135.05	121.65	119.1	115.4 (Appr)
126.800		124.75	121 9	123.9	115 1 (Dep)
127.400		134.35			117.7 (Appr)
132.400					128.75 (Appr)
La Guardia - LGA					
118.000	120.4	132.85	121.7	118.7	125.95 (Appr)
120.800	127.05	135.2	121.85		127.05 (Dep)
Newark - EWR					
120.150	119.2	118.85	121.8	118.3	115.7 (Appr)
126.700				134.05	132.45 (Dep)

Vintage Bronze & Wood Banks!

From Original Brasstown, N.C. Post Office Boxes!

When the Brasstown, N.C. Post Office recently converted to modern facilities, we were fortunate to purchase the old Post Office boxes. More than a half-century old, these bronze boxes have been custom-fitted into handsome, finished wood cases hand-crafted by Brasstown artisans to make highly-collectible coin banks. Each has its own unique combination lock and glass window. Quantity is limited, so order now at these low prices before these charming memoribilia are gone forever. Call today to order your collectible bank. (Note: Condition varies; no returns.)

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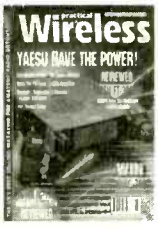

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WUNnerful Intercepts

I've been spending a lot of time recently monitoring the federal agencies on shortwave circuits. I have had a lot of help in doing this by being a member of the WUN electronic mailer. The WUN is the Worldwide Utility News Club. It is a hobby radio club formed in January 1995 to promote the sharing of information about the shortwave utility hobby. Several times a day I get downloads through my Internet provider from the mail server at Grove regarding the latest HF intercepts. I will explain at the end of the column how to become a member of the WUN group.

Ray Colbert and Jeff Chambers have been most instrumental in providing intercepts regarding our Mexican neighbors and the associated workings with our federal agencies. For example, the Mexican Federal Highway Police net has been monitored on 7790 kHz. They will be very open regarding the types of traffic they are passing. Traffic such as, "be on the lookout for various types of vehicles, aircraft, persons, and boats" are often monitored there. Similar operations are monitored on 10130, 10140, and 10150 kHz, but the 7790 kHz channel is the busiest. Callsigns used are 181, 183, 163, 154, 165, 176, 132, and 187.

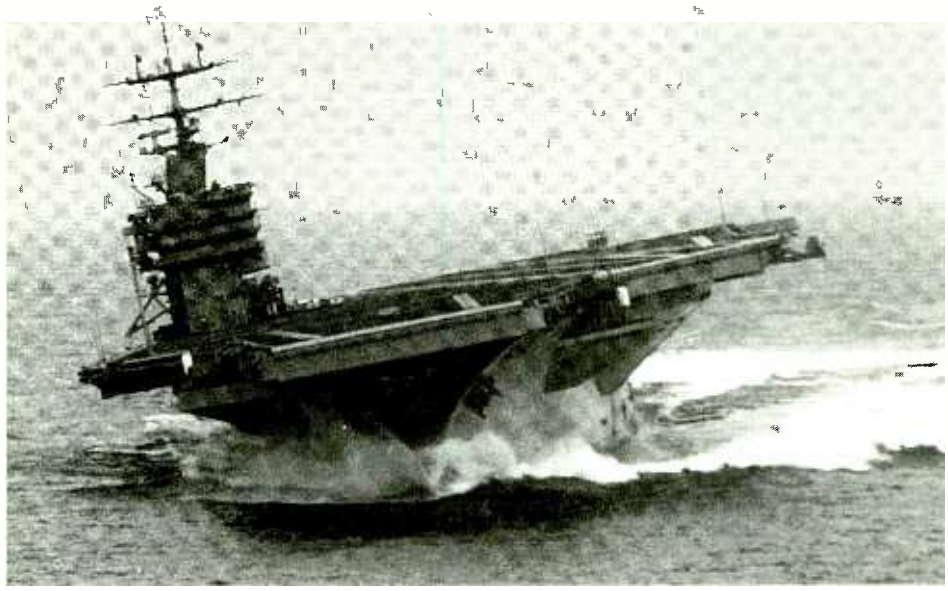
What does this have to do with U.S. federal agencies? Often our federal agencies in other countries will be heard on the host country's radio systems. As an example, it is rumored that some of the above callsigns and traffic are related to joint Mexican/DEA operations.

The Mexico City DEA office has been monitored on 11494 kHz. This is apparently a joint operation of some sort with the Mexican government. The Mexican DEA (our DEA units in Mexico) identify with the callsign CONDOR. Some of these units have been monitored working joint operations with the PGR, which is the Mexican Attorney General's Office in anti-drug activities.

Some of the callsigns monitored and tentatively identified are:

CONDOR 100--MEXICO CITY
CONDOR 200--GUADALAJARA
CONDOR 400--MATZATLAN
CONDOR 600--HERMOSILLO
CONDOR 700--MERIDA
CONDOR 800--MONTERREY

U.S. Customs have been active lately on the high frequency bands also. They were monitored on 5277 kHz working Miami Coast Guard in a search and rescue. The identifier of PANTHER, which is DEA Bahamas, was also heard on this frequency. Also active with Customs is the frequency of 5732 kHz, where they were heard with encrypted voice on upper sideband (USB).



USS Stennis aircraft carrier

This is an interesting frequency, because a German numbers station camps out here also—the mystery never ends. The frequency of 5841 kHz had Panther 1912, which is a Bahamas DEA unit calling 32 Charlie (unidentified unit)—advising him to change to encrypted mode. Units also heard on this frequency were 93 Delta and 53 Alpha.

Our old friend 7527 kHz has been active again. This is an interesting frequency. For a long time a Cuban numbers station used it for its home. The station was pin-pointed with direction finders to the numbers transmitter site at Bauta, Cuba. This was the site run by the Soviets when they had a commanding presence in Cuba. The site is still there, and most of the Cuban numbers stations from the island of Cuba come from there, even to this day.

However, the frequency of 7527 is now home to U.S. Customs. It is one of the frequencies used for their automatic link establishment equipment. Encrypted speech has been monitored there using callsign SERVICE CENTER. They were monitored calling OMAHA 57, which is a Customs aircraft.

All of the above intercepts were reported on the WUN mailer. How do you join? First you need internet access. Once you have that, send email to **majordomo@grove.net** (no subject line, no signature block). In the body of the text, type: *subscribe wun,* or if you want the digest, type: *subscribe wun-digest.*

After you have successfully subscribed you can post messages to the group be sending them to **wun@grove.net**.

If you would like to see what other groups are served by the Grove server, send a message to majordomo@grove.net (no subject line, no signature block). In the body of the text type: *lists*. This will get you email back that shows what types of newsgroups, such as the Milcom group, are available on the Grove server.

I have my WUN and Milcom mailers, and others, through an America On Line account, not the address on the top of this column. For some reason, the AOL mailer will not let you leave the subject line blank. I just type in "subscribe" and then proceed as mentioned above. This is just a hint that you may have problems.

More Federal Trunking

Back on March 20th of this year, Robert Wyman, one of our devoted South Florida monitors, went up to Port Everglades near

Fort Lauderdale, Fla. There he took his lunch hour or so, monitoring the radio traffic from the *USS Stennis* aircraft carrier which was in port. Robert reported the following:

136-144 MHz band---no traffic
149-151 MHz band---no traffic
406-420 MHz band---TRAFFIC

The navy uses the Ericsson trunked system on its vessels. The following frequencies were in use on the *Stennis*:

410.025
411.525---control channel
411.950
412.425
413.150
419.900--input

As you can see, more and more agencies are going trunked.

■ Maritime Mode

I read some internet traffic regarding U.S. Coast Guard traffic in the ACSB mode. This is the amplitude compatible sideband mode that is being used on the 220-222 MHz band. It seems that one monitor had picked up a wideband signal on 416.2375 MHz. Upon looking at it with a spectrum analyzer he discovered it was a USCG relay of marine channels 16 and 22. This was a multiplex relay of the channels for point to point traffic. The monitor was wondering if it was ACSB.

In a word—no. What he was hearing was indeed a wideband FM signal with sideband subcarriers. What you will hear on your scanner will be an FM signal with "donald-duck" sideband speech. This is the sideband subcarrier. Each subcarrier will have to be demodulated. The R-7000 does a nice job of it—as do many other high end radios. These systems are very common in short haul, low density traffic systems. The Florida Turnpike operates several of them in the 930 MHz range around Orlando and Disney World, which is where I first discovered them.

■ "For Spies Only"

Recently I was cruising through the National Security Agency internet homepage at **http://www.nsa.com**. There I learned about special cellular telephones that are available to "certain key government agencies." These phones are made by Qualicomm and they work in either the digital mode or the analog mode.

The interesting point is that these phones have a PCMIA port on them into which the encryption card is plugged. The card is capable of changing the encryption key over the air. The card can also be changed out when you wish to change the entire encryption scheme. The phone works with existing cell sites. There are no special "federal cell-sites."

What was interesting was that the name given to these phones was CONDOR. Condor again? I wonder if Robert Redford is being consulted?

■ Federal Law Enforcement Training Center

Located in Brunswick, Georgia, the Federal Law Enforcement Training Center is the police academy for nearly all of the federal agencies. While this is not on the beaten path for most monitors, if you should happen to be in Georgia on vacation, it makes for good monitoring. Their radio setup is as follows:

Security and Maintenance Support:

Security	170.975
Maintenance	170.100

Investigations Training Support

Investigator	173.125	Ch.1
Investigator	171.500	Ch.2
Investigator	173.7875	Ch.3
Investigator	170.825	Ch.4
Surveillance	172.200	Ch.5

Enforcement Training Support

Simulation	173.7375	Ch.1
Simulation	170.8250	Ch.2
Simulation	170.925	Ch.3
Simulation	172.300	Ch.4
Simulation	173.175	Ch.5

Vehicle Driver Training Support

Skid control	169.550	Ch.1
Coordination	169.600	Ch.2
Coordination	170.000	Ch.3
Response	170.425	Ch.4
Coordination	170.600	Ch.5
Coordination	173.025	Ch.6
Coordination	173.075	Ch.7
Coordination	173.125	Ch.8

The National Capital Police Training Unit uses the frequency of 411.825 MHz for its training operations there. The General Services Administration paging transmitters are on 415.2 and 417.2 MHz.

Speaking of the GSA, a little-known agency of which very little is ever written is the **Federal Supply Service**. This is, quite simply, the supply service of the General Services Administration, which is the landlord of all controlled federal property. The Supply Service has these known channels in use:

Anchorage, AK	166.225
Bell, CA	164.275
Stockton, CA	149.000
Colorado Spngs, CO	166.225
Denver, CO	166.225
Washington, DC	168.575
Hogback Mtn., VA	168.575

Smithsonian

Clearfield, UT	166.225
Ogden, UT	166.225

The Personal Property Services of the Federal Supply Service has a nationwide channel of 164.275 MHz. The Public Buildings Service has nationwide allocations of 413.950 for the repeater input and 415.2000 MHz for the repeater output.

The **Law Enforcement Branch**, formerly known as the Federal Protective Service, which guards federal buildings around the country, has a nationwide radio system as follows:

Channel	*Frequency*	*Use*
01	419.1750	Repeater Input
	417.2000	Repeater Output
02	417.2000	Simplex
03	412.2000	Simplex
04	417.4250	Simplex

With the cutbacks in federal monies, some of the federal sites have gone to private security services to maintain their own security. These guard services will often be in the commercial business frequencies.

■ A Federal Institution on the Move

If you are in Washington, D.C., this summer, the **Smithsonian Institution** is a wonderful place to visit. But did you know that the Smithsonian may come to your town? Yes, they have traveling exhibits for important displays. You might want to check with their public affairs office to see when the next traveling exhibition will be in your area.

The Smithsonian has its own security force. They operate both in Washington and also when they have traveling exhibits. The frequencies used are as follows:

Channel	*Frequency*	*Use*
Xx	165.0375	Simplex--National Assignment
01	169.3750	Repeater Input
	169.2000	Repeater Output
02	169.2000	Simplex
03	169.0500	Motor Pool--Simplex

The National Gallery of Art, which is a part of the Smithsonian, operates a security repeater on 411.5500 input and 406.5500 output. In the neighborhood is the National Zoo. It has its operations net on 169.7250 MHz, simplex.

No matter where you go on vacation, federal monitoring is somewhere at hand!

Ken Reitz, KS4ZR

Radio's Future Now: Digital Music Express

Fifty years from now, when historians examine the last quarter of this century, the subject of entertainment will loom large. Thanks to the increasing presence of the micro-chip and the application of digital technology, this era will be known as the Age of Electronics. It is the era of instant, world-wide communications; of powerful personal computers, and the advent of the Compact Disc, known the world over in every language as the CD.

The invention of the CD was the biggest revolution in recorded music since acetate discs replaced wax cylinders. Finally, wobbly tapes and scratchy LPs could be retired, and the crisp, true sound reproduction of the CD would become the audio standard. Over the last 10 years CDs have taken over home entertainment systems and dominated the music played on America's radio stations. Things have never sounded so good.

But, that's just the beginning. The next phase of the digital audio tidal wave is digital broadcasting. Within the next five years there will be digitally transmitted radio for your car, and fully digital FM radio broadcasts will not be far behind. There will be a whole new generation of FM receivers on the market, and the choices for music programming for any given location will number in the hundreds of channels.

■ Step into the Future

But, why wait?! Now you can step into the future and join with 2 million other music lovers who are enjoying the pleasures of digital radio today through the satellite delivered music service known as Digital Music Express (DMX). DMX offers CD quality, commercial-free programming on more than 90 format channels with no disc jockeys or any other interruptions.

It took a savvy businessman with a music lover's heart to create DMX, but to Jerry Rubinstein, Chairman and Chief Executive Officer of DMX, it was a natural next step in the evolution of recorded music. Rubinstein graduated from Loyola Law School in 1965 and set off on a career as business manager for pop stars like Joni Mitchell and Neil Young. His interest in music led to stints as chairman of United Artist Records and ABC Records throughout the 1970s. In 1986 he founded DMX and has slowly built a distribution system where the programming is available on hundreds of cable franchises and via Ku-band satellite as well as DBS. DMX also enjoys an extensive audience in Europe via the ASTRA satellite.

■ Receiving DMX

DMX was originally conceived as a music source for businesses, hence the name "DMX Business." Stand-alone systems complete with dish and feed horn were provided to the business and a nominal monthly charge was billed. However, it didn't take long before the value of the service became known to cable operators, and an abbreviated form of DMX migrated to the C-band feed found on Satcom C3 channel 24. Thirty of the more popular formats are carried on 850 cable systems in the U.S. Recently, the DBS pioneer Primestar dropped its insipid SuperAudio services in favor of adding the same 30 DMX channels. Subscription to this service is covered by the basic Primestar subscription charge.

DBS newcomer AlphaStar offers two DMX packages, the same 30 channels as Primestar or the whole impressive play list. Unfortunately for DMX, the agreement to offer the full service on AlphaStar has not been the success first imagined. This is owed entirely to the poor start AlphaStar has made in the DBS marketing world but should improve dramatically if AlphaStar can catch up to the competition. Subscribers to the AlphaStar 30 channel service pay in the same manner as Primestar customers. However, AlphaStar subscribers wishing to have the whole DMX service must buy the additional DMX receiver and pay an additional monthly charge.

The service is also offered to the TVRO market. In this case, subscribers must purchase the DMX receiver and have a Ku-band compatible satellite system. This simply means that you must have a C/Ku-band feed on your dish and add a splitter to feed the DMX receiver. (It's important to note that with this set-up you should make sure the feed to the DMX receiver has a DC block fitting to the coax cable to prevent DC voltage from the LNB from damaging the DMX receiver.)

DMX Direct, the 120 channel direct-to-home digital audio service, utilizes a receiver by ComStream, a compact antenna dish and the DMX▲DJ®.

By turning your dish to Telstar 402 Ku-band on any even numbered channel you'll be able to pick up the DMX signal. The DMX receiver is a complete satellite receiver, but it is designed to receive only one channel on one polarity. It doesn't matter which channel your satellite receiver is on, but it must be set to the right polarity.

TVRO subscribers must buy the DMX receiver (about $800) and, once authorized, pay the monthly fee ($15). Once you've listened to DMX you'll soon discover that it should have its own dedicated dish. There will be many times when you'll want to just listen to the fabulous programming while other family members will want to watch TV. Luckily, DMX is prepared for the situation and offers a complete dish/feed horn set up (you provide the pole and coax cable).

■ The Programming

All current DBS services, most cable systems, and TVRO owners have access to many music sources. With the exception of C-band TVRO, all music programming is part of a

pay package. However, no service comes anywhere near matching the DMX deal. Its 90 plus channels offer the most diversity and depth of anything on the market. There is no competition.

There are six channels of Latino-oriented music from Brazilian to salsa; five different jazz channels from classics to Dixieland; four separate instrumental channels; three country music channels; six "oldies" channels from big bands to the '80's; eight pop/adult channels from soft hits to folk rock; four rock channels; six "urban" channels from uncensored rap to traditional blues; five classical music channels including one just for classical guitar; a stunning twenty-one channels of international music including Hebrew hits, Cantonese pop, Greek, Indian, Italian, German, French, Danish, Flemish, and that's not half! There are fifteen specialty channels featuring everything from Gospel and Christian to Hawaiian and Cajun. All transmitting full fidelity CD quality, 24 hours a day with no interruptions.

Did I mention the polka channel? There's a channel for movie sound Tracks and one for show tunes. There's a special children's channel with music just for kids and a holiday music channel which features holiday oriented music year 'round. One of my favorites is the environmental sounds channel which brings the serenity of the rain forest or a mountain brook, a summer thunderstorm, or pounding surf into your home. But, DMX is not content with this line-up! They are planning to add more channels; they have room to expand up to 120 channels.

The DMX Trump Card

Having access to all this music is great, but it's not long before you start to wonder who recorded this? What CD is this from? Who wrote this piece? With all other music sources there's no way to know unless you have an all-intrusive disk jockey to tell you. At DMX the slogan is "Disk jockeys should be seen, not heard." So, DMX has an infra-red remote control they call the DMX/dj which features an LCD display screen. With the press of a button, data from the receiver is transferred to the remote control and all available information on the song currently playing is displayed. This makes all the difference in listening to music, especially unfamiliar pieces and helps settle disputes about who recorded what.

The DMX/dj is available only on the full service subscription and is not available on the Primestar, AlphaStar, or cable services using the 30 channel format. Only DirecTV, which uses Music Choice (DMX's only competition), offers similar information; however, the information is displayed on the TV screen, which means you have to have your TV on the whole time you're listening to the music.

The DMX Receiver

The DMX DR200 receiver is made by ComStream and comes with a 40 page user guide. The DR200 is simplicity itself. There are only three buttons on the unit — a power switch and channel up and channel down buttons. The green LED display indicates the music channel currently in use, and two indicator LEDs show that the satellite signal is being received and that the unit is authorized. If either of these two lights are not on, you will hear nothing. There is a nearly hidden pull-down panel under the three switches which conceals a slot for a future News Datacom Smart Card. So far, the Smart Card is not used.

The back of the receiver has an "F" connector for the LNB input; a mini jack for signal strength output (used by professional installers in the field); a monaural RCA output jack and two RCA output jacks for stereo. There is a digital output jack for stereo systems equipped to receive direct digital input.

The DMX remote control has a limited range of about 20 feet and can't have any obstructions in the way, though the signal can be bounced off walls and ceiling. However, to receive data from the receiver, the remote control must be pointed right at the receiver. An infra-red remote extender can be used with this system for one-way remote control from other rooms.

One of the most convenient functions of the remote control is an extremely accurate signal strength meter which is displayed on the receiver's front panel. This is most useful, because very few satellite receivers feature a front panel signal strength meter and peaking your dish for optimum DMX reception ensures top grade performance on C- and Ku-band video as well. Aside from a mute button and volume control, there is direct channel entry and a "last" button to recall the previous channel selection. There are numerous buttons which indicate that DMX has provided for future functions and expansion. This is an extremely well planned system.

An Audiophile's Dream Come True

Imagine owning tens of thousands of CDs and playing them on a state-of-the-art audio system: That's DMX. Once you get past the initial expense of the receiver, paying $15 a month for this much diverse programming is cheap. For less than the full price of one CD you have the entire output of the CD industry in your home. What's more, you'll have access to music you would never have bought or even heard in most locations. Expose yourself to the world's music and everything it has to offer — you'll be surprised at what you've been missing. Digital Music Express is the greatest thing since sliced quartz.

For information on DMX call or write:

Digital Music Express
11400 West Olympic Blvd.
Los Angeles, CA 90064-1507

Phone: 310-444-1744

DMX is also available from Skyvision
1010 North Frontier Drive
Fergus falls, MN 56537

Phone: 800-543-3025

Bill Cheek
email: bcheek@san.rr.com

Forgotten Memory for Forgotten Scanners

Professor Peabody" — a prolific instigator of great scanner hacks — recently awakened from an extended self-induced coma (he calls it "out-of-body experience"), and crisply chided me to revisit five classic scanners of yesteryear, the Uniden BC-760XLT, BC-950XLT, BC-590XLT, BC-600XLT, and Regency R1600. Tumbling back into a stupor, he mumbled, "Check the memory chip, pin 19 and..." and with that, the good Professor was gone. I mean, his mind was gone. He does that. I'm used to it now.

Say what? Revisit five old scanners? Well ... hmmmm ... they were great scanners in their day, but gee whiz, we know everything there is to know about them now. So it was with some misgiving that I reached up to the dusty, long-forgotten service manual for the BC-760. Chuckling at the goofy old Professor's ways, I turned to the schematic diagram thinking, "Good grief...the memory chip? I've already exploited that puppy for all it's worth, from its measly stock 100 channels to 1600 or even 6400 channels. What could be new? Pin 19, huh?"

There it was, grounded. Big deal.

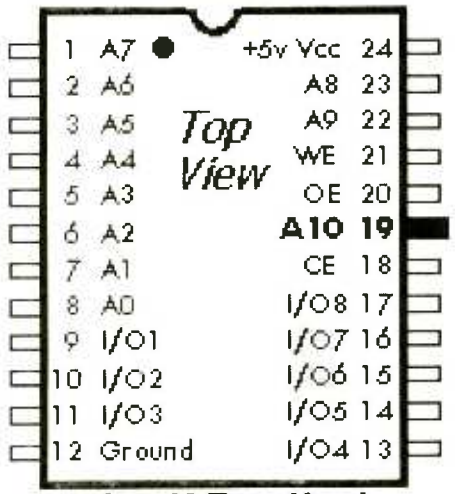
Wait a minute! Pin 19 is a memory address port (A10). Why is it grounded? You don't permanently ground memory address pins—not unless you prefer fewer memory channels than is possible! Why did Uniden do that?

We don't know why, but the Uniden BC-760XLT, BC-950XLT, and the Regency R-1600 are clones of each other: the same radios with different model names. All three are full featured 100-channel, 800 MHz scanners. Schematically, the three are identical. Likewise, the Uniden BC-590XLT and BC-600XLT are identical clones, and almost identical to the first three except that there is no 800 MHz plug-in module. In the memory chip area, all five are alike. The remainder of this article applies to all five scanners for a cheap and easy doubling of the programmable channels.

FIG-1: STATIC RAM CHIP PINOUT GUIDE

Used in these scanners:

PRO-2004/5/6
PRO-2021/2022/2032
PRO-39/37/34/32
BC-760/950/590/600XLT
R-1600



Possible IC Type Numbers

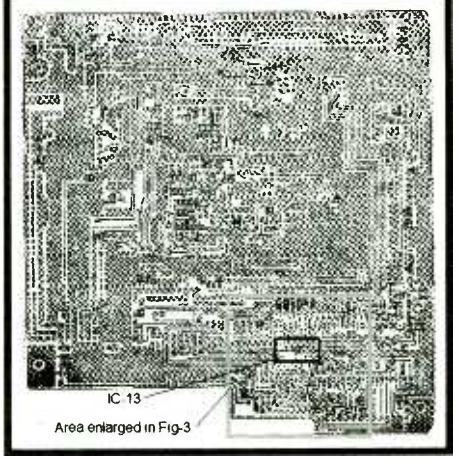
CXK5816M-15L LC3517BML-15
TC5517CFL-20 MB8416-20LPF
μPD446G-45

■ Eureka!

By golly, that old Professor was on to something. There it was, in black and white: IC-13, Pin 19, machine-soldered to a permanent ground trace! Well, that will hardly do! But let's think it through first, as we refer to Figure 1—the pinout guide for the common static random access memory (SRAM) chip that's used in a number of popular scanners.

We see eleven address pins, A0 through A10, distributed among pins 1-8, 23, 22, and 19. A cursory review of the scanner's schematic diagram reveals that ten addresses, A0-A9, are connected to the CPU, but A10 is grounded. The meaning is simple: ten memory address pins are controlled by the CPU; one address is not controlled, since it is tied to a permanent "low" (ground).

FIGURE 2: BOTTOM VIEW OF SCANNER CIRCUIT BOARD



What would be the result if we were able to control that eleventh address, A10, at Pin 19? Easy: The number of memory locations would double. Whoa, Bubba, not so fast! Notice the scanner's CPU is internally programmed to deal with ***only*** 100 channels. You have to understand that we can't do anything about that. We cannot alter the programming of the CPU.

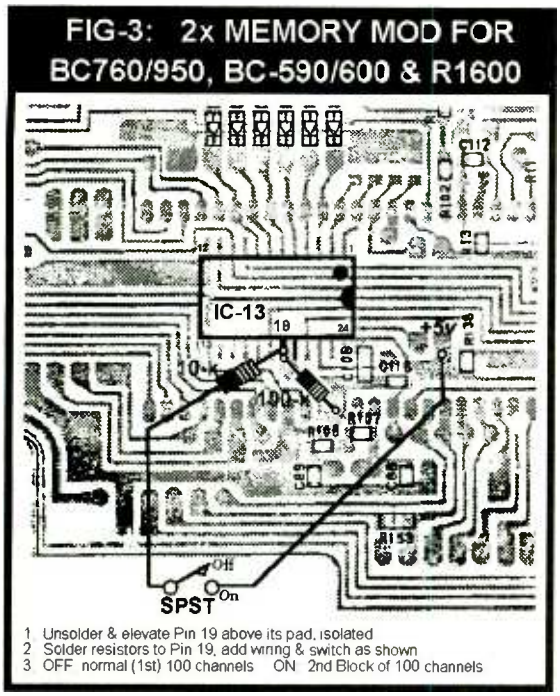
Are we stumped? Nope; this is the easy part. Given that the CPU addresses and displays only 100 channels at a time, we will install an external control (switch) with two states, off and on, each position of which creates a separate and unique block of 100 channels to make 200 channels, total – free, or almost so. It doesn't get much better than this.

■ Let's do it

Remove the top and bottom cases of the scanner: four screws on each side. Turn the radio upside down, front panel facing you. Referring to Figures 2 and 3, locate IC-13, a 24-pin surface mount chip. There should be no confusion: there are not many components on that side of the board. It's mostly just the solder side.

Study IC-13 for a moment to understand the pin numbering arrangement, and then identify Pin 19. Figures 1 and 3 will assist. You'll see where Pins 19 and 20 are soldered to a common ground pad.

We have to melt the solder on that pad and lift Pin 19 up and free of the solder so that it is



isolated, not touching anything. Slip a sewing needle between Pins 18 and 19 (if you're right-handed) or between Pins 19 and 20 (if you are left-handed). Angle the needle so that it uses the adjacent pin as a fulcrum and exerts a bit of upward force on Pin 19. Gently now! Very gentle.....

Now with the gentle upward force on Pin 19, heat the pad for Pins 19 and 20 until the solder melts, at which time, Pin 19 should "pop" free and move up a little. If it is free of the pad, remove the soldering pencil and let it cool. If pin 19 isn't free of the solder blob, then exert a bit more upward force until it clears the pad and then remove the soldering pencil. This procedure takes only two or three seconds and is not harmful to the chip.

Next, you need to straighten the free-floating Pin 19 so that it protrudes outward from the body of the chip and can't touch anything. Use a pair of duckbill pliers or even long-nosed pliers or hemostats. Just be careful to not break Pin 19 from the body of the chip.

Solder one end of a 100-k ohm 1/8 or 1/4 watt resistor (RS #271-1347) to the protruding lead of Pin 19. Solder the other end of this resistor to a PCB ground spot as shown in Fig 3.

Solder one end of a 10-k ohm 1/8 or 1/4 watt resistor (RS #271-1335) to the protruding lead of Pin 19, and let the other end of this resistor hang free for a moment.

Find a convenient place on the scanner, preferably the front panel, to install a mini SPST toggle switch (RS #275-645). Solder a light, flexible hookup wire lead to each of the lugs of the switch.

Solder one of the switch wires to the free end of the 10-k ohm resistor. Solder the other switch wire to a source of +5v in the scanner, typically Pin 24 of the memory chip. See Fig-3 for a possibly handier spot than Pin 24. Use a voltmeter to verify the +5v spot, if you are not sure, or if you have better ideas. Voilà! You're done.

Test

Apply power to the scanner; turn the switch to its OFF position; and test the scanner for normal operation. You should not have lost any previously programmed channel data, and otherwise, the scanner should appear normal in all respects. Program a channel or two; turn the scanner off and on to see if the programming "took."

The OFF position of the switch is your "normal" or previous 100 channel program. The ON position of the switch cuts out the "normal" program and brings in a whole new block of 100 channels, ready for your input. You can use only one 100-channel block at a time, of course, but you can switch one out and the other in at any time, whether the scanner is on or off.

If you are in the Manual mode, there will be no visible effect of switching until you perform a subsequent action, like hitting Manual again, or Scan, or Search, etc. If you are scanning or searching when the switch is flipped, the change will be immediate.

Conclusion

Despite the fact that this memory chip is used in quite a number of scanners, only the five specifically stated in this article are amenable to this mod. The other scanners use Pin 19 and should not be tampered with. There could be other scanners, I suppose, that do not use Pin 19, but this will be readily seen by it being grounded (or perhaps tied to a permanent spot for +5v.) As far as I know, only these five, all from Uniden, have the hidden, extra 100 channels.

Interestingly enough, the Uniden BC-855XLT holds an easily liberated 50 more channels and it is legend how the PRO-2004 hides an extra 100-channels. These seven are the only scanners of which I am aware that have concealed, easily liberated memory.

Correspondents, Please Note

I have a new e-mail address with a 24-hr direct connection to the Internet now. Please note the new address and make an added note that my BBS, The Hertzian Intercept, is closing down for good on May 31, 1997. It will be replaced, bigger and better, by my Web and FTP sites in the coming months.

WWW:	http://ourworld.compuserve.com/homepages/bcheek
FTP:	ftp://ftp.cts.com/pub/bcheek
FAX:	(619) 578-9247 anytime
Postal:	PO Box 262478; San Diego, CA 92196-2478

John Catalano, PhD
j_catalano@conknet.com

Armchair Flights of Fancy

This month's column might be called "Computers, Radio & Aircraft." When I look around my immediate part of the world, besides the desk tops filled with radios and computers, I see my bookshelf lined with over forty aircraft software simulators. Well, I guess that's not that surprising. Back in 1972 I soloed in a single engine aircraft, after nine hours of terrorizing myself.

Perhaps, because of sheer will to overcome my initial "fear of flying" I now list getting my flying license—at the US government's minimum required 40 hours of flying time—at the top of my personal accomplishments. There really is nothing like a bit of aerobatics to give you a new perspective on life and the world. This third dimension adds a whole new set of problems and opportunities not encountered by ground hugging humans.

Over the past few years other priorities and responsibilities have relegated me to the computer simulation hanger and aircraft band scanning; both of which I do avidly. Computer "flying" utilizes a majority of my computer's time. Beginning in the late 1980's with Yeager's Combat Simulator, and continuing today with the latest Microsoft Flight Simulator and Janes' USN Fighters, the line between real flying and simulations is becoming blurred. At Web sites such as Mike Marando's **simflight.com** you can download very realistic scenery and airports (with all their radio emissions) for your Flight Simulator program. After practicing landings at Nice, France, you'll feel right at home landing on the Riviera. The amount of aircraft simulation software available on the Internet is staggering.

Another large chunk of computer time is taken up scanning aircraft frequencies using my seven scanners and shortwave receivers. Any of the ScanCat line of software work great for collecting, storing, and controlling aircraft monitoring radios. But lately I've realized I'm using my computer and Internet for lots of other aircraft monitoring related purposes. One purpose is to download aircraft frequency lists directly into my ScanCat Gold program. By downloading these files and saving them as ".txt" text files, they can then be read by ScanCat.

F-15 Eagle

■ Monitoring Aircraft on ShortWave

There are two distinct categories of aircraft users to be monitored: military and civil. The civil category includes commercial, business, and private aircraft operators.

For long hauls, such as transatlantic crossings, all types use the shortwave bands in the single sideband mode to communicate with ground stations. An excellent source of data for all shortwave (HF) aero frequencies can be downloaded into your receiver control software from **www.grove.net/~larry/hfaero.html** — That's right; it's Larry (the Chief) Van Horn himself! Commercial aircraft also stay in touch with their company via shortwave. These "company" frequencies can also be found at this site.

■ Being "Civil" on VHF

Just above the FM commercial broadcast band sits the 108 - 136 MHz civil aircraft band, using the AM mode. Two types of ground to air stations — those at an airport and those at enroute centers (including Flight Service weather advisory stations) — can be heard on VHF. Airports have tower, ground, approach, and navigational signals that can be monitored within a radius of about 10 to 30 miles of the airport. To find the frequencies of the airports in your area try AirNav at **www.airnav.com/** for all the info you'll need under the Airport Information section.

The enroute centers have much stronger transmitters and can be heard as far away as 50 miles under certain conditions. As with other VHF signals at these frequencies, reception is almost line of sight. Therefore, hearing high flying aircraft 80 miles away is quite possible. Hearing ground stations 20 miles away is possible but rare if structures and natural land features intervene.

Using the Navaid Information section of AirNav you can search by frequency, name, or identifier for navigational radio signals. Aircraft use non-directional beacons (NDB) for direction information. Therefore their exact location is also given in the Navaid database. These beacons, which are below the medium wave AM broadcast band, are of interest to longwave listeners. This site provides a ready-made longwave station database for these folks. VHF (50 to 136 MHz) navigational stations are also listed in Navaids database.

■ Military Aircraft - The Spoilers

There is always the guy who has to be different! Military aircraft use their own fre-

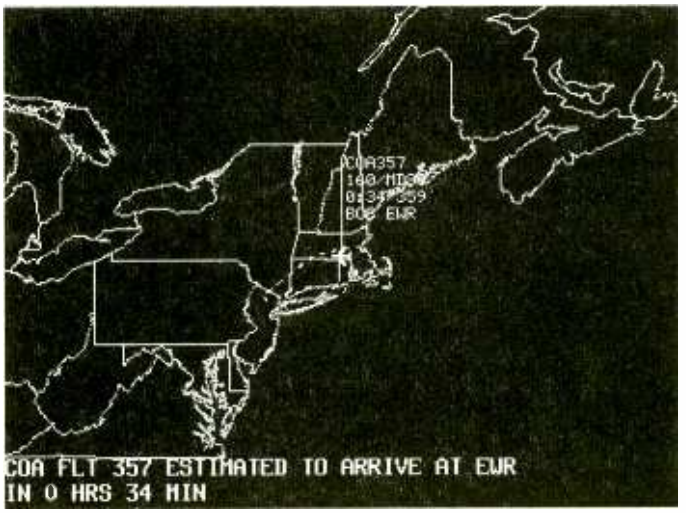


FIGURE 2 - *FlyteTrak of Boston to Newark Continental FLT 357*

quency range: 200 to 400 MHz, UHF. But they do broadcast in the AM mode like their civil counterparts. Therefore, in order for the civil air traffic controllers to communicate with military aircraft, the ground station must transmit on a frequency that civil traffic cannot hear. In many cases the ground stations broadcast in the civil band and the military band, simultaneously. That explains why you can sometimes hear the ground station but not the military aircraft he is talking to.

This parallel band capability is common throughout the US air traffic control network. To find the frequencies of military bases in your area you might check Jim Fordyce's Aviation Scanning Information page at **www.li.net/~j4dice/avifreq.html** for lots of good mil scanner frequencies to download.

Mil Callsigns

Since military aircraft don't really want to announce where they have come from, or their destination, they use code signs such as "Jaws." Although they can be changed daily, having a list of callsigns can help identify the homebase and aircraft type in many situations.

Try **www.personal.u-net.com/~morfis/callsign.htm** to download a list of military aircraft callsigns. This location has not always been accessible. You can also get European based military aircraft callsigns at **www.cee.hw.ac.uk/~ceeamh/callsign.html** Can anyone E-mail me the address of a USA based military aircraft call sign list? Promise, I'll share it.

Tracking and Monitoring Aircraft

Listening to commercial aircraft as they move across the USA can provide a whole day of interesting monitoring, especially if the sky is full of clouds and rain. If you can identify the airline, flight number, and destination airport, you can track the outbound flight that you are monitoring using *Flyte Trax*. See Figure 2. This service is available at **www.weatherconcepts.com/FlyteTrax** free of charge. Flyte Trax displays a map with the aircraft's route as filed in their flight plan and their current location. Estimated arrival data will also be displayed when available.

Don't Just Listen - Read!

Well, anyone who has read this column over the past year has seen at least one ACARS decoding review. This packet-like digital mode is used by the airlines to report in-flight route, passenger and aircraft information to ground stations. A number of ACARS decoders are commercially available, for example from Universal Electronics. If you are into ACARS, go to **http://web.inter.nl.net/hcc/Hans.Wildschut/acars.htm** This site is in the Netherlands or Belgium. But the info is useful all over the world. Another useful ACARS page is on our very own **www.grove.net/~acarsweb/index.html**
The reference section is very useful for the experienced or new ACARS monitor.

Hearing is Believing

Finally, another melding of computer and monitoring is now provided by RealAudio at **RealAudio.com**. Download the program and you will be able to hear live, as it happens, aircraft communications at Dallas Ft. Worth airport. After you download RealAudio then go to **www.simuflite.com/** and click on "LIVE." You'll be monitoring aircraft before you know it.

Air Links

Check the following for links to aircraft related Web pages:

World Utility News
www.cybercomm.net/~slapshot/wunurl.html
Pete Costello's Shortwave Radio Catalog
itre.ncsu.edu/radio/RadioCatalogRS.html#DIGITAL1
Flight Sim Central
www.fscentral.com/links.htm

Just remember that things on the Web are changing rapidly. Don't expect every link that we mentioned to work every time.

Burlington tower, this is Cessna Citation 3245 Lima at 100 feet. We are about to execute a show-off loop. I'm real glad it's just a simulator so I can be around to "See you next month."

Rich Arland, K7SZ
k7sz@juno.com

Those Beloved Boat Anchors

This month's column is devoted to collecting vintage or classic communications equipment. Affectionately called "boat anchors" or BAs, by those who collect, restore, and use them, classic vintage comm gear is one of the fastest growing facets of the hobby.

Whether it's Collins, Hallicrafters, Johnson, Hammarlund, National, Heathkit, Knightkit, Eico, or Gonset, these rigs bring back the history and glamour of the past in amateur radio and shortwave listening. It was an era when quality American made equipment dominated the commercial and amateur communications industry worldwide.

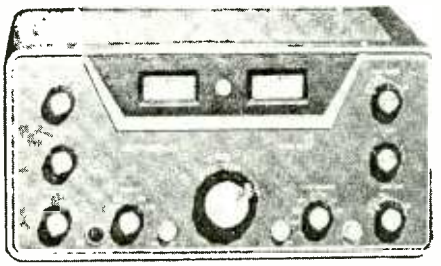
My entry into BA collecting/restoration started a couple of years ago when I answered an ad in the *Ham Trader Yellow Sheets*[1] for a GR-81 super-regenerative SW receiver. This had been my very first kit as a budding SWL. I bought it for $25. When it arrived it was very dirty. After a cosmetic clean-up using Murphy's Oil Soap and some Simple Green, along with a liberal application of contact cleaner in the controls and tube sockets, the little rig came alive and continues to work today.

Shortly thereafter I found the companion receiver, a GR-91 superhet of the same year. It was in excellent condition except for the cabinet that the previous owner had painted an ugly gold. A quick trip to the sand blaster, a spray of the cabinet with primer and top coat and I had a pristine GR-91 to place beside my GR-81. I continue to regularly use both sets for general SW listening.

About two years ago, a friend of mine offered me an unbuilt Heathkit GR-78 SW receiver. I took my time and in about two years (yep, you read it right) I had myself a pristine GR-78.

I have had several Zenith Trans-Oceanics come my way. The first one, a model R-600 (circa 1954) was given to me by one of my coworkers. It had lived in a basement for about 30 years and was a physical mess. Electrically it worked after the standard recapping (replacing all the paper and electrolytic capacitors on the chassis) and alignment. The physical restoration was much more intense, involving getting rid of the mildew smell from all those years in a dank basement.

The black simulated leather (called "stag" by Zenith) was reglued to the wooden case in the areas that had pulled up. Next, Murphy's Oil Soap was used to thoroughly wash the inner and outer surfaces of the case. After allowing it about two days in which to dry, black shoe dye was applied all over the leatherette to a uniform blackness. Then four coats of hand-rubbed black paste wax was applied and buffed. The results: an outstanding case that complements the radio very well. All the brass fittings and hinges were cleaned with brass polish. The plastic front panel and controls were cleaned. I now have an absolutely beautiful Zenith T-O that is 40 years old but still works great and is a pleasure to look at.



Too many radios and too little time means cultivating a specialty — My weakness is for Hallicrafters, like this 1960s era HT-44. (Photo courtesy "Transmitters, Exciters & Power Amplifiers" by Raymond S. Moore)

At the 1996 Shortwave Winterfest Dr.Harold Cones and I were walking through the mini flea market and ran across a Zenith model Royal 1000 Trans-Oceanic. This was the very first transistor model that came out of the Chicago plant in 1959. Harold told me to offer the seller $15 (he wanted $20). I did, and walked away with a new T-O. The seller warned that the set did not work. Harold said that was not a problem.

Outside the flea market, we opened up the back of the set and Harold pointed out the transistors to pull and spray down the sockets and transistor leads with good quality contact cleaner. The plan was to reseat the transistors several times to remove any corrosion. Once I did this and replaced the batteries, I had a working Royal 1000! It was that easy. After the obligatory cosmetic cleanup and alignment, the set functioned perfectly. Later in the year, I traded that receiver for two Hammarlund HQ-170ACs and restored both of these receivers to full working condition. See how this hobby builds upon itself with minimal cash outlay?

■ Cultivating a Specialty

Or it would, if it weren't for the fact that BAs can become extremely addictive. Those of us who have been at this a while come to the realization that you cannot collect and restore everything you want. It boils down to too many radios and too little time.

After the initial exposure to BAs, most of us settle into a niche and concentrate on obtaining a specific brand name or type of classic radio. My personal favorites are Hallicrafters receivers and transmitters from the mid-50s to the late 60s. This brings back memories of my earliest exposure to ham radio and SW DXing.

A fully restored SX-117/HT-44 receiver and transmitter now comprise the HF station that I use regularly. I have one of the HQ-170s paired up with a B&W 5100B 100 watt AM transmitter for my AM station. If I really want to get nostalgic, I fire up the crystal-controlled Knightkit T-60 novice CW transmitter and HR-10B Heathkit receiver and relive my novice days. I do my general SW listening using a beautifully restored Hallicrafters SX-71 receiver.

Other BA collectors specialize in Heathkit, Knightkit, Collins, etc. It all depends upon your personal interests, the availability of units, and, of course price. Collins and E.F. Johnson seem to demand premium price, while Heathkits and Knightkits cost very little by comparison. At the Virginia Beach hamfest last September, I purchased a complete Heathkit SB-101 station (power supply, speaker cabinet, station console, monitor scope, and microphone) with extra tubes and all manuals for $150! Not bad for a vintage SSB station.

■ Other Places for Plunder

Sometimes you can run across a BA bargain at a yard sale. This is an ideal situation, because seldom does the seller really know the worth of the radio. This last summer I was 15 seconds too late to buy two working R390s for a total of $10.00! Cam Hartford, N6GA,

found a pristine SX-71 with matching speaker sitting on a curb side awaiting the garbage truck! Needless to say, Cam now has a great SW receiver and he didn't spend a dime!

Another source is your local flea market. These events have become quite popular all across America. Be prepared to haggle. Most of the "regulars" at flea markets have a good idea of the value of old receivers, and they will jack the price up accordingly. Once in a while you'll get a really good deal, but most of the time you will end up paying market value for a BA at a flea market.

Hamfests are another source of BAs. Most of the time the good deals are gone early in the day, leaving nothing but overpriced junk to the late comers. Hamfests produce some good buys, but also be aware that you can get burned, too. Shorted power or modulation transformers in tube-type transmitters or linears are almost impossible to economically replace. Beware of the "screwdriver technician" who might have modified a piece of vintage gear.

Last July at our local hamfest, I picked up a scruffy Hallicrafters SX-140/HT-40 receiver/transmitter pair for $40. The previous owner said that he had recapped the receiver but could not get it working. I took the units home, checked the wiring against the schematic and found that he had installed the electrolytic capacitors in the power supply backwards! Some quick work with a soldering iron had both units up and playing in short order. The cases were sandblasted, reprimed and painted (Krylon™ #1601 "Pewter" is a good match for the early 60's light Halli gray). I procured an HA-1 T.O. Keyer and sold the completely reconditioned station for $250! Needless to say, the profits of this sale went back into the BA hobby.

Other sources include the *Ham Trader Yellow Sheets*, which are a very good source of used ham and SW equipment. There are several "collectors" nets on HF, along with regional swap nets. My favorite source is the Boatanchors Reflector on internet: *boatanchors@theporch.com*. This is a subscription list and costs $12/yr, but is worth every penny. Not only are there about 750 members who have a wealth of knowledge to share, but you can post a question and get an answer without the usual "flaming and spamming" encountered on the *rec.radio* newsgroups. The BA reflector caters to all forms of "radios that glow in the dark." From Collins, Hammarlund, and Hallicrafters to military collectors and vintage test equipment collectors, it's all there.

If collecting Heathkits is your niche, I highly recommend *Heathkit: a Guide to the Amateur Radio Products* by Chuck Penson WA7ZZE.[2]

■ Restoring Tips

Let me inject some words of caution regarding restoring boat anchors. First there is the need to be familiar with vacuum tube circuits. Tube technology is not related to transistor technology. Voltage differences aside, you have to start thinking in "hollow-state" in order to be an effective boat anchor troubleshooter. Old ARRL handbooks of the 1950s and 60s are an invaluable source of tube technology info.

One thing to remember: tubes will work when they are marginal, often giving indications of problems elsewhere in the radio. Transistors either work or they don't: There is no middle ground. But, just because a tube checks good in a tube checker does not mean that it will work in a circuit. The best method of checking a tube is substitution with a known good vacuum tube. Likewise, do not assume that if you buy new, old stock (NOS) from a tube supplier that the tube is good. A faulty NOS 6SS7 in my S-51 Hallicrafters caused me about three hours of headaches. Once the 6SS7 was replaced the IF stage functioned as advertised.

There is something exotic about working on tube equipment, especially when you realize that lurking beneath the chassis is enough voltage and current to *kill* you! SAFETY FIRST! USE EXTREME CAUTION WHEN WORKING ON VACUUM TUBE RECEIVER AND TRANSMITTER CIRCUITS. LETHAL VOLTAGES AND CURRENTS ARE PRESENT ABOVE AND BELOW THE CHASSIS!

Follow the old technician's rule of working with one hand in your pocket, so you don't become part of any circuit that can cause electrocution. It takes very little current (yes, it's current that kills you) to make you a former reader of this column. As little as 30 milliamps taken directly through your heart muscle can cause death. While human skin is an excellent insulator, your body's total resistance changes dramatically as skin become moist due to perspiration. Low skin resistance coupled with high voltages can set the stage for disaster. No kidding, folks, use caution.

That's a wrap for this column. Hope you enjoyed our brief tour of boat anchors. One of these days I'll tell you the story about restoring the rarest of all Zenith SW portables: the Global. Made for only three or four months in 1946, finding a Global is like discovering the Holy Grail for Zenith aficionados. But meanwhile, start out with what's at hand, and Keep It Simple.

1 *Ham Trader Yellow Sheets*, P.O. Box 2057, Glen Ellyn, IL 60138; $18 subscription. Also carry some buyer's guides on used equipment.
2 *Heathkit: A Guide to the Amateur Radio Products*, Chuck Penson. Electric Radio Press, Box 14643, Cortez, CO 82321; er@frontier.net; 970-564-9185. $24.95 plus $3 shipping

MT REVIEW

Radio Shack FRS-105 UHF transceiver

By Steve Donnell WA1YKL

Radio Shack was the guiding force behind the creation and the FCC's approval of, the newly authorized Family Radio Service (FRS). In the April issue of *MT*, Bob Grove took a quick look at this summer's release, the FRS-108, but the more powerful FRS-105 was Radio Shack's first transceiver specifically designed for FRS.

The intended purpose of the new service is to provide a way for family members and other individuals to reliably communicate over short distances of up to two miles. The frequencies allocated for this function are fourteen interstitial or "splinter" frequencies in the 462 and 467 MHz bands. The FRS-105 is capable of operating on just the seven frequencies in the 462 MHz range. (See table 1) These channels are manually selected by way of a rotary switch: The FRS-105 does not contain any channel scanning functions.

TABLE 1

FRS-105 CHANNELS	
CH 1	462.5625 MHz
CH 2	462.5875
CH 3	462.6125
CH 4	462.6375
CH 5	462.6625
CH 6	462.6875
CH 7	462.7125

FRS radios are required to limit their transmitter power to no more than 500 milliwatts, and the antenna must be permanently attached to prevent the use of range-enhancing "gain" antennas and/or external amplifiers. The FRS-105 uses a flexible rubber antenna, measuring 3.5 inches long.

Subaudible tone signaling is permitted, but not required. The FRS-105 may operate on any of seven CTCSS tones: 77.0, 88.5, 97.4, 107.2, 118.8, 127.3, and 136.5 Hz. The radio will encode and decode only the selected tone on all of its seven channels. The tone is selected by way of a rotary switch inside the battery compartment and behind two batteries. Although simple to use, it may also be seen as a constraint if you want to contact others who are using different CTCSS tones.

As with most other radios that use CTCSS, the FRS-105 includes a Monitor button that, when pushed, will briefly defeat the CTCSS decode function and open the radio's squelch to listen for users that are not using the same CTCSS tone as the one you have selected.

The FRS-105 is conveniently powered by three AA size batteries. While there is no provision internally for using rechargeable batteries, use of externally charged NiCds or even the new rechargeable alkaline batteries is possible. During extended outings, however, I recommend you use non-rechargeable alkaline cells.

Like many other portable scanners, the FRS-105 includes a battery-saving circuit that cuts down on receiver current drain during idle periods. The FRS-105 is rated for 20 hours of use on a set of alkaline batteries, against a "typical" usage pattern of 10% talking/receiving and 90% standby time.

Although there are no provisions for connecting external DC power, the FRS-105 does include jacks for external microphone and earphones. Radio Shack currently offers a couple of different accessory packages for the FRS-105. These include a headset with boom mic, or a more discreet molded earpiece with an inline mic.

Refarming Debut

Beyond the simplicity of its operating frequency and CTCSS functions, the FRS-105 heralds a new beginning in radio beyond FRS: It is one of first "next generation" of radios that can operate on (UHF) frequencies spaced only 12.5 kHz apart, as required in order to meet the FCC's spectrum "refarming" requirements. One of the earliest concerns regarding the creation of the Family Radio Service, was that they would result in interference to and from other radio users on the "primary" radio frequencies that the FRS splinter frequencies reside between.

From what I have seen so far in evaluating the FRS-105 such concerns have proven groundless. First of all, transmitter frequency deviation in our FRS-105 was measured to be just slightly over 2 kHz. While this will make the FRS-105's transmitted audio sound lower compared to other types of radios, this should pose no problems between other FRS radios. This lower modulation level should easily prevent any "splashover" problems onto the adjacent GMRS primary channels.

The FRS-105's receiver was equally impressive. With the CTCSS deactivated and a strong test carrier signal being produced, it modulated with a 1 kHz audio tone at 4 kHz of deviation. When the test carrier was moved plus or minus 8 kHz from the center of the FRS-105's frequency, it was no longer noticeable. In a field test, the FRS-105 was checked two miles away from GMRS repeater, which had a fairly heavily modulated voice on its carrier. The FRS-105 was switched between two of its channels that were adjacent to the repeater's output frequency. No interference was received and only a small amount of the repeater's signal could be recognized when the FRS-105's Monitor button was pressed.

Physical Considerations

Physically, the FRS-105 measures approximately 4.5" x 2.5" x 1.2", with nicely rounded edges that make it easy to hold onto and slide into your pocket. The FRS-105 also comes with a detachable belt clip. While the clip could be somewhat more rugged, it's better than ones found on many scanners. The rest of the FRS-105's case seems to be very durable and is well sealed against weather contamination.

The cover for the battery compartment is well designed to prevent it from accidentally falling off, but it requires some practice to master the art of setting and releasing the two latches on the sides that hold the cover in place.

One ergonomic glitch I noticed concerns the labeling for the volume-on/off control and the channel selection switch: When you look at the FRS-105 face on, the labeling for the volume control is correct, but the channel selection numbers are reversed.

It is also interesting to see that there is no attempt to "hide" the true manufacturing lineage of the FRS-105: With the Motorola name on the front and its "Big M" on the belt clip, it's obvious where the FRS-105 hails from. I suspect this was a calculated marketing strategy, given the reputation for high quality that Motorola has garnered in recent years with other product lines. In case you haven't yet noticed, the FRS-105 is a very close clone of Motorola's own FRS series radios, the Sport 7.

If you use the FRS-105, with CTCSS activated, with a non-Motorola radio, you will experience a loud, annoying squelch "tail" following the received signal. It is not a problem when used with another Motorola radio, because, upon releasing the Push To Talk button, the phase of the transmitted CTCSS tone is reversed. This instantly stops the decoding of the CTCSS tone on the receiving end.

The FRS-105 is an easy-to-use, low cost radio that's great for use by families or individuals that want reliable short-range communications, without the need of obtaining an FCC license.

WHAT'S NEW?

PRODUCTS AND BOOKS OF INTEREST

by Larry Miller

Contributors: Rachel Baughn, Bob Grove

Cyber Crime

When authorities talk about internet crime, they are talking much bigger than the unauthorized use of credit cards. They're talking about issues of national security. And big business is shaking.

From the first in a list of spectacular cyber crimes in the late 1970s (a hacker stole $10.2 million from a Los Angeles bank) to today, the potential is mind-boggling. Authorities are taking the threat seriously. Says FBI special agent William Tafoya, "Crime involving high-technology is going to go off the boards."

Cyber Crime - How to Protect Yourself from Computer Criminals, is an excellent introduction to this fascinating, dark world. Says author Laura Quarantiello, "If you believe that you cannot be harmed ... then you are a victim-in-waiting."

There are three levels of vulnerability, say the cyber cops who patrol this new digital beat. You'll meet some of these good guys — and some of the bad. Complete with indispensable appendices, a list of online resources, and a glossary of terms, every computer-user should have a copy. You can get *Cyber Crime* (ISBN 0-936653-74-4) at your local bookstore or by calling the publisher direct 800-420-0579. The price is $16.95 plus $3.00 shipping. Mail orders are accepted from Limelight Books, P.O. Box 493, Lake Geneva, WI 53147. Mention *MT* when you call!

New Euro Freq Guide

Simon Spanswick has announced a new publication: *Global Radio Guide*. Produced under the banner of The Association for International Broadcasting, it's a 45-page booklet that promises a "comprehensive index of international broadcasting stations."

For the most part, the bi-annual booklet consists of advertisements, the usual introductory information ("From Albania to Kazakhstan..global radio offers a unique window on the world!") and tips on choosing a receiver. The center section is arranged by country and lists the station name, address, telephone number, fax, e-mail address, web site, and UTC schedule for English transmissions.

Orders for *Global Radio Guide* can be faxed (+44 181-852 0853) or mailed (P.O. Box 990, London SE3 9XL, UK). The January 1997 edition has a cover price of £3.95 or US $6.45. Mention *Monitoring Times* if you order.

Heathkit Guide

Recently a number of excellent directories of former radio receiver and transmitters have appeared on the market; Hallicrafters, Collins, Zenith, Philco, and others have been especially highlighted. This latest photoessay, *Heathkit Guide To Amateur Radio Products*, written

by Chuck Penson WA7ZZE, is a welcome addition focussing on Heathkit amateur radio equipment (but not test equipment),

A superb chronology of Heathkit — a treasure trove of historical information on the company and its product development — precedes the product listings. The bulk of the book's 248 pages is dedicated to the photos and the descriptions — some 200 of them — and is superbly done. If you don't know all about Heathkit and their amateur radio product line when you're through reading this book, you haven't been paying attention!

Heathkit Guide To Amateur Radio Products is $24.95 plus $3 shipping from Electric Radio Press, 14643 County Road G, Cortez, CO 81321-9575; ph. (970) 564-9185.

— *BG*

New Drake Radio

R.L. Drake radios certainly have a noteworthy pedigree. So, when the Ohio company re-entered the shortwave receiver market some years ago, it was greeted with no small amount of enthusiasm. There was the R8, then the R8-A, both landing on the scene with fairly hefty price tags.

Drake, realizing that some of us have incomes in the sub-stratosphere range, introduced the more mass-market SW1 receiver. Like the R8 and R8-A, the SW1 was well accepted, but lacked single sideband — a major deficiency to some.

The new SW2 takes care of all of that and goes several steps further. Not only has Drake added single sideband but selectable-sideband synchronous detection (made popular many years ago by the groundbreaking Sony 2010), bargraph S-meter, 50 Hz tuning steps, and improved RF gain control. This is the same radio that boasts 10 kHz through 30 MHz, 100 memory channels, dual antenna inputs, double conversion design, and a neat, compact size (10-7/8"W x 4-3/8"H x 7-5/8"D).

There are more features worth mentioning, but the best of them is affordability: the SW2 is $489.95. To get the full run-down on specs or to check out the list of available options, look at the Grove catalog that came in your May issue of *Monitoring Times*. To order, call Grove at 800-438-8155.

New JRC-345

If the above-mentioned Drake SW2 is the consumer version of the higher-priced R8-A, then the new introduction from Japan Radio Company is the consumer version of the NRD-535. However, at a price of under $900, the NRD-345 is clearly intended to compete with receivers in the so-called "professional" price range.

This is a nice receiver. The NRD-345 combines some of the luxury of the higher-end JRCs and, according to the manufacturer offers "advanced multifunctions to meet the exquisite requirements of enthusiastic BCL and SWL friends." Among the most highly touted is the addition of an AM synchronous detection circuit, again, targeted to the more casual listener who wants to avoid those annoying highs and hollows of a fading signal.

Here's how the rest of the JRC NRD-345 shapes up: The NRD-345 is clearly a high-quality, double conversion receiver with wide frequency coverage (100 kHz to 30 MHz), multimode reception (AM, AM synch, USB

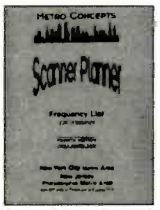
and LSB), sharp selectivity (2/4 kHz), high sensitivity (0.3 microvolts), wide dynamic range (100 dB), dual VFOs, and precision tuning (5/100Hz, 1/10 kHz steps). IF selectivity is -6/-60 dB (4/10 kHz wide and 2/6 kHz narrow). Image rejection is a healthy 70dB with selectable AGC, noise blanker/limiter, and RS-232C computer interface.

For more information or to place your order just dial up 800-438-8155. Grove is expecting to have these hard-to-get receivers already in stock.

NY/NJ/PA Frequency Guide

David Garofalo's *New York City/New Jersey/Philadelphia Scanner Guide* is growing into quite a publication, about 200 pages worth.

Garofalo pretty much introduced the concept of the "live" frequency guide, choosing, at least in initial editions, to list only active frequencies and not simply re-print the standard FCC frequency dump of everything, live, dead, planned, and unused. New to this edition are national sports teams and more PL tones, along with the latest updates on public safety and government agencies.



The book costs $21.95 plus $4.00 shipping. If you are a Jersey-ite, you need to include the state's hefty 6% sales tax. The address to order is Metro Concepts Scanner Planner, P.O. Box 74, Netcong, NJ 07857.

Know Your Xmitters

Transmitters is the subject of Ludo Maes' booklet, entitled, *TDP SW-97 Transmitter Documentation Project*. Clearly a labor of love by Mr. Maes, previous editions have been a compilation of somewhat arcane transmitter information. Now filling out to 80 pages, it's arranged by country, and each listing indicates the name of the station, transmitter site, geographical coordinates, and call sign. It also shows the number of transmitters at the site, their power, manufacturer, type number, and year of installation. Note: no attempt is made to list frequencies.

You'll find a list of transmitter manufacturers and their headquarters, and a statistical breakdown of the number of shortwave transmitters in use around the world. This information is in turn grouped by power level, country, and manufacturer.

You can get a copy of this exhausting exercise by sending US$10 to Ludo Maes, P.O. Box 1, 2310 Rijkevorsel, Belgium. If memory serves, I believe that last time Mr. Maes accepted payment in cash only.

AR8000 on Ice

The FCC has revoked the certification of the AOR AR8000, because the FCC felt it met the proscribed criteria of being "easily modified" to receive cellular communications. There will be no more units available until the cell-blocked version is designed, submitted to the FCC, and approved.

EDCO, US distributor for AOR, declined to make any prediction of availability, but it will undoubtedly be several months.

Listening to the Earth

This month's cover story may entice you to try your hand at listening to the pops, crackles, and whistles of lightning and other nature-induced radio waves. But, due to the sometimes overwhelming interference of the

modern electricity grid, such reception may not be available to you unless you're willing to remove yourself to some of the most inhospitable locations that the Earth has to offer.

This is precisely what Stephen P. McGreevy has been doing over a period of five years, to gather a fantastic collection of Natural VLF recordings. Once on location, McGreevy uses his custom VLF equipment to receive the audio frequency radio waves generated by millions of lightning bolts striking the Earth (sferics), the interaction of these lightning bolts with the Earth's magnetic field (whistlers), and when in Alaska and points north, the sound created by the eerie Borealis effect (Auroral Chorus).

These recordings are available on the *Electric Enigma* double CD, which is accompanied by two 34-page booklets giving detailed information on each uninterrupted recording. The *Electric Enigma* double CD costs £18.50 plus shipping (£2.00 Europe; £3.00 U.S.). Order from: THESE Records, 112 Brook Drive, London SE11 4TQ, UK; tel 44-171-587-5349 or fax 44-171-582-5278. Credit cards are accepted.

A new addendum of McGreevy's latest recordings from Alberta, Canada, is due out soon. Check out the VLF URL at **http://www.ibmpcug.co.uk/~irdial/vlf.htm** for the latest news and sound clips!

— *RB*

Heads Up

It's a shame, says Byrun Fox. Every year, millions of people around the world believe that they are being abducted by aliens from outer space. Fox says that these people report being paralyzed and helpless, although conscious. Worst of all, abductees often claim that the aliens perform terrifying medical experiments on them.

"People are afraid to go to sleep for fear of someone appearing in their room," says Fox.

According to a story in the *Vancouver Sun* three months ago, Fox began offering an Alien Abduction Alarm which he claims will warn of approaching UFOs. "I'm as serious as a heart attack about what I'm doing," says the New Westminster, BC, inventor. Of course, "a certain number of people calling me need care, and perhaps, medication, but there are others whose experience is very real and physical."

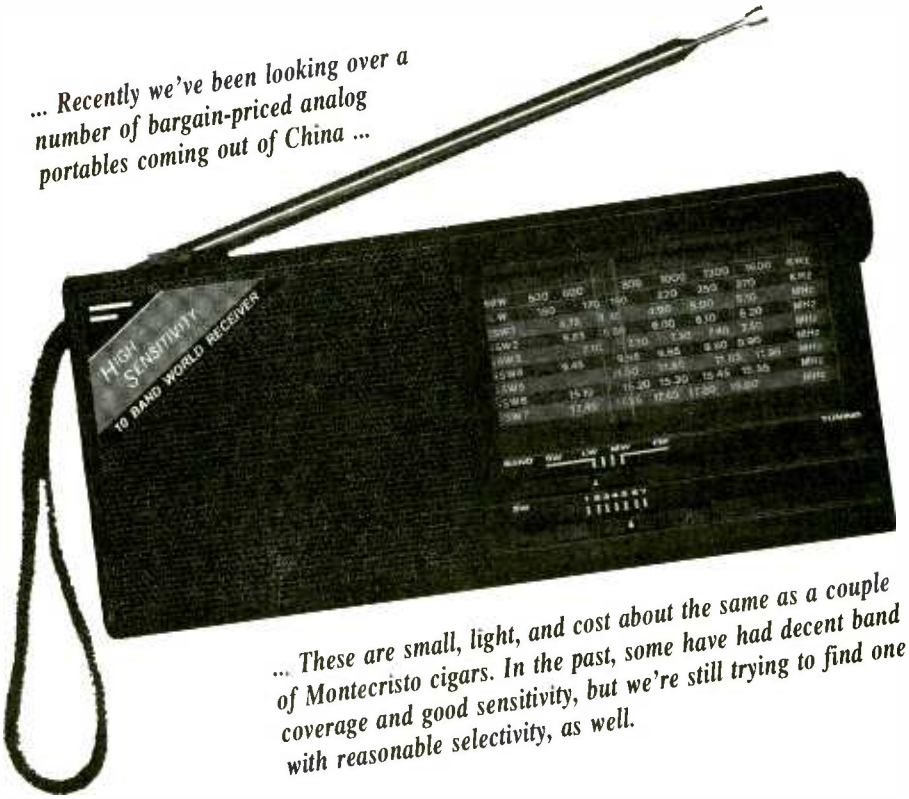
Designed to pick up "electromagnetic and electrostatic waves," the device emits a loud noise if it detects a UFO. The beep is designed to bring the abductee out of the paralyzed state. Although Fox agrees that there is no way he can prove the alarm works, he will say that it is a "state-of-the-art anomalous scalar wave detector."

According to the *Sun* story, you can order an Alien Abduction Alarm from Mr. Fox for (CAN)$399 at 250-524-4062. (Mention another magazine if you call!)

Books and equipment for announcement or review should be sent to "What's New?" c/o Monitoring Times, P.O. Box 98, 7540 Hwy 64 West, Brasstown, NC 28902 Press releases may be faxed to 704-837-2216 or e-mailed to mteditor@grove.net.

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

International MT-798 Travel Portable



... Recently we've been looking over a number of bargain-priced analog portables coming out of China ...

... These are small, light, and cost about the same as a couple of Montecristo cigars. In the past, some have had decent band coverage and good sensitivity, but we're still trying to find one with reasonable selectivity, as well.

Back when Gerald Ford meant more than Henry Ford, it used to be that a traveling gladiator of the airwaves faced three choices.

Most practical was to take along a compact, low-cost plastic analog portable, and stuff it in with the socks and shirts. But if that wouldn't do the trick, you could tote a full-sized portable, such as a Zenith Transoceanic, NordMende Globetrotter or, for the cognoscenti, a Barlow-Wadley XCR-30 Mark II. These were beefy, as portables go, but they were a solid notch better than the smaller offerings. Indeed, the South African Barlow-Wadley qualified as a genuine DX receiver of sorts, and you didn't have to worry about battery failure. After all, it could easily run for a year or more on a set of "D" cells.

Barlow-Wadley aside, gearheads who wanted serious hardware were forced to trot off with one of the smaller tabletop models, such as a Drake SPR-4, and some sort of homebrew or other quasi-portable antenna. Trouble is, these created luggage problems, and once you arrived at your destination you were at the mercy of the local power company, as battery power was not practical.

I went this last route in 1971 on a solo trip to France, sticking my beloved Drake R4-B into a modified Kodak Carousel projector carrying case. To this I added an English-made "Joystick" antenna that was like a tubular broomstick with a coil amidships.

The first night after I arrived, I tried listening from a fourth-story walkup in Asnières, outside Paris. What a payoff—I was in DXer's heaven, pulling in at least several minutes of juicy Asian catches!

However, unbeknownst to me, the power in Asnières regularly varied plus or minus 40 percent, and I had plugged in my beloved R4-B during one of the power grid's wilder swings on the high side. Something essential in the radio got fried, so I spent the next several weeks looking like an NSA agent on the lam, toting suspicious-looking but useless eavesdropping gear on trains throughout France.

Ever since, I've been scouring the planet for the holy grail of a small portable that's not so pricey that I can't afford to lose it.

Time has been kind. There's no longer a need to lug around Big Iron on any trip this side of a DXpedition. The Sony ICF-2010 comes as close to the ideal as a serious radio lover could hope for, although it's a handful and doesn't come cheap. The Sony ICF-SW100 is itsy and light enough to carry on the Tour de France, but its audio quality rivals that of an antique telephone, and it costs nearly as much as a '2010. Its sensitivity isn't the greatest, either, and early production units suffered from a tendency for the computer-type cable between the two halves of its clamshell to give out after months of flexing.

Probably the best overall compromise is the Sony ICF-SW7600G. With its synchronous selectable sideband, it comes reasonably close to performing like a '2010, but is smaller and cheaper. Still, at around $200 it's not something you'd want to forget on Waikiki Beach, or involuntarily donate to the Shanghai Hotel Employees' Fund.

So, recently we've been looking over a number of bargain-priced analog portables coming out of China. These are small, light, and cost about the same as a couple of Montecristo cigars. In the past, some have had decent band coverage and good sensitivity, but we're still trying to find one with reasonable selectivity, as well.

So, hoping for a bit of Irish good luck, around St. Patrick's Day I ordered an International MT-798 compact analog portable at a Scotsman's price of $35, including shipping. Physically, it shows promise, weighing well under a pound with two "AA" batteries. And although it's what we classify at *Passport to World Band Radio* as a compact, at just under seven inches by three inches by 1-1/2 inches, it's a small compact, indeed—close to ideal for traveling.

It covers longwave, which can be useful in Europe, North Africa, and the Near East. Of course, the usual FM band is included, in mono, along with the AM band to 1610 kHz. Alas, that's fine for much of the world, but in North America the AM band now goes to 1705 kHz, even if the FCC has been slower than an armadillo in mud getting stations allocated within the 1610-1700 kHz "expansion band."

Shortwave coverage is 60 meters (4700-5100 kHz), 49 meters (5830-6200), 41 meters (7050-7500 kHz), 31 meters (9410-9900 kHz), part of 25 meters (11450-11880 kHz), most of 19 meters (15050-15550 kHz) and 16 meters (17400-18050 kHz). Omitted entirely are 120 meters (2 MHz), 90 meters (3 MHz), 75 meters (4 MHz), 22 meters (13 MHz) and 13 meters (21 MHz).

Twenty-two meters (13 MHz) was first

created at the 1979 World Administrative Radio Conference (WARC-79), and has been used increasingly ever since. China may be the land of the Great Wall and shortwave jamming aplenty, but certainly 18 years is ample time for the existence of 22 meters to have penetrated even the most remote reaches of this populous nation.

Too, the real-world 25 meter band stops at 12100 kHz, not 11880 kHz (although the radio's dial shows the upper limit as 11950 kHz, so some samples may tune higher than ours). Even the pre-WARC-79 upper limit was 11970 kHz.

Otherwise, this radio is characteristically uncomplicated. There's a cloth wrist strap, a small tuning knob, volume slider, two bandswitches, single-LED tuning indicator, 3 VDC input for an AC adaptor (not supplied), and an earpiece jack (ditto). The on-off button, which lacks a travel-off lock, is easily activated by accident, so travelers should remove at least one battery before packing the radio away.

The telescopic antenna swivels, but can't rotate. This makes it a problem to hear the radio when it is laid on its back—although it is less tipsy than most small radios in this regard. It also adds to the potential of the antenna's being broken by accident.

Shortwave performance? A disappointment!

To begin with, on our unit the factory alignment is so sloppy that the frequency readout is sometimes off by 70 kHz. Twenty, even 30 kHz, okay, but being off by 14 channels is ridiculous.

The radio comes with a bright Mao-red label on the front proclaiming, "High Sensitivity." Forget it—this claim is as brazen as they come. Although we've tested a few radios with less sensitivity, the MT-798 may have you wondering whether your hearing has failed, or there's an ongoing major ionospheric disturbance. Powerhouses come through okay, along with some moderate signals, but by and large this is a radio for the deaf.

Audio quality, single-position selectivity and image rejection are only slightly better, but passable for a model of this class.

In all, the MT-798 is a major letdown, because if there's one good reason to get an analog radio instead of a cheap digital model it's better usable sensitivity.

The AM band? It would be passable, but here, too, sensitivity is mediocre. However, FM broadcast selectivity, sensitivity, and capture ratio are all decent, even if audio quality through the speaker is nowhere equal to the listening potential of local-quality signals.

Our International MT-798, although from China, has no indication on the radio, box, or other contents as to the country of origin. It is available at various shops abroad, or in North America for $35, postpaid, by check or money order (no cards) from RGB Enterprises, Box 5367, Old Bridge NJ 08857; phone 908/679-8026 or fax 800/605-5162.

This equipment review is performed independently by Lawrence Magne and his colleagues in accordance with the policies and procedures of International Broadcasting Services, Ltd. It is completely independent of the policies and procedures of Grove Enterprises, Inc., its advertisers and affiliated organizations.

Bob Parnass, AJ9S

Innovative Scanner Patents of the 1970s

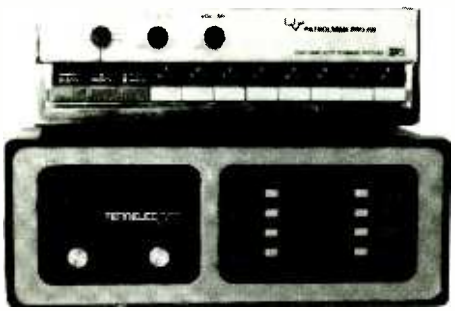
Library shelves are filled with books about the history of automobiles, trains, firearms, tanks, rockets, and just about every other invention — except the narrow, but interesting history of scanner radios. My basement is full of old scanners and monitor receivers and their stories deserve to be told.

How can we get historical information? By following the patent trail. The federal government issues patents which protect the inventor, or company to whom the patent rights are assigned, from other people wrongfully using, manufacturing, or selling their invention. Among other requirements, patent applicants must disclose the details of their invention. That's why patents are good sources of technical information — the information is publicly available, and I will tell you how to obtain complete copies of patents.

Some scanner patents contain information about scanner circuitry and internal firmware design you won't find in a service manual, though not all patents are commercialized. What follows are some of the more interesting scanner patents from the 1970s.

■ June 1972, Priority-Frequency System for a Signal-Seeking Receiver

Kazuyoshi Imazeki, of Tokyo, devised two scanner innovations and applied for two patents simultaneously. First, he invented a priority scan circuit for crystal controlled scanners. His design uses an astable switching circuit (an oscillator) to periodically override the scanning circuit to tune the receiver to a priority channel. The priority channel in Imazeki's scanner was selected by a rotary switch.



Top: Radio Shack (GRE) Patrolman PRO-88 with priority channel selector switch. Bottom: Tennelec MCP-1, controlled by a CPU and programmed via full numeric keypad (photo by Pam Parnass N9HRZ)

Imazeki's work resulted in patent 3801914, assigned to GRE (General Research of Electronics) in 1974. GRE made several scanners for Radio Shack and the Patrolman PRO-88 model illustrates the priority features in this patent. The PRO-88 is one of the few models with a priority channel selector switch on the front panel.

■ June 1972, Frequency-Skipping System for a Signal-Seeking Receiver

Imazeki's second idea was for a way of bypassing channels without wasting time processing them while scanning. A simple channel lockout scheme, as used in the Heathkit GR-110, was merely to deactivate the crystal using a switch, but the scanner would spend as much time sampling a locked out channel as it would an enabled channel.

Though it's difficult to believe, early scanners either had no channel lockout, or would permit locking out only one channel (e.g., Midland 13-904, Sonar 2514)! Imazeki allocated a lockout switch for each channel so any one or more channels could be skipped. Patent 3794925 was assigned to GRE in 1974.

■ September 1973, Programmable Signal Seeking Radio Receiver

John Brown and Anisur Khan applied for a patent to cover an early programmable three band scanner. The design used a phase lock loop synthesizer whose frequencies were "programmed" by configuring the diodes within a large diode matrix. The same diode matrix also contained band information for switching various front ends. A single antenna was used for reception on all bands.

Brown and Khan were awarded US patent 4000468, which was assigned to Teaberry Electronics Corp. in 1976. Teaberry offered crystal controlled scanners, but I don't know of any synthesized Teaberry scanners offered commercially.

■ March 1974, Crystalless Scanning Radio Receiver

Patent 3961261 covers a synthesized scanner which could be programmed through front panel switches. Peter Pflasterer was the inventor and Tennelec, Inc., the assignee.

Pflasterer's scanner was a 16 channel multiband design. The user programmed synthesizer data for each frequency into a RAM in binary using two keys (for 0 and 1 respectively). Like earlier crystal scanners, each channel had a lamp which lit when the receiver was tuned to that channel. The same lamps were used to indicate the binary codes while programming.

The 150 - 170 and 450 - 470 MHz bands were converted down to a tunable IF of 30 - 50 MHz. Each front end used a separate antenna. Many of the ideas in this patent were embodied in the Tennelec Memoryscan MS2.

■ May 1975, Crystalless Scanning Radio Receiver Controlled by Processing Means

This patent improved upon the scanner described above. Pflasterer added a full numeric keypad and display and controlled them using a CPU. Tennelec, Inc., was assigned patent 3962644 a year later and developed the Memoryscan MCP1 model.

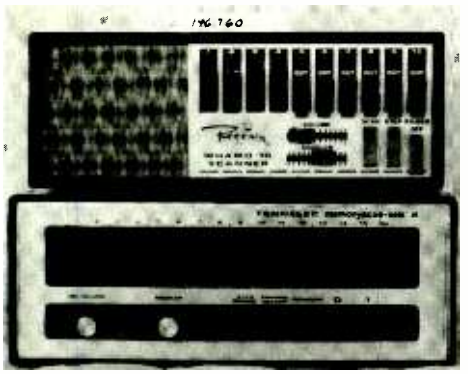
■ May 1975, Tunable Scanning Radio Receiver

Scanner radios up until this time used either crystals or a phase lock loop synthesizer to determine frequencies. Raymond Hanson had a different, lower cost idea. He patented a receiver design in which each frequency was determined by the voltage applied to a varactor diode. A varactor diode is a type of diode whose capacitance can be varied by applying a variable voltage across it. Each channel in Hanson's scanner had its own potentiometer which had to be adjusted to provide the appropriate voltage to the varactor. The scanner included conventional circuitry for tuning the commercial AM and FM broadcast bands, as well.

Patent 4011515 was assigned to General Electric in 1977, which offered the Surveyor model.

■ June 1976, Frequency Synthesized Scanner Having Conductive Programming Elements for Channel Selection

Richard Koch devised the idea of using



Top: Regency WHAMO-10, programmed using metal combs. Bottom: Tennelec MS-2, programmed using binary codes entered through the 0 and 1 keys (photo by Pam Parnass N9HRZ)

aluminum combs to program a synthesized scanner. The brittle metal teeth were broken according to a binary code, then the user inserted the comb into a socket. US Patent 4057760 was assigned to Regency Electronics and is best illustrated by the WHAMO 10 scanner.

■ July 1976, Channel Selector for a Scanning Monitor Receiver

Craig Corporation's Marshall Brown proposed a scanner design in which each channel had a switch with three positions: scan, bypass, and select. Previous models used 2-position switches to permit bypassing channels while scanning. The select position in Brown's scheme allowed the user to designate a subgroup, or bank, of channels. An additional Selector switch allows the user three choices: scan all channels, scan all non-bypassed channels, or scan only selected channels.

Brown's design included an internal, two speed, scan speed control. The channel selector circuitry activated a higher scan speed when skipping over a bypassed or nonselected channel, increasing the effective overall scan rate. Brown's patent, 4063179, was granted in December 1977.

■ May 1977, Center Frequency Tuning System for Radio-Frequency Signal Receiver

A receiver should be tuned as close as possible to the center frequency of the desired station for best reception with minimum noise. Kazuyoshi Imazeki of GRE devised a new circuit which provided a gating signal when a receiver was tuned to the center frequency of a selected signal. It prevented a scanner from stopping on off-frequency signals while scanning or stopping prematurely while searching.

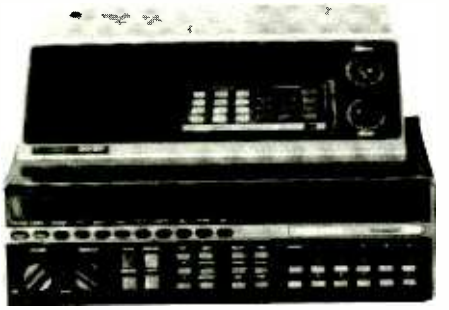
The invention used a "window detector" circuit to monitor the discriminator current. The window detector output was a digital signal which indicated whether or not the receiver was tuned "close enough," within preset limits, to a signal's center frequency. It was more accurate than earlier schemes, which relied on signal strength measurement for tuning.

Patent 4245348 was granted in January 1981. Window detector circuitry is found in most GRE-manufactured Radio Shack scanners, as well as Bearcat models.

■ July 1977, Scanning Receiver

Joseph Yiu, Jeffrey Lea, and Roy Holmes patented a scheme which allowed channels to be locked out from scanning without the expense of providing a separate lockout switch for each channel. Their idea used a RAM to keep track of which channels were to be bypassed. A user could designate a channel to lock out by stepping the scanner to the desired channel and flicking a switch, which would set a bit for that channel in the RAM.

The idea was applicable to both synthesized and crystal controlled scanners. Patent 4187464 was assigned to Hy-Gain de Puerto Rico, Inc., in February 1980.



Two Electra scanners featuring service search. BC20/20 top, BC-300 bottom (photo by Pam Parnass N9HRZ)

■ April 1979, Processor Controlled, Service Selecting, AM/FM Scanning Radio Receiver

I mentioned this patent in the July 1996 column. William Baker of the Masco Corporation applied for a patent covering a Service Search feature. Baker invented a better way to scan signals in police, fire, or other services than merely searching between two frequency limits. Allocations for a given service are often intermixed with frequencies of other services. Further, Baker pointed out that services, e.g. aircraft and fire, may use different emission modes and require activating different detector circuits with the same receiver.

Baker's scanner was preprogrammed with frequencies based on FCC and federal band plans. The preprogrammed frequencies could be subdivided into categories, e.g., police, fire, etc. US patent 4,270,217 was assigned in 1981 to Masco, which owned Electra, maker of the Bearcat scanner line. Electra embodied Baker's Service Search concepts in their BC220 and BC300 models.

■ How to Obtain Copies of Patents

Scanner patents are often several pages long and contain drawings, block diagrams, and circuit schematics. The patent description explains the invention in detail, and is a good way to learn how scanners really work. This is especially true of modern scanners which employ large scale processor ICs.

If you want to understand the squelch algorithm used in the Uniden/Bearcat BC9000XLT, for example, you can glean much more information studying the relevant patents than by reading the Uniden service manual. I will discuss other scanner patents in future columns.

Printed copies of US patents may be purchased for $3 each, but you must know the patent number. Credit card orders are taken over the telephone by the Assistant Commissioner for Patents at (703)305-4350. Alternatively, you can mail a check or money order, made payable to "The Assistant Commissioner for Patents" to:

The Assistant Commissioner for Patents
Washington, DC 20231

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If you have Internet and WWW access, you can search a patent database and view portions of patents at no charge by using the IBM patent server at **www.patent.womplex.ibm.com**.

Clem Small, KR6A

Antenna Resonance

Last month, in answering my own Radio Riddle, I made the statement that "Any antenna is resonant at *some* frequency or frequencies." I should have thought it out more fully before I wrote that. Some of the ones which I mentioned as non-resonant antennas actually don't have any resonant frequency.

Let's see what makes an antenna resonant, and then see why some are not resonant at any frequency.

A Simplified Model

Just what causes resonance in an antenna is not obvious nor simple. Nevertheless, I'll offer a simplified explanation here that will give us some insight into antenna function.

When a passing radio wave encounters a dipole antenna it causes current to flow in the antenna. If the antenna is half a wavelength long, as many antennas are, the electrons comprising that current travel to one end of the conductor until they can go no farther, and are then reflected back in the direction from which they came. This changes the current's relationship to the RF signal which caused it, such that the two are no longer "in step." We would say that they are "out of phase" by 180 degrees.

However, traveling on in this reverse direction, the current will eventually encounter the conductor's other end where it is again reflected and it shifts in phase again by another 180 degrees. The two reflections have given the current a total of a 360 degree phase shift, which equals one complete cycle. The current is also in phase with the next energy arriving from the same source which caused the initial current. More on the importance of this later.

Consider now that as the current continues on down the wire and passes the point where it first started, its total travel will have been twice the full length of the wire. This travel, two halfwaves, represents a 360 degree (one full wavelength or cycle) phase shift which again will not put this original current out of phase with the incoming energy from next cycle in the received wave. Thus, as the current which has been circulating in the antenna starts a new round-trip journey along the wire's length, it is exactly in-phase with any new current which will be induced in the antenna by a continuing input from the same signal source which initially started the circulating current flowing.

Different currents which are in-phase combine to produce a stronger signal level than each individual current could produce by itself. In a non-resonant antenna, current caused by the incoming wave and the antenna current already received from earlier portions of that wave (circulating current) aren't necessarily in phase; some cancellation usually occurs between the two. This is one reason why signal strength is greater in a resonant antenna than in a non-resonant antenna.

The above explanation is simplified, but it gets the basic idea across: If the antenna is constructed such that circulating current induced by a passing wave stays in phase with later instances of current induced by the same signal, then the antenna is resonant.

So Aren't All Antennas Resonant?

The antennas mentioned last month as being non-resonant were the classic non-resonant V, non-resonant rhombic, and the Beverage. Contrary to my statement that "Any antenna is resonant at *some* frequency," these antennas — when terminated to ground by resistors at one end — have no resonant frequency in the sense we use it here. They act more like a transmission line in which signals from the direction of maximum antenna response induce current which flows from the antenna to the feedline and on to the receiver.

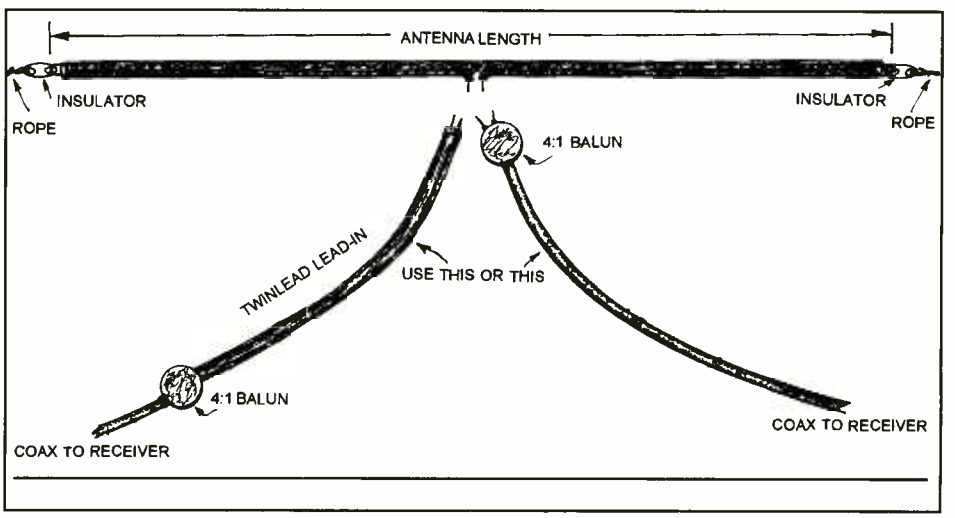
Signals from the opposite direction induce currents which flow from the antenna to ground through the grounding resistors. There is essentially no circulating current to be either in-phase or out of phase with incoming current, and resonance is not possible.

Want to Make a Resonant Antenna?

The halfwave folded dipole antenna is somewhat different from a simple halfwave dipole. Although it functions as two straight dipole elements connected in parallel, it looks a bit like a skinny loop, and it covers a greater bandwidth than a simple dipole. Let's make one.

1. Cut a piece of 300-ohm TV twinlead the length of the antenna shown in fig. 1. The total length of the antenna should be 468/frequency (MHz). Thus a 10 MHz antenna would be 468/10 or 46.8 feet long. In the metric system use 143/frequency (MHz). A 10 MHz antenna would be 14.3 meters long.
2. Trim bare about 1/2 in of insulation from each wire at one end of the twinlead. Separate the two wires at this end so that you can put one of the separated ends through an insulator. Twist the bare end of this wire together with the bare end of the other wire.

FIGURE 1. *A folded-dipole antenna showing connections for either a coax or twinlead lead-in.*



This will form a loop through the insulator. Solder the two ends together. Do the same to the other end of the twinlead with a different insulator.

3. At the exact center of the antenna cut only one of its two wires. Trim insulation from the ends of this clipped wire for about 1/2 in. This is the point to attach either a twinlead feedline or a 4 to 1 balun for a coax feedline.

4. If your lead-in cable must be long (say 100 ft or over for HF, 50 ft or over for VHF and higher) you may want to use twinlead as your lead-in for its low-loss characteristics. You can then use a 4 to 1 balun at the receiver end of the lead-in with its low-impedance winding connected to your receiver, and high impedance winding to the feedline (see fig. 1). If you use a balun at the antenna feed point you can connect the high impedance winding to the antenna feedpoint, and the low-impedance winding to the coax feedline (fig. 1). Attach the other end of the coax directly to the receiver.

5. Install the antenna as high and in-the-clear as practical, never near power lines.

6. Remember to provide lightning-induced damage protection. Minimum here is never use the antenna in lightning weather, and disconnect and ground the antenna when not in use.

RADIO RIDDLES

■ Last Month:

I mentioned "the "traditional" explanation for radiation of a radio wave from an antenna, and asked you what that explanation was. Here it is:

An antenna, being a tuned circuit, actually has capacity and inductance just as surely as a capacitor and inductor do. As a matter of fact, an antenna actually *is* both a capacitor and inductor! RF current supplied to the antenna by the transmitter charges the capacity of the antenna. This charge will discharge through the inductance of the antenna.

As this current flows, an electric field is created around the antenna. The field so created moves from the antenna outward at the speed of light. This field attempts to return to the antenna if the current in the antenna reduces to zero. As we know, the current does reduce to zero twice each cycle of the RF current.

As the field returns to the antenna it takes some time to do so, and during this time a new field is being created at the antenna. This new field is created by the next cycle of RF which is beginning to energize the antenna. Just as the first field did, this new field moves out from the antenna at the speed of light. Of course the returning field will meet this newly created field coming towards it. The interaction between these fields when they meet is such that the returning field is repelled outward (launched) away from the antenna by the new field.

Of course the antenna's changing electrical current produces a magnetic field, and so there is a magnetic field associated with the electric wave. Once launched, these two fields travel (propagate) together through space, and are what we know as electromagnetic waves, or radio waves.

■ This Month:

What is the effect of antenna resonance on antenna radiation-reception patterns?

You'll find an answer for this month's riddle, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

SPECIAL EVENT CALENDAR

May 30-June 1	Rochester, NY	Rochester Amateur Radio Association / Rochester Hamfest and Computer Show / Information: 716-424-7184, Ticket Information: 716-671-4430 / Location: Monroe County Fairgrounds, Route 15A, Rochester, NY. Talk-in 145.28/88.
June 1	Livermore, CA	Livermore ARK / Noel Anklam, KC6QZK, 510-447-3857
June 1	Cote St. Luc, QC	Montreal ARC / Gerald Philips, VE2XGP, 514-683-6469
June 1	Newington, CT	Newington AR League / Fred Jarvis, N1KWJ, 860-666-1952
June 1	Princeton, IL	Starved Rock Radio Club / Debbie Burton, N9DRU, 815-795-2201
June 1	Chelsea, MI	Chelsea ARC / 20th Annual Swap and Shop / K. Alan Robbins, KB8VCK, 3800 Hooker Rd, Pinckney, MI 48169, 313-878-0363 / Location: Chelsea Fairgrounds, Chelsea, MI. Gates open 8am.
June 1	Queens, NY	Hall of Science ARC / Arnie Schiffman, WB2YXB, 718-343-0172 / Location: New York Hall of Science parking lot, Flushing Meadow Park, 47-01 111th Street, Queens, NY. Talk-in 444.200 WB2ZZO Repeat 146.52 Simplex. 9am - 3pm $5 admission.
June 1	Butler, PA	Breezeshooters ARC / George Artnak, N3FXW, 412-854-5593
June 1	Manassas, VA	Ole Virginia Hams / Mary Lou Blasdell, KB4EFP, 703-369-2877
June 6-8	Arlington (DFW), TX	Texas State Convention (Ham-Com '97) / Tom Gentry, K5VOU, 972-442-1721, Fax: 972-442-3609, http://www.hamcom.org
June 7	Kitchener, ON, Can	Guelph & Kitchener-Waterloo ARCs / Bill Smith, VE3WHS, 519-821-6642, E-mail: eeaton@sentex.net
June 7	Grand Rapids, MI	Independent Repeater Association / IRA Info Line: 616-534-6803
June 7	Minneapolis, MN	TwinsLan ARC / Shep Shepardson, N0NMZ, 612-633-8135
June 7	Lempster, NH	Conn. Valley FM Association / Conrad Ekstrom, WB1GXM, 603-543-1389
June 7	Teaneck, NJ	Bergen ARA / Jim Joyce, K2ZO, 201-664-6725
June 7	Plattsburgh, NY	Champlain Valley ARC / Chuck Orem, KD2AJ, 518-563-6851
June 8	Maple Ridge, BC, Can	Maple Ridge ARC / MRARC, Nick, VE7FYT, 604-463-9476
June 8	Granite City, IL	Egyptian RC / Bill Dusenbery, N9OQK, 618-398-1456
June 8	Wheaton, IL	Six Meter Club of Chicago / Joseph Gutwein, WA9RIJ, 630-963-4922
June 8	Wabash, IN	Wabash County ARC / Don Spangler, W9HNO, 219-563-5564
June 8	Erlanger, KY	Northern Kentucky ARC / Robert Blocher, N8JMV, 513-797-7252
June 8	Bethpage, NY	Long Island Mobile ARC / Rich Seltzer, N2WJL, 516-481-8263
June 8	Darien Ctr., NY	Lancaster ARC / Charles Koester, WD2AIK, 716-937-3592
June 8	Charlotte, NC	Charlotte ARC / Daryl Sampson, KM4GO, 704-522-4971 (Ext. 3330)
June 8	Akron, OH	Goodyear ARC / Ken Phillips, K8CHE, 330-733-5795
June 8	Junction City, WI	Central Wisconsin Radio Amateurs / John Feltz, WA9LWJ, 715-457-2506
June 13-14	Albany, GA	Georgia Section Convention / Arthur Shipley, N4GPJ, 912-439-7055 or 912-439-2351 (Ext. 15), E-mail: ashipley@isoa.net
June 13-15	Alberta, Canada	Central Alberta Radio League / Bob King, VE6BLD, 403-782-3438
June 13-15	Seaside, OR	Northwestern Division Convention / Randy Stimson, KZ7T, 503-297-1175
June 14	Ft. McCoy, FL	Ft. McCoy Amateur Radio Operators / Bob Dary, K4VDX, 352-694-6160
June 14	Paducah, KY	Paducah ARA / Craig Martindale, WA4WBU, 502-444-6822 or 502-443-3860
June 14	Hermon, ME	Pine State ARC / Roger Dole, KA1TKS, 207-848-3846
June 14	Midland, MI	Midland ARC / Jeff Weinberg, W8CQ, 517-839-9371 or 517-636-0643
June 14	Cortland, NY	Skyline ARC / Andrew Slaugh, KB2LUV, 607-753-0597
June 14	Winston-Salem, NC	Forsyth ARC / Tierney "Sparky" Ramey, KE4TES, 910-777-0381
June 14-15	Whitetail, MT	Northern Lights AR Group / Stacey Hanrahan
June 14-15	Maple Valley, WA	Maple Valley ARC / MVARC, PO Box 488, Maple Valley, WA 98038
June 15	Santa Maria/Orcutt, CA	Satellite ARC / Eric Lemmon, WB6FLY, 805-733-4416, Fax: 805-733-4418
June 15	Crown Point, IN	Lake County ARC / Malcolm Lunsford, WN9L, 219-769-3925
June 15	Frederick, MD	Frederick ARC / Eric Gammeter, N8AAY, 301-865-0865
June 15	Cambridge, MA	MIT RS & Harvard Wireless Club / Steve Finberg, W1GSL or Nick Altenbernd, KA1MQX, 617-253-3776
June 15	Monroe, MI	Monroe County Radio Communications Assn. / Fred VanDaele, KA8EBI, 313-242-9487 / Location: Monroe County Fairgrounds, M-50 at Raisinville Rd (about 2 miles west of Monroe). Talk-in 146.72/12. 7:30am - 1:00pm. $5 at the gate.
June 15	Macedonia, OH	Cuyahoga ARS / Rich James, N8FIL, 216-468-2035 or 800-404-2282
June 15	Bluefield, WV	East River ARC / Don Williams, WA4K, 540-326-3338, Fax: 540-322-2282
June 21	Goshen, CT	Southern Berkshire ARC / Bob Schoenfeld, KA1ARR, 413-229-8695
June 21	Slidell, LA	Ozone & Pearl River County ARCs / Ronald Riviere, WB5CXJ, 504-882-5067
June 21	Dunellen, NJ	Raritan Valley RC / Robert W. Pearson, WB2CVL, 908-846-2056 or John Manna, WA2F, 908-722-9045, Pre-registration: Chuck Fainsbert, KC2NB, 908-873-2198 / Location: Columbia Park, near intersection of Route 529 and 28. Talk-in 146.625(r) 447.250(4) tone 141.3, 146.520(s). 7am - 2 pm. $5 admission.
June 21	Milford, OH	Milford ARC / Chris Reinfelder, KB8SNH, 513-753-5066
June 21	Marmora, Ontario, Can	Tri-County ARC & Northumberland Amateur Repeater Assn. / Pete, VA3PGB, 613-473-1171 or Richard, VE3BZY, 613-473-2665
June 21	Hanover, PA	Hanover Area Hamming Assn. / Pleasant Hill Amateur Radio and Computer Show / Wayne Leister, N3MTR, 410-239-8451 / Location: Pleasant Hill Volunteer Fire Department, about 5 miles south of Hanover, PA on PA 94. Talk-in 146.895. 8am - ?
June 21-22	Atlanta, GA	Georgia State Convention / William R. Bass, W4LFC, 770-493-8438
June 27-29	Veronia, OR	NW Astronomy Group & NW Astronomy Ne / Sandy Mikalow, 503-429-2430
June 28-29		Field Day

Send announcements of events or club information to: Editor, Monitoring Times, P.O. Box 98, Brasstown, NC 28902-0098. Fax 704-837-2216; e-mail mteditor@grove.net. See MT's homepage on **www.grove.net** for complete event and club listings.

CLUB CIRCUIT

North American Club Listings B - D

Bay Area Scanner Enthusiasts: Bruce Ames, P.A.O., 105 Serra Way #363, Milpitas, CA 95035, (408)267-3244. Western U.S.; 25+ MHz. Listening Post (bi-monthly). Meets 2nd Mons. 7:30 Milpitas Police Admin Bldg. $25 US, $2 sample, or SASE for info.

Bayonne Emergency Radio Network (BERN): Ray Baron/Bob Frasca, P.O. Box 1203, Bayonne, NJ 07002-6203, 1-800-286-2876. Metro NJ, NY; Fire/disaster, pub safety.

Boston Area DXers: Paul Graveline, 9 Stirling St., Andover, MA 01810-1408, (508)470-1971, 50 mile radius Boston; 3-30 MHz. Meets 3rd Fris 7:30pm, The Lexington Club, Route 4/225 1/4 mi W of Rte 128.

Canadian Int'l DX Club: Sheldon Harvey, 79 Kipps St., Greenfield Park., Quebec, Canada J4V 3B1, (514)462-1459, (514)671-3775 fax. Canada nationwide/membership open to all; General coverage. The Messenger. $28 Can, $25 US, $US30 or $Can38 ww. $2 sample. Meets 2nd Tues 7pm Montreal; several annual events.

Capitol Hill Monitors: Alan Henney, 6912 Prince Georges Ave, Takoma Park, MD 20912-5414, (301) 270-2531/5774 fax. DC, MD, No.VA, So.DE. Scanner bands. Frequency Forum BBS 703-207-9622 (8-N-1) Capitol Hill Monitor. $10. Meets irregularly.

Central Florida Listeners Group: Mike Twyford KE4ORR, 207 Hill St, Casselberry, FL 32707-3424; (407) 695-6529, e-mail mikiefl@concentric.net Central Florida; All bands. Net on 146.820 MHz Sun 8 pm. Conference #10 on Laser BBS (407) 647-0031 or Bullwinkle's Corner BBS (407) 896-5772.

Central Indiana Shortwave Club: Steve Hammer, 2517 E. DePauw Road, Indianapolis, IN 46227-4404. Central Indiana; SW broadcasting, pirates, and the offbeat. Shortwave Oddities.

Central VA Radio Enthusiasts: Richard Rowland, POB 34832, Richmond, VA 23234-0832. Metro Richmond and vicinity. VHF/UHF. SASE. No newsletter, no dues. Meets quarterly in Richmond.

Chicago Area DX Club: Edward G. Stroh, 53 Arrowhead Dr., Thornton, IL 60476. 300 mile radius of Chicago; DXing all bands. DX Chicago. $17, $1 sample. Meets irregularly.

Chicago Area Radio Monitoring Association (CARMA): Ted & Kim Moran, Box 2681, Glenview, IL 60025, (630) 612-0609 fax. Chicago & midwest. Public safety & general coverage. CARMA BBS (630)852-1292. CARMA Newsletter. Meetings (Sats) and newsletter bi-monthly on alternate months.

Communications Research Group: Scott Miller, 122, Greenbriar Drive, Sun Prairie, WI 53590-1706. Wisconsin area. Scanning.

DecalcoMania: Paul Richards, P.O. Box 126, Lincroft, NJ 07738, (908)591-2522. Worldwide AM, FM and collecting radio related items. DecalcoMania. $10 US, $11 Can/Mex, $16 Eur, $17.50 Asia/Pac.

Delaware County (PA) Emergency Radio Club: David A. Donohue, 610.493.0292 DDONOHUE@bigfoot.com. Scanning public safety in Delaware, Philadelphia, Buck, and Chester counties. Monthly meetings and online newsletter www.tripod.com/~ddonohue/DCERC.HTM - $5 dues.

DX Audio Service (National Radio Club): Ken Chatterton, P.O. Box 164, Mannsville, NY 13661-0164, (315) 387-3583; http://wcoil.com/~gnbc. Worldwide. North American Broadcasters. DX-Audio Service (90-min.tape). Sample $3.

NEW SHORTWAVE RECEIVER FROM JRC

So Little Money, So Much Class!

Introducing from JRC! NRD-345

Known for their luxury, high-performance receivers, Japan Radio company (JRC) has just released a high quality, double conversion receiver at a low, competitive price! The new NRD-345 offers wide frequency coverage (100 kHz-30 MHz), multimode reception (AM, synch. AM, SSB), sharp selectivity (2/4 kHz), high sensitivity (0.3 microvolts), wide dynamic range (100 dB), strong audio (1 watt), dual VFOs, scannable memory (100 channels) with channel lockout, computer control (RS232C), dual clock timer (12/24 hour), precision tuning (5/100 Hz., 1/10 kHz steps), and adjustable noise blanker.

Additional features include selectable AGC timing, 20 dB attenuator, adjustable tone control, backlit S meter, large backlit LCD display, and dual-voltage (12 VDC / 120 VAC) power supply. See specifications at right.

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Place your order now. Your credit card will not be billed until the unit is shipped. JRC expects to begin shipping these new units soon. Check the Grove website for updates on specifications, price and availability for this exciting new receiver.

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- Frequency Range: 100 kHz-30 MHz
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- Display: Backlit LCD
- Recommended use: General purpose SW and utilities
- Receiving modes: AM, AM synch, USB, LSB
- Memory: 100 channels
- Scan: Yes
- Clock: 12/24 hr. clock/timer
- Audio Output Power 1 Watt
- Record Audio Output: Yes
- Signal Strength Indicator: LCD bargraph
- Computer Interface: RS-232C
- Conversion Scheme: Double up-conversion
- Sensitivity: 0.3 uv
- Selectable Attenuator 20 dB
- IF Selectivity: (-6/-60 dB) 4/10 kHz wide 2/6 kHz narrow
- Image Rejection -70dB
- Selectable AGC: Off/fast/slow
- Dynamic Range: 100 dB
- Noise Blanker/Limiter: Adjustable
- Tone Control: Yes
- Antenna Connector: SO-239 and 600 ohm
- Dimensions: 10"W/4"H/9"D
- Weight: 7.7 lbs.
- Power Requirements: 12 VDC/120 VAC
- Warranty: One year
- Accessories Included: AC adaptor

ASK BOB

ANSWERS TO YOUR RADIO QUESTIONS

Bob Grove, WA4PYQ
bob@grove.net

***Q.** I am hearing the same AM broadcast stations in several spots on my receiver's dial; how can I tell if these are images or intermodulation? (Jonathan Mulcare, Ellijay, GA)*

A. If both stations are displaced from their repeat frequencies by the same amount, say 910 kHz (typical in receivers with a 455 kHz intermediate frequency), then it is image interference produced by the receiver IF stage. More likely, you are hearing intermod produced by strong signal overload, either in the receiver or generated by nearby metallic junctions like rusty guttering or electric wiring which radiates multiple products of the signals. You can determine if this is the case.

Using a length of wire for a makeshift antenna, assuming you still have the interference, take the receiver and the antenna to another house down the street and listen there; if you still have the interference, it is caused by the receiver.

You can tell if the receiver is suffering from intermod by installing an attenuator (or, if your receiver has a built-in attenuator, switching it on); intermod reduces much faster than the actual signal. For example, if you install a 10 dB attenuator, the S meter should drop 10 dB on the signal strength; if one of the spurious signals goes down by much more than 10 dB, it's intermod.

If you can borrow another model of a high quality receiver, you could try it on your antenna to see if you get the same interference, same strength. This may indicate that the transmitter itself is "dirty," radiating spurious signals into the airwaves.

Finally, harmonics of stations will always be whole-number multiples of the original frequency; in other words, if a 600 kHz broadcaster is radiating harmonics, you will here them on 1200 kHz, 1800 kHz, and so on, diminishing in strength with the higher frequencies.

***Q.** Despite ads and reviews, I still cannot figure out what advantage to a monitoring station a frequency counter is. It displays an active frequency, but so does my scanner, and from much farther away. Some counters will store those frequencies, but so will my scanner. And I can actually hear signals on my scanner. Am I missing something? (Fred Pierce)*

A. You aren't missing a thing. Frequency counters add absolutely nothing to a monitoring post. Their low sensitivity makes them useful only to nearby signals, they have no selectivity, so you can't choose which signal you're measuring, and they don't have detectors so you can't hear the contents of the transmission.

The singular advantage of a frequency counter is that if there is an emission from a near-field transmitter, the frequency will be revealed instantly, whereas a scanner would have to search for the signal.

***Q.** What frequency is used for "AirMedia Live" broadcasts to personal wireless receivers of late-breaking news, sports, financial reports, and personal e-mail? (Name withheld)*

A. According to AirMedia, the transmissions are made over PageNet's nationwide digital paging network. For more information, visit AirMedia's web site at **www.airmedia.com**.

***Q.** On what frequency was the SOS sent by the Titanic? (Numerous inquiries)*

A. 25-year-old radioman Jack Phillips sent this emergency message April 15, 1912, on the maritime distress frequency 500 kHz: "CQD DE MGY," which means, "All ships, we are in distress and require immediate assistance; this is the *Titanic*."

***Q.** Now that the medium wave broadcast band has been extended to 1705 kHz, can present day radios by modified to cover that extra 100 kHz? (R.H. McMinn, Whittier, CA)*

A. Not if the radio is synthesized (step tuned), as virtually all automotive radios are. Non-synthesized, continuously-tunable radios can be extended, however, by merely adjusting the oscillator and RF amplifier trimmer capacitors on the back of the tuning capacitor.

***Q.** While listening recently to EMS communications on 463 MHz, I could clearly hear the hospital, but not a nearby mobile unit. Do they use some type of encrypted system? (Tom Whitmore, San Antonio, TX)*

A. There are ten UHF channels used for ambulance/hospital communications. The hospitals transmit in the 463 MHz band while the ambulances respond 5 MHz higher (468 MHz). They may or may not use repeaters (their option) which might account for your not hearing the 468 MHz ambulances.

Bob's Tip of the Month

Simple Stand for Portable Radios and Scanners

Long-time *MT* reader Tom Welch was looking for a way to prop up his Sangean portable, when he came across a plastic tray for holding 3-1/2" computer diskettes. After removing the disk holder portion from the lid and placing the holder on a table at its natural tilt, he found that it held his radio at a perfect viewing angle.

Hand-held scanners can undoubtedly be stabilized by the same method, using similar, inexpensive, plastic utility trays available from the electronics sections of discount stores. Thanks, Tom.

***Q.** While tuning the shortwave bands, I frequently receive telephone conversations on or around 6950 kHz. The signal sounds like FM; I can hear both sides of the conversation, and it originates from my own telephone system! What causes this? (Jeff Wayne, North Haven, CT)*

A. Over the last several years I've had occasional reports similar to yours, Jeff. My guess is that your phone has a microprocessor in it, and the time base oscillator is being modulated by voltage fluctuations produced by the voices. This would produce an FM signal.

***Q.** Are the miniature satellite dishes on major gas stations and fast food restaurants used to receive "orders from headquarters?" (Mike Elcsisin, Lake Berryessa, CA)*

A. These very small aperture terminals (VSATs) are used to relay inventory and sales reports to administrative headquarters of the chains. AT&T, General Motors, and many other super-magnates use them to send their digitized bursts in the low Ku band, 11.7-12.2 GHz.

***Q.** Many mobile two-way radio operators have a scanner in their vehicles as well. What prevents the transmitted signal from overpowering the scanner through the adjacent whip and causing damage? (Fred Pierce)*

A. Nothing except good scanner design with diode-protected front ends. I have a 50 watt Icom transceiver and a scanner in my vehicle; their whips are separated by about three feet. Our local law enforcement officers have a similar installation along with their 100 watt mobiles. None of us have experienced damage to our scanners. But, if you wish, you can make a nifty little overload protection device that is virtually foolproof.

Simply mount two antenna connectors on a small metal box, and solder their center pins together. Next solder two small-signal diodes (1N914, 1N4148 or similar, available from Radio Shack) from center pin to frame, but cross-polarized. That is, connect the cathode (+) of one diode to the center pin, but the anode (-) of the other to the center pin, and the other two leads to the metal box. This will short-circuit excessive signal voltage harmlessly to ground, while having no effect on overall performance of the scanner.

Questions or tips sent to "Ask Bob," c/o *MT* are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of *MT*, or e-mail to **bob@grove.net**. (Please include your name and address.) The current "Ask Bob" is now online at our WWW site: **www.grove.net**

Research Help Needed

November 30, 1997, will mark the 10th anniversary since former Soviet Union stopped jamming of Western radio broadcasts. Rimantas Pleikys, Lithuanian Minister of Telecommunications and Informatics, is writing a booklet for that occasion. The booklet will contain a review of the history of jamming, its techniques etc. The booklet will be published in English.

ANY information about jammers with ID signals 1D, 1G, 4F, 4N, 7K, 7M, 8A, 8L, which jammed Polish broadcasts of Radio Free Europe is appreciated. For a list of more specific questions, or to forward any information or names of recommended contact persons, write to:
Mr. Rimantas Pleikys <justaspl@pub.osf.lt> or Mr. Sigitas Zilionis <dx@is.lt>, Postal: P.d. 985, LT-2300 Vilnius, Lithuania, Fax: +370-2651092, +370-2518246

INDEX OF ADVERTISERS

STOCK EXCHANGE

Monitoring Times assumes no responsibility for misrepresented merchandise.

Ads for **Stock Exchange** must be received 45 days prior to publication date. All ads must be paid in advance to *Monitoring Times*.
Ad copy must be typed for legibility.

NON-COMMERCIAL SUBSCRIBER RATES: $.25 per word — *Subscribers only!*
All merchandise must be personal and radio-related.

COMMERCIAL RATES: $1.00 per word. Commercial line ads printed in bold type.

1-3/4" SQUARE DISPLAY AD: $50 per issue if camera-ready copy or, $85 if copy to be typeset. Photo-reduction $5 additional charge. For more information on commercial ads, contact Beth Leinbach, 704-389-4007.

LONGWAVE PRODUCTS AND KITS. Send 32 Cent stamp to: Curry Communications, PO Box 1884, Burbank, CA 91507-1884. Visit us at: http://www.fix.net/~jparker/currycom.htm

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POOR RECEPTION on your A.M. Radio? Our signal booster will help. Guaranteed! Version 1601 tunes 530-1600 KHz. $39 + $5.50 S&H. If not satisfied within 30 days, we'll refund your money, less S&H charge. Fala Electronics-6, P.O. Box 1376, Milwaukee, WI 53201-1376. (414) 671-5203.

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T.M.C. ENTERPRISES, 358 S LEMON AVENUE, E 132, WALNUT, CA 91789. Space saver desk stand - converts regular sized hand-held ham radios - scanners - C.B.s into base units. Allows perfect viewing of LCD displays. Keeps antennas upright. Difficult to knock over. Invaluable for ham radio store sales displays for hand helds. Sorry, no credit cards. Money orders - US Funds Only. $5.95 each, two for $11.50. S/H 1st Class Mail USA $2.50, Canada $4.50.

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www.radiofinder.com -- vintage amateur & military shortwave equipment. finder@radiofinder.com (313) 454-1890.

RAILROAD RADIO SCANNING GUIDE: *Railroad Radio* by Vincent Reh is the complete guide to hearing and understanding railroad radio communications and systems. In 208 illustrated pages, you'll learn about railroad radio history, modern rail communication systems, radio operations, and the future of railroad radio and railscanning. Plus, you get all the information you need to monitor railroad radio and maximize your scanner's effectiveness. Send $19.95 plus $3.50 shipping to Byron Hill Publishing, Box 197N, Grand Isle, VT 05458. (802) 893-1315, rehvince@together.net. VISA/MC accepted.

FM MICRO BROADCASTING: Transmit many miles. 88-108 MHz. PLL. Kit or assembled. Mono/stereo, 1-100 watts. We ship worldwide from Canada. Call (250) 642-2859. R. Scott Communications.

DEPOT SERVICE CENTER — All prices flat rate labor + parts (includes UPS return). Uniden/Bearcat scanner repair $39.00, Motorola Minitor pagers $19.95, 2-way radio repair - GE, Motorola, Regency, most major brands $55.00. Radio programming $14.95 ea. TSC, 12C West Avenue, Atlantic Highlands, NJ 07716. (908) 872-2926.

SOUP UP YOUR RADIO with extra-narrow AM and FM filters, internal antenna booster, alignment, modifications, all done in our lab! Send $.32 stamp for details. Worldcom, Box 3364, Ft. Pierce, FL 34948. (407) 466-4640.

TEST EQUIPMENT BONANZA! Free shipping! Bird 4411W wattmeter, like new; elements for 2-30, 144-520, 400-1000 MHz, leather case. Orig. cost $1383 (order TIN75 $569.95). Grove Enterprises, P.O. Box 98, Brasstown, NC 28902. 1-800-438-8155.

PRO-46 HANDHELD scanner, 100 channel, 29-956 MHz, cellular restored. New in the box. $325.00. Call or fax Thomas at (513) 661-1234.

"RADIO STUFF SALE!" Magazines, bulletins, books, radio station items, some equipment. Send 2-stamp business size SASE or $1 for list: G. Dexter, 213 Forest St., Lake Geneva, WI 53147.

FOR SALE: Sony ICF-SW100S used twice, works great, must sell $275, I ship. WANTED: Sony TR-714 transistor radio, AM/SW shirt pocket from late 1950s, Zenith Leather Transoceanics. Jeff Wayne, 61 Allendale Drive, North Haven, CT 06473, (203) 281-6038, wayne4@snet.net.

KENWOOD RZ1 full coverage (incl cellular) receiver. Good working condition with orig. manuals. $275.00 plus shipping. Pete (520) 760-2026.

ICOM TV-R7100 TV-FM adapter (ATV, DXTV, etc.). Mint. Offer. WB9YCJ/6, (714) 564-9010.

FOR SALE: Kenwood R-2000, $400. Sony SW-1S, $200. Both in excellent condition. Call Kannon Shanmugam, (913) 841-3264.

ICOM R7100 full coverage scanner. Like new. Call Dan after 5pm ET. $1100. (215) 957-2343.

DRAKE SW8, mint condition, manual, $495.00. Sony ICF-2010, as new, boxed, all literature, $275.00. Kenwood R-300, mint, $95.00. Call Jerry, (954) 720-1972.

(LETTERS...Continued from page 4)

"Finally, if those politicians spent that amount of energy on balancing our country's budget, the country wouldn't be in debt today."

—Robert K. Newcomb, Jr., Hilo, Hawaii

"I thank you all for a great team effort. I will continue 'listening in.' And thanks again for the 'scanner controversy hearings' updates."

—George Knight, Garfield, New Jersey (SW, scanner, and ute listener)

"I would like to extend my gratitude to you for taking your time to voice the opinions of scanner listeners who believe in the 'freedom of the airwaves' — all airwaves, not just the ones that Congress wants us to listen to."

—Jeff Kettell, N1YHZ, Hyannis, MA

"Still a truly 'great' magazine! What? 15? — Go for at least 50!"

—Howard Ragan, Beaverton, Oregon

Send your comments to "Letters to MT," P.O. Box 98, Brasstown, NC 28902 or to mteditor@grove.net. Letters may be edited for brevity and clarity. - Rachel Baughn, Editor

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CLOSING COMMENTS

By Bob Grove, Publisher

The Auctioning of the Capitol

I don't subscribe to conspiracy theories; usually, they appear to me to be oversimplifications by the brain-dead, fodder for paranoids. The general rationale seems to be, "If it treads on my real or imaginary rights, it must be a conspiracy." But let's add a little fuel to the fire.

Privileged relationships between Congressional members and their commercial sponsors, exhibited during that shameful TV display orchestrated by the House Telecommunications Subcommittee and the Cellular Telecommunications Industry Association and reported in our April issue, should be especially alarming to conscienable Americans. While we can vote scoundrels out of office every four years, the election often goes to the best-funded new scoundrels. Money owns the political system, and one of the best sources of apparently inexhaustable revenue is the radio spectrum.

Keep in mind that the FCC does not receive a penny of the auction proceeds—these go to the general treasury. The potential revenue is astronomical, in the hundreds of billions of dollars. Congress, at its discretion, can disburse these funds as they see fit, including abusing the privilege with self-indulgent pork-barrel projects.

With an incalculable cash cow of salable spectrum still waiting, what frequency block will be next? The amateur radio spectrum has been under siege recently, with key allocations in the VHF, UHF, and microwave ranges now being targeted by land mobile and satellite services.

Does the FCC actually have the right to sell frequencies? How do the International Telecommunications Union (ITU) and the International Frequency Registration Bureau (IFRB) feel about American corporations owning globally-shared radio frequencies? Does a commercial entity have the exclusive right to own a frequency? After all, a frequency is not tangible property, it is a measurement. Can someone own blue? 98.6 degrees? C sharp minor? 87 inches?

There is considerable Congressional activity afoot to abolish the FCC and allow anyone to transmit anywhere on a non-interference basis. How can manufacturers design equipment without knowing which service, modes, powers, and frequencies will be needed? Who will reconcile disputes? Who will set standards? How will interference complaints be handled? What enforcement will be needed, and by whom?

Recently a set of regulatory guidelines for industry was established by the FCC requiring amateur radio stations to measure their RF exposure levels. Naturally, amateurs are ill prepared to make those measurements, so Congress has a new expedient to close any service which may be deemed "hazardous to your health." What is the true motivation here, a concern for environmental hazard, or a chance to make a buck selling confiscated spectrum?

■ Selling Spectrum: Selling Out

Does our political system breed the incestuous pandering we are witnessing with growing regularity? At the last election, several freshman candidates announced their withdrawal from re-election, disillusioned with the corrupt system. The cost of power is staggering. Can any elected representative afford to maintain his integrity and still keep his seat?

Consumer advocates like Common Cause continue to hammer at the electoral system. Congressional representatives carry the banner when it is politically expedient, but efforts toward campaign financing reform are defeated with disappointing regularity. History offers little reassurance, since many of today's offenses were yesterday's reforms.

One has to wonder if there is any way to break the self-perpetuating cycle of mutual back-scratching that is Washington. Our precious radio spectrum is only the latest victim on which these parasites have decided to "capitolize." As long as they see green, chances are they'll suck it dry. Short of using bucks for ballots, is there anything we can do about it?

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