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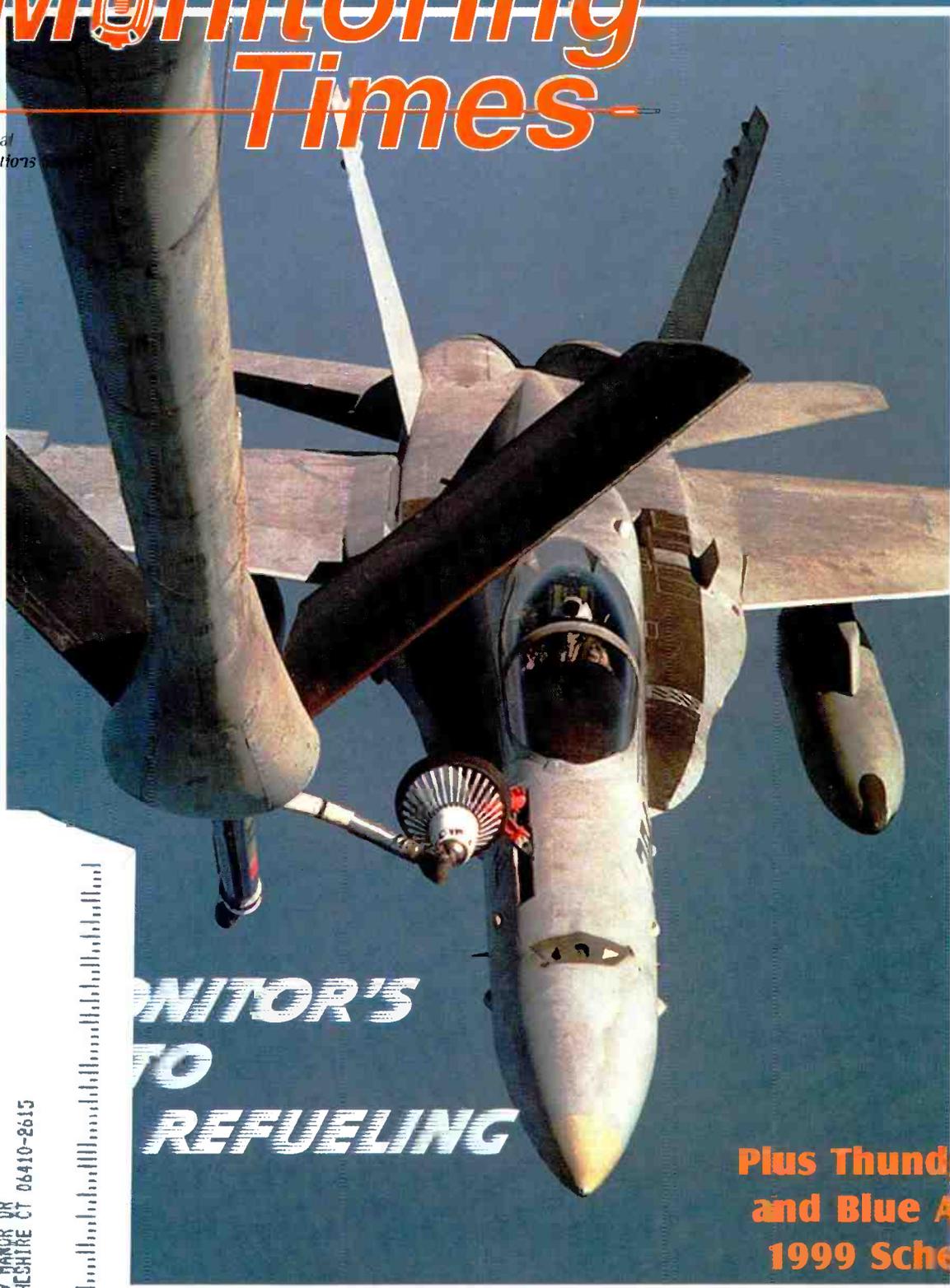
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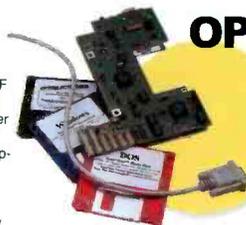
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Cover Story

A Monitor's Guide to Aerial Refueling

By Larry Van Horn

Audible from nearly every location in North America or Europe is one of the more exciting exercises routinely performed by air force crews: refueling in mid-air. All you need in order to monitor this drama in the skies above you is a scanner capable of receiving the military aviation band, coupled with the comprehensive information provided in this article which begins on page 8.

In our cover photo, an F-18 "Hornet" takes on fuel from a KC-135 over the Persian Gulf. (Photo by Lieutenant Jack Liles)

To monitor an aerial ballet a lot closer to the earth, take your scanner along to a Thunderbirds or Blue Angels air show. Schedules and frequencies for 1999 appear in this month's Milcom column on page 72.

C O N T E N T S

Behind the Mic at Columbia Square 14

By Robert Rusk

One Hollywood landmark usually missed by the casual tourist was once the hottest place to be in the days of live radio shows. Columbia Square, home to news station KNX-AM, used to be the center of CBS' lineup with such venerable shows as *The Edgar Bergen and Charlie McCarthy Show* and *The Jack Benny Program*. Although the modern-day studio is as up-to-date as any, relics of the Golden Age of radio still remain. Join Robert Rusk for a tour.



1998 - The Shortwave Year in Review 18

By Glenn Hauser

Did 1998 pass in a blur? You'll enjoy Hauser's irreverent recap of the events and trends which emerged over the year just past.

Tuning in to Radio via Satellite 20

By Ken Reitz



Governments and corporations are still just catching on that they can cover entire continents with satellite transmissions; and most dish owners are equally unaware of the variety of signals already arriving at their dish. If you've wondered how to receive all that intriguing programming listed on pages 62-64, here's how to tune in these hidden audio broadcasts and much more.

Reviews:



This month *Monitoring Times* looks at a range of radio receivers: The new **Radio Shack DX-397** compact portable shortwave receiver (p.90), **Sony's dynamo-powered emergency radio** (p. 97), we compare the **Bose Wave** radio to its **Zenith** look-alike (p.96), and we look at restoring the **Hallicrafters S-38**. We also get our hands on the new SLK series of **Motorola TalkAbout** FRS radios (p.87), **RS-8500 software** to control the **ICOM R-8500** receiver (p.92), the **MFJ 259B SWR analyzer** (p.84); and a great air navigation software program called **AirNav 2.10** (p.94).





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WASHINGTON WHISPERS

By Fred Maia, W5YI
fmaia@cwixmail.com

• **In remarks given at the FCC's new headquarters, Commission Chairman Bill Kennard laid out his Agenda for the FCC for 1999.**

He started by saying that every major economic indicator in every sector of the communications industry was up in 1998: job growth, revenue, investment, stock values.

"Our communications system is the envy of the world. It's miraculous by comparison to many other countries. It happened because we have the right statutory and regulatory model in this country."

Chairman Kennard said the major initiatives for 1999 are "...all focused on our core goals to promote competition, to foster new technologies, to protect consumers, and to ensure that all Americans become full participants in the richness of the Information Age ... no matter where they live, what they look like, what their age, or what special needs they have..."

One of Kennard's 1999 initiatives is to promote the development and deployment of high-speed Internet connections to all Americans. And in response to appeals from microbroadcasting interests, Kennard said the FCC would be "...opening lowpower radio frequencies for local use and promoting the participation of people of all backgrounds in broadcasting and other communications media."

• **In a letter to FCC Chairman William Kennard, a coalition of thirteen executives from the technology industry have asked the FCC not to adopt any rules which specify how the high speed Internet should evolve.** Instead, the Commission should let the industry develop the broadband networks. Consumers will get more choices for these services, far quicker "...if the commission maintains a 'hands-off' approach that trusts markets to determine how the emerging broadband networks will be built and utilized," the letter said.

The FCC is considering requests by America Online, telephone companies, and consumer groups to impose regulations on cable giant Tele-Communications Inc.'s high-speed cable TV lines as a condition of TCI merging with AT&T Corp. Opponents of the merger want access to TCI's high-speed cable lines to offer competing Internet, cable and telephone services.

John Dingell, the highest-ranking Democrat on the House Commerce Committee, which has jurisdiction over the FCC, said federal regulators shouldn't force AT&T Corp. and TCI to take on new obligations as a condition for winning approval of their planned merger. "...the agency should look for ways to reduce regulations on companies, not increase them."

• **Supporting e-commerce and reforming the Federal Communications Commission are two issues at the top of the incoming Congress' high-tech agenda.** Online privacy, encryption, 'spam' (or junk e-mail) and Internet gambling are other issues also left over from the previous Con-

gress.

Legislators believe FCC regulations have blocked competition in phone markets promised by the Telecommunications Act of 1996. Many Republican lawmakers are also outraged by the FCC's 'e-rate' program, which offers discounts to schools and libraries that want to get wired. Lining up to curb the FCC's authority are Sen. John McCain (R-Ariz.), chairman of the Senate Commerce Committee, Rep. Tom Bliley (R-Va.), chairman of the House Commerce Committee, and Rep. W.J. "Billy" Tauzin, (R-La.), chairman of the Commerce Committee's Telecommunications, Trade, and Consumer Protection subcommittee.

"We've got a horse-and-buggy agency trying to bridle a supersonic technology," Rep. Billy Tauzin (R-La.) said. He wants to reform the FCC from top to bottom. "It is painfully obvious that the FCC structure has become a roadblock to competition."

• **The FCC has created a new page on Low Power FM (LPFM) radio broadcasting proposals on its Web site.** It covers the ongoing debate on whether the FCC should authorize future low power FM radio services for local communities. Currently under review at the FCC is the potential licensing of stations at various low power levels that could meet the special needs of neighborhood-based community groups.

On the agenda for the January 28, 1999, public meeting of the Federal Communications Commission is Mass Media Item 8, "Creation of a Low Power Radio Service."

This will be the first new free, over-the-air radio broadcasting service the FCC has proposed to create in decades (except for the so-called "Special Broadcasting Service" at 698-806 MHz on which the agency has taken no recent action).

The FCC based its proposal on several petitions for rulemaking that called for low power FM services. Importantly, none of the proposals contemplated use of modern digital technologies that could accommodate large numbers of stations.

The item is a proposal (a Notice of Proposed Rulemaking or NPRM) and should actually contain specific technical and operational rules for the new service.

Important questions surrounding the proposal include:

- o Does it accommodate large numbers of new stations?
- o Does it provide for commercial stations, or noncommercial only?
- o Will the FCC auction licenses?

See the FCC web page for developments, as well as the FCC Audio Services Bureau webpage at <http://www.fcc.gov/mmb/prd/lpfm>

• **Nineteen more unlicensed (pirate) FM broadcast band radio stations were shut down in the Miami, Florida, area in December.** Acting in conjunction with the U.S. Marshals Service, the FCC seized equipment, via court order,

that had been used to broadcast illegally in violation of Section 301 of the Communications Act of 1934.

Other agencies assisting in this action included the U.S. Attorney for the Southern District of Florida, Drug Enforcement Administration, U.S. Customs Service, U.S. Coast Guard, and local law enforcement officers.

A previous enforcement effort conducted in South Florida in July 1998 resulted in the seizure of equipment from 15 unlicensed stations. A follow-up investigation by the FCC resulted in the shut down of these 19 additional unlicensed stations.

• **On Dec. 17th, the FCC privatized and streamlined its equipment approval procedures.** As part of its 1998 Biennial Regulatory Review, the FCC has amended its RF equipment authorization rules to allow accredited private parties in the U.S. designated by the FCC to certify that RF devices meet its technical specifications. It also will designate parties in foreign countries to approve equipment as conforming the U.S. technical requirements.

The Commission noted certain equipment that uses radio frequencies must be approved by the FCC before it can be marketed. Allowing parties other than the FCC to certify compliance will permit communications devices to be introduced more rapidly.

Because the number of equipment applications filed with the FCC will likely decrease, the Commission said it will redirect resources to enforcement of its rules. (By Report & Order, Gen. Docket 98-68)

• **A powerful real estate alliance has appealed an FCC satellite antenna ruling in Federal Court.** A group of large real estate organizations have joined forces and filed suit in a Washington, DC, federal court. They seek to overturn an FCC order which grants tenants the right to install a satellite dish or antenna on their balconies without the approval of the building owner/manager.

The National Multi-Housing Council (NMHC), American Seniors Housing Association (ASHA), National Apartment Association (NAA), the Building Owners and Managers Association International (BOMA), Institute of Real Estate Management (IREM), National Association of Realtors (NAR), and the National Realty Committee (NRC) maintain that the government does not have the authority to grant permission for tenants without ownership interest to install outside video antennas without the property owner's consent.

The coalition maintains that Congress did not intend for Section 207 of the 1996 Telecommunications Act to apply to leased property or to apply to services other than video programming. They say that the FCC has not only overstepped its authority, but it also ignored basic safety guidelines. The FCC Order is scheduled to take effect on January 22, 1999.

Batteries of Big Concern

It's always a surprise to us here at *MT* headquarters to see what elicits the most response from our readers. We expected to get some comments on our "alternative power" ideas from the January issue, but never anticipated that all the comments would center around the simplest of the three articles: the battery in a bucket.

Dan Hamilton was the first to log in with this comment and suggestion:

"I have been using the 14-amp/hour battery from my motorcycle for years to power scanners and my Sony 2010 during hurricanes or other extended outages here on Cape Cod.

"Looking at your design, I am concerned about lack of venting, especially when you charge the battery. If something arcs it could ignite the hydrogen gas-laden atmosphere in the top of the bucket and cause a nasty explosion that could spray sulfuric acid around the area.

"Luckily, the solution is simple: make a vent in the top and side of the bucket to allow air to circulate or leave the lid off while charging."

Ken Stamm N2TIA, of Westport, Connecticut, had these comments and questions:

"You're correct in saying that the battery-related articles in the January '99 (oops, 1999-01-01) issue 'need some tweaking...'

"First, and least importantly, in 'Regulating the Alternative Power System,' while 6 volt batteries are fairly accessible, I'd be interested in knowing where the author has found 8 volt automotive batteries, which underlie the design of his 14 volt-based system. Secondly, and more seriously, I have some reservations:

1. The claim that 'a good automotive battery...can be recharged many times' ignores the fact that automotive batteries are not designed for applications where they will be significantly discharged. As anyone who's had to jump-start his car a few times will tell you, discharging an automotive battery several times will lead to its premature failure. The author would be better served with a 'marine' or 'deep cycle'

Battery in a Milk Crate

Mark Burns of Terre Haute, Indiana, wrote to Jacques and described the system he has used over the years.

"I liked your article 'Bucket Batteries.' I never thought of doing it that way! I do go on DXpeditions requiring a 12-volt power supply. This is how I do it ...

"I purchased a Delco size 24F battery on sale at a local Wal-Mart. The battery is a sealed unit. It can leak acid, but it has to be tipped at a 45 degree angle to do so. It has a built-in 'green eye' hydrometer which shows green when the state of charge is above 65% full. When not in use, I 'top it off' with a lamp trickle charger for a couple of days every six weeks or so. I also 'top it off' before an outing in the field. When fully charged, I can DX for about 14 hours before the voltage drops to 11, at which time the Drake quits. I also power a CB radio, spotlight, Kiwa loop, and a voltmeter off the battery when in the field.

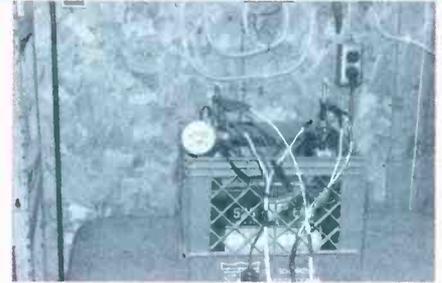
"I transport the battery in a milk crate tied down in the bed of my truck. It moves around a little bit, but not excessively so.

"As you can imagine, powering all the above takes several wires hooked to the battery. I also have a 25 foot cord that I use to charge up the battery from my truck's charging system if necessary. The picture looks like an electrician's nightmare, doesn't it?

"Finally, the cables, a few tools, and the CB radios, base and handheld units, fit easily into the tool box. I use the CB radio to communicate with the person adjusting the termination resistor at the far end of a Beverage antenna, if I'm using one. I also carry cables to ground out nearby electric fences, hook ground rods together and other such stuff.

"The system works well for me, provided I set up and take down in an organized fashion in the field.

"In your article you said you power your 2010 from the battery. How do you reduce the voltage down? My tape recorder needs 6 volts, but I just run it off of internal batteries."



battery designed for this purpose. Most marine batteries on the market would have trouble fitting inside the author's drywall-compound bucket, though.

2. The Author's design appears to have two potentially serious safety flaws:

- a. Placing a conventional lead-acid battery inside an airtight bucket is ill-advised, particularly during the recharge cycle. Hydrogen gas can be vented by the battery and trapped in the bucket-bomb which lacks any provision for ventilation.

- b. Although the author states the bucket is impervious to battery acid spills, the

foam used is of greater concern. Lacking the specific brand or composition, it would be wise to confirm that the proposed foam would not react with the battery acid, possibly producing noxious fumes and heat, notably inside an unventilated sealed bucket."

Jacques d'Avignon replied as follows:
a) "Let start with the first one. This set up was designed to be portable! If you want to use a deep cycle or a marine battery you are looking at using both arms to just lift such

Letters, continued on page 101

Tabloid writer arrested

Eric Ford, a tabloid journalist and photographer, was arrested in December for allegedly having used a modified scanner to eavesdrop on a cellular phone conversation between Tom Cruise and his wife Nicole Kidman. A federal grand jury indicted Ford on one count of illegally intercepting a wire communication and two counts of disclosing the contents of the phone call for financial gain. He had reportedly sought to sell the transcript to two publications: the British *News of the World*, and the Florida-based *Globe*. Ford pled not guilty and is out on bail.

"This should certainly put people on notice that it is illegal to intercept wire communications and people should expect some privacy in their private communications," said Los Angeles prosecutor Wendy Clendening.

BBC reductions?

Major cuts in the BBC World Service were to be proposed in February, according to the London *Observer*, which claimed to have obtained secret documents. According to the proposal, the German and Czech departments are to be closed entirely, with reductions in Hungarian, Thai, Russian, and Arabic broadcasts as well. These cuts are part of a three-year plan to cut 21 million pounds (\$35 million) from the budget and costing 100 jobs, in response to a 21 million pound shortfall in government support.

A World Service spokeswoman protested that such speculation was inaccurate, and that no final decisions had been made, and that "priorities are being established."

Afghans Hooked on Soap

If there was ever a hard audience, it's the Taliban, which banned all entertainment other than listening to the Koran in Afghanistan. But even they are listening to a soap opera which has been airing on shortwave three nights a week for nearly five years. *New Home, New Life* is a project of the BBC Afghan Project, funded by the BBC and various United Nations agencies.

"The soap opera format is very useful when you have a lot of themes and messages to address," says John Butt, the show's creator. "It also allows us to inject humor into the series." According to the report in the *Christian Science Monitor*, popular characters are Nazir the slapstick night watchman, Ali Gul the aid worker, and Rabiya the can-

tankerous housewife.

"We are not trying to emancipate. We are trying to educate in the context of Afghan culture and Islamic religion," adds Shirazuddin Siddiqui, head of the project. But just like soap opera fans everywhere, they're hooked.

When is the 10 o'clock news?

Two television network affiliates in Hawaii made a New Year's resolution to run their stations on "clock time." That is, actually air the *10 O'Clock News* at 10 o'clock! Apparently, when programs used to be broadcast from tapes sent from the mainland, stations got into the habit of slipping in extra commercials before the late night news. Fox's



KHON and ABC's KITV say they have turned over a new leaf and "the viewers will like it better."

Blame it on El Niño

Seems like everything in 1998 got blamed on El Niño; you'd think it stopped the world going 'round. Well, not stopped, exactly, but scientists say El Niño does slow it down. La Niña causes the rotation to speed up, but only about three-quarters as much.

Maybe that's why the atomic clocks had to insert a leap second at midnight, Dec 31, 1998 — only the 22nd leap second since 1972. The clocks must be synchronized with the rotation of the earth. Modern navigation and communication systems are based on the travel time of electromagnetic signals.

Precursors of Year 2000?

It seems some computers couldn't wait for the year 2000 to have trouble with a new year. Reports of computer glitches came from Singapore, Sidney, Anchorage,

BULLETIN BOARD

Mid-March HAARP Listening Test

The High Frequency Active Auroral Research Program (HAARP) facility will conduct its second listening test sometime in mid-March. As in the first test in March 1997, HAARP will transmit on or near the frequencies 3.4 MHz and 6.99 MHz to allow listeners the opportunity to listen for the HAARP signal, send in a report of logged signal strength, and claim a QSL card. They will transmit a "CW" message to give listeners the opportunity to verify their reception of the HAARP transmission.

Since HAARP cannot transmit above 10 MHz, the test will be scheduled after sunset in Alaska so that propagation conditions are best for listeners in the "lower 48." The specific time and address will be posted at <http://www.haarp.alaska.edu/haarp/hh2.html>

March 13-15: Kulpville, PA

12th annual Winter SWL Festival, Holiday Inn (215-368-3800) on Sumneytown Pike, Exit 31 PA Turnpike NE Extension. Full registration \$40, no meals \$17, spouse \$22, payable to WinterSWL Fest. For more info write PO Box 591, Colmar, PA 18915 or listen to ANARC SWL net on 7240 LSB at 10a.m Sundays.

March 13, March 27, April 10, May 1: St Louis County, Missouri

All-day training Severe Weather Observation seminars. SKYWARN level 1 in a.m., Level 2 in p.m. Level 1 taught in evening class on March 23; new class on Severe Weather Safety evening of April 14. For locations and information call 314-889-2857 for taped message. Classes open to anyone at no cost.

March 21: Hamilton Twp, NJ

Delaware Valley RA Hamcomp '99 at Tall Cedars of Lebanon picnic grove, I-95 North to I-295 South; Exit 60A to I-195 East; Exit 2 to Yardville; South Broad St to end (3.7 mi); left at yield onto Old York Rd; next right onto Sawmill Rd; 1.1 miles on right. Talk-in 146.67 (-) 8a.m., admission \$6. Info 609-882-2240 or www.slac.com/w2zq

March 21: Yonkers, NY

Westchester Emergency Communications Assoc (WECA) WECAFest at the Yonkers Raceway, I-87 Exit 4 from North or Exit 2 from South. Talk-in 147.66/06 (PL 114.8). 8am-2pm, admission \$7. Contact Tom Raffaelli WB2NHC 914-741-6606 or visit www.weca.org



"Just a minute, that's my call waiting."

Stockholm, and two other Swedish locations. None of the glitches were serious and all were corrected within a few hours. One explanation could be that some programmers have apparently used a series of 9s to mean "end of file" or "cease operating."

Guess Where I Am?

In a recent op ed article the author confessed to listening to cellular conversations and derided the unoriginality of the number one, most-used opening line in a cell-call: "Hi, guess where I am?" But it's unlikely those were Laura Dekkers' first words when she called her husband from her cellphone.

Dekker had been kidnapped from a church parking lot, forced to drive to an unknown spot, tied up, and shoved into the trunk of her BMW. After more than 12 hours, she managed to free herself and call her husband. From her position in the trunk she remained in periodic contact with 9-1-1 operators for the next several hours until her car was finally spotted by security guards in the garage of a Primm, Nevada, casino.

Guess Where I Am?

Forget the one phone call: jail cells across the state of Georgia are beginning to come equipped with a phone in the cell — courtesy of the sheriff. A local jail can get from 25 to 40 percent back on toll calls, depending upon its agreement with the phone provider. All calls are toll calls, and they are paid by the person receiving the call. Although the revenues are substantial, Sheriff Kenny Webb in Laurens County warned that use of the phone was an incentive for good behavior. "If they act up, we can cut off the phones," he said.

EEB Owner Pleads Guilty

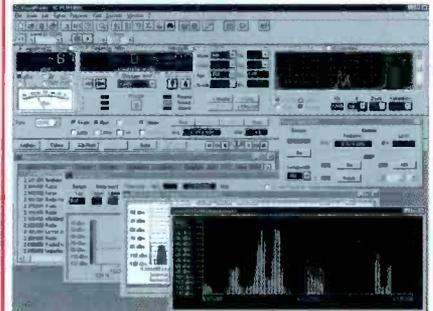
Richard (Dick) Robinson, owner of Electronic Equipment Bank in Vienna, Virginia, has pled guilty to conspiring to defraud the Drug Enforcement Administration (DEA), according to the US Attorney's Office.

Robinson conspired with Robert Burchell, a specialist with the DEA, to submit two false invoices totaling \$50,000 for batteries which were never delivered. Burchell pleaded guilty and has been sentenced to four years in prison. Robinson was to be sentenced Feb. 19.

"Communications" is written by Rachel Baughn from material submitted by MT readers. Special thanks to this month's team of reporters: Anonymous, Albany, NY; Anonymous, Worcester, MA; Roy Beavers, email; Camilo Castillo, Panama City, Panama; John Figliozzi, Clifton Park, NY; Patrick Griffith, Fed Heights, CO; Ray Hyde, email; Maryanne Kehoe, Atlanta, GA; Kevin Klein, Neenah, WI;

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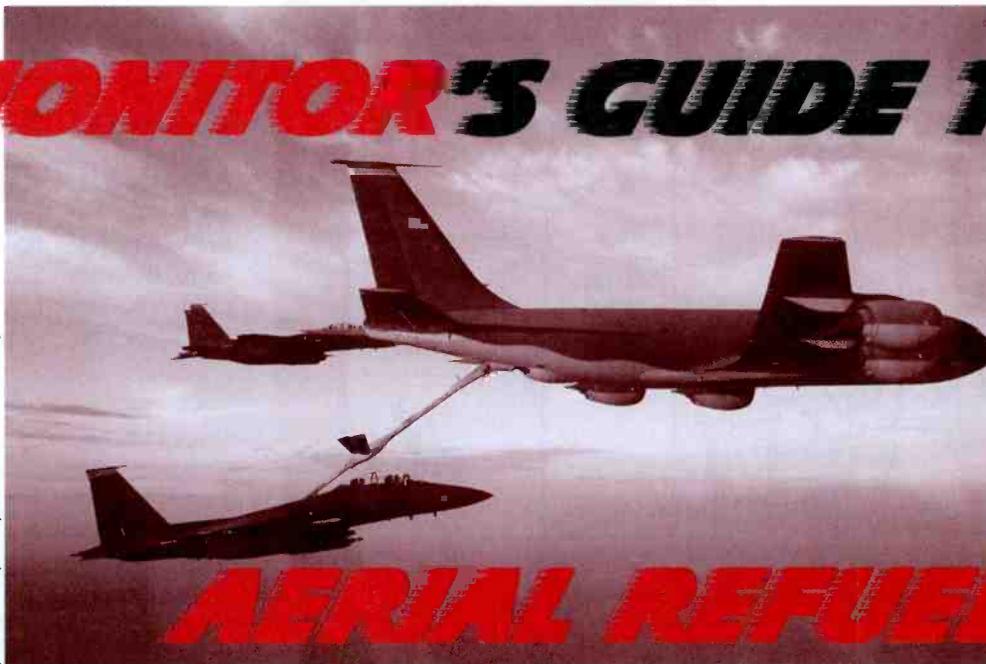


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A MONITOR'S GUIDE TO

(U.S. Air Force photo by Senior Airm. Conrad Evans)



AERIAL REFUELING

By Larry Van Horn, MT Assistant Editor

The air over the Iraqi no-fly zone is as hot and turbulent as the land below. Even at 18,000 feet you can still see sand swirling in the atmosphere. As part of a tanker aircrew flying Operation Southern Watch air refueling missions, Saudi Arabia's parched beige desert has become an all too familiar sight.

Suddenly, in front of you, the clouds open up to reveal another Air Force tanker a mile ahead. "It's getting pretty congested up here, you think to yourself." A short while later, you lower the 27-foot refueling boom to your customers — two EF-111s deployed from Cannon Air Force Base in New Mexico, and four F-16s from Misawa Air Base in Japan — all lined up for gas behind the tanker.

The silence in your headset is broken. "Happy 98-Gemini 31. Fill'er up, check the oil, clean the canopy ... and do you take credit cards?"

You watch as your customers maneuver into final position for refueling, bobbing in the rough air. Finally they hook up and the gas starts to flow. You can hear the whirring of pumps passing fuel to the waiting aircraft at the end of your boom. And the planes do get close; so close, in fact, you can read the pilot's name tag on his flight suit.

Before long all six aircraft are refueled, and 40,000 pounds of fuel has been pumped through your boom. The refueling took about three minutes per plane. The pilots were friendly, even whistling while they waited. And when they were done, they waved goodbye as we wait for more customers to pull up to the pump and gas up.

Our imaginary scenario can only hope to give us a feel for what it is like to be a boom operator onboard a U.S. Air Force air refueling tanker. But for those of us who can't experience firsthand what it is

like, we have available the next best thing: we can monitor this aerial maneuver.

Every day hundreds of air refueling operations are conducted on established routes all across the US, Canada, and Europe and nearly every scanner should be within earshot of some of the action. All you need is a scanner that covers the military aero band between 225-400 MHz.

Table one is a comprehensive list of DoD primary/secondary air refueling frequencies. Table two is a list of FAA and Canadian air traffic control frequencies associated with aerial refueling track/anchors. Table three is a list of some of the commonly heard aerial refueling unit callsigns.

aerial refueling frequencies you will find a whole new language unique to this sort of military operation.

Aircraft refueling operations are normally conducted in designated tracks or anchor areas. Each track or anchor area is controlled airspace assigned to a specific military unit. Most are assigned to the Air Force, but the Navy and the Army also have a few. The tanker aircraft is responsible for keeping the tanking operation within the track or anchor, unless clearance is granted.

There are differences between refueling tracks and refueling anchors. A track is a straight-line refueling area, whereas an anchor is a larger area for orbital refueling. On a track, the receiver aircraft initiates a rendezvous with the tanker, then descends to the refueling altitude after passing the Air Refueling Initial Point (ARIP). The tanker will orbit at the Air Refueling Control Point (ARCP), awaiting the receiving aircraft. All refueling is done under Instrument Flight Rules (IFR). A track will have checkpoints to pro-



(Air Force Photo by Dave Patterson)

An F-15 from Eglin Air Force Base, Fla., approaches the boom of a 157th Air Refueling Wing KC-135 to receive fuel.

Learning the Lingo

When you listen to the

vide adequate navigation for the refueling aircraft, and to depart or exit from the track after refueling.

A refueling anchor is a designated geographical area that is based on a specific anchor point. An anchor pattern surrounds this geographic point, which is a left-hand race track pattern with legs separated by a minimum of 20 miles, and with a minimum leg length of 50 miles. There are specific entry and exit points for the aircraft.

There are Air Route Traffic Control Center (ARTCC) frequencies (see table two) used at the entry and exit points.

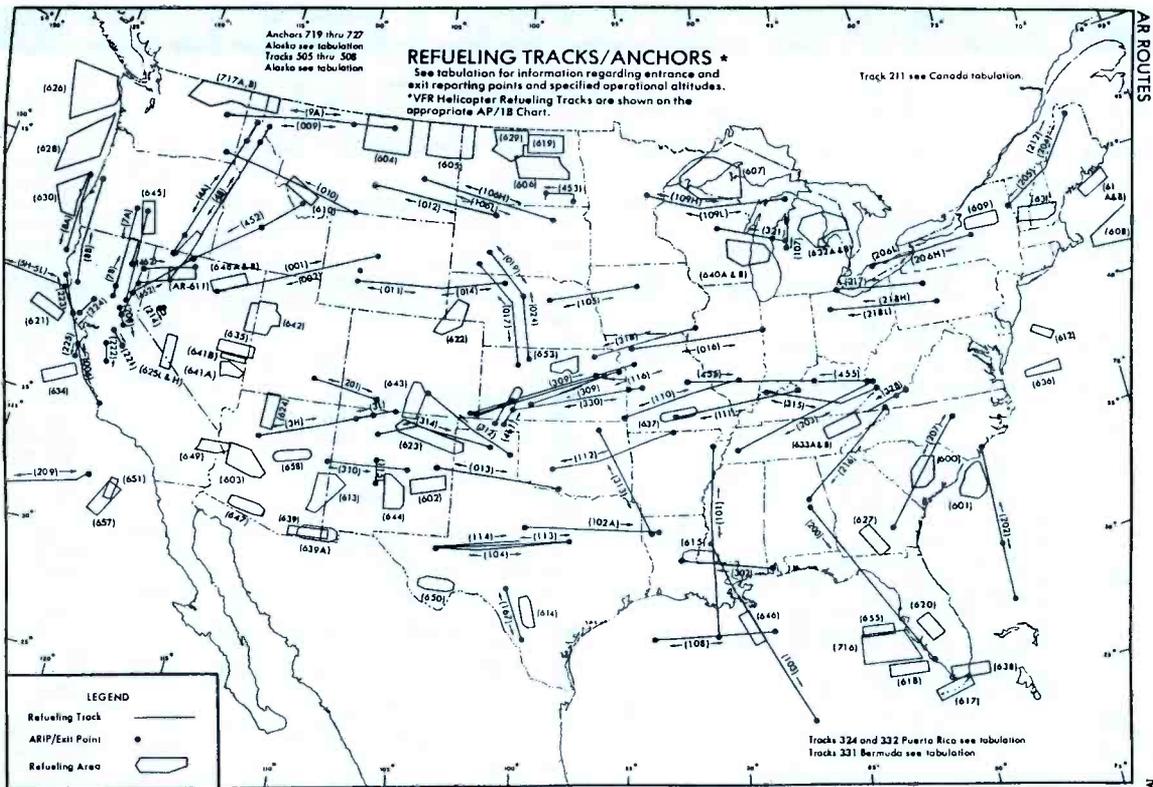
Each track/anchor has primary and secondary military UHF frequencies, which is where the action is. Also each track/anchor has its own designator. Often one base controls several AR's, and they will usually have the same secondary frequencies. Wherever you are in the continental United States, you should be within listening range of at least one of these tracks or anchors.

The Air Force Tanker Aircraft: KC-10/KC-135

The two primary aircraft in use by the Air Force today to refuel military aircraft are the McDonnell Douglas KC-10 Extender, and the Boeing KC-135 Stratotanker.

Although the KC-10A's primary mission is aerial refueling, it can combine the tasks of tanker and cargo aircraft by refueling fighters while carrying the fighters' support people and equipment during overseas deployments.

Using either an advanced aerial refueling boom, or a hose and drogue refueling system, the KC-10A can refuel a wide variety of U.S. and allied military aircraft. It is equipped with special lighting for night operations. The KC-10A's boom operator controls refueling operations through a digital fly-by-wire system. Sitting in the rear of the aircraft, the operator can see the receiver aircraft through a wide window. During boom refueling operations, fuel is transferred to the receiver at a maximum rate of 1,100 gallons (4,180 liters) per



minute; the hose and drogue refueling maximum rate is 470 gallons (1,786 liters) per minute.

The KC-10A can be air-refueled by a KC-135 or another KC-10A to increase its delivery range. The KC-10A fleet is being modified to add wing-mounted pods to further enhance aerial refueling capabilities.

During Operations Desert Shield and Desert Storm, the KC-10 fleet provided in-flight refueling to aircraft from all branches of the U.S. armed forces as well as those of other coalition forces. Air operations continued without costly and time-consuming ground refueling. In-flight refueling was key to the rapid airlift of material and forces.

The Old Workhorse

Like the KC-10, the KC-135 Stratotanker's principal mission is air refueling.

Four turbofans, mounted under 35-degree swept wings, power the KC-135 to takeoffs at gross weights up to 322,500 pounds (146,285 kilograms). Nearly all internal fuel can be pumped through the tanker's flying boom, the KC-135's primary fuel transfer method. A special shuttlecock-shaped drogue, attached to and trailed behind the flying boom, may be used to refuel aircraft fitted with probes. An operator stationed in the rear of the plane controls the boom. A cargo deck above the

refueling system can hold a mixed load of passengers and cargo. Depending on fuel storage configuration, the KC-135 can carry up to 83,000 pounds (37,648 kilograms) of cargo.

Air Mobility Command manages more than 442 Stratotankers (primary aircraft assigned), of which the Air Force Reserve and Air National Guard fly 268 of those in support of AMC's mission. McConnell Air Force Base, Kansas, is the host for the first KC-135 Air Force Reserve associate unit, the 931st Air Refueling Group, which shares KC-135s with the base's 22nd Air Refueling Wing.

Of the original KC-135A's, almost 400 have been modified with new CFM-56 engines and are designated either the KC-135R or KC-135T. Other Air Force Reserve and Air National Guard tankers were re-engined with the TF-33-PW-102 engines. These re-engined tankers are more fuel efficient, can offload more fuel, and are quieter than the KC-135A.

Let's Get Started ...

Military air refueling missions are fun and exciting to monitor. So fill up a bank in your scanner with some of the frequencies listed below for your area and give AR monitoring a try. You won't have to wait long before one of these flying gas stations flies over your area and fills your speaker with some hot AR action communications.

Table One: Department of Defense Air Refueling Frequencies

AM mode unless otherwise indicated

6.751 USB	USAF 155 Air Refueling Wing Lincoln Muni, NE (Nebraska Air National Guard) Operations	283.050	Anchors: AR-608, AR-609, AR-616A, AR-631, AR-632 USAF/NATO ARA-2 Aerial Refueling Track Primary (Great Britain)	320.900	SW), AR-207 (SW/NE), AR-216 (NE/SW), AR-315 (East/West), AR-328 Anchors: AR-600, AR-601, AR-617, AR-618, AR-620, AR-627, AR-633A/B, AR-636, AR-637, AR-638, AR-655, AR-716 USAF CONUS Established Air Refueling Tracks/Anchors-North of 39 North (Secondary) Tracks: AR-11 (East/West), AR-12H, AR-17 (South/North), AR-19 (South/North), AR-24 (South/North), AR-105 (East/West), AR-106H/L (East/West), AR-109H/L (East/West), AR-453
6.761 USB	USAF Worldwide Aerial Refueling Common	283.800	USAF Alaska Air Refueling Established/Random Tracks/Anchors (Primary) Anchor: AR-725 (NW/SE)	322.800	Anchors: AR-606, AR-607, AR-619, AR-622, AR-640A/B USAF CONUS Random Air Refueling Tracks
9.018 USB	927 Air Refueling Wing Selfridge ANGB, MI <i>Piston Operations</i>	283.900	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-2, AR-5H (East/West), AR-113 (East/West), AR-217, AR-309 (East/West)	324.200	USAF Alaska Random Air Refueling Tracks
9.022 USB	97 Flying Training Wing Altus AFB, OK Command Post	286.200	USAF AR-658 Air Refueling Anchor High Block (Primary)	324.400	USAF CONUS Established Air Refueling Anchors (Primary) Anchors: AR-644, AR-645, AR-653
11.217 USB	USAF Refueling Coordination Frequency (Helicopters)	286.300	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Track: AR-461	324.600	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-101 (North/South), AR-107, AR-204 (NE/SW), AR-207 (SW/NE) Anchors: AR-617 and AR-638
11.217 USB	USAF 155 Air Refueling Wing Lincoln Muni, NE (Nebraska Air National Guard) Operations	286.600	USAF AR-331 (East/West) Air Refueling Track Bermuda (Primary)	327.600	USAF CONUS Established Air Refueling Tracks (Primary) Tracks: AR-103, AR-109L (East/West), AR-110 (East/West), AR-202 (North/North Alternate/South), AR-205
11.2345 USB	117 Air Refueling Wing Birmingham Intl, AL (Alabama Air National Guard) <i>Dixie Control</i>	286.900	USAF CONUS Air Refueling Discrete	336.100	USAF CONUS Established Air Refueling Tracks (Primary) Tracks: AR-14 (East/West), AR-201 (East/West), AR-455 (East/West)
11.447 USB	22 Air Refueling Wing McConnell AFB, KS	288.700	USAF AR-324 Air Refueling Track Puerto Rico (Primary)	337.400	USAF CONUS AR-020 (NE/SW) Air Refueling Track (Primary)
228.550	117 Air Refueling Wing Birmingham Intl, AL (Alabama Air National Guard) <i>Dixie Control</i>	288.800	USAF Alaska Air Refueling Established/Random Tracks (Primary)	339.200	USAF CONUS AR-3H Established Air Refueling Track (Secondary)
234.825	927 Air Refueling Wing Selfridge ANGB, MI <i>Piston Operations</i>	289.700	USAF CONUS Random Air Refueling Tracks	339.400	USAF US/Canada Established Air Refueling Tracks (Secondary) Canada: AR-211 (NE/SW) US: AR-20 (NE/SW)
234.825	USAF CONUS Random Air Refueling Tracks	289.900	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-312, AR-453, AR-453 (East/West) Secondary Anchors: AR-625L, AR-637, AR-639A	341.400	USAF CONUS Established Air Refueling Anchors (Primary) Anchors: AR-654 and AR-674
235.100	USAF California (Grizzly call sign) Statewide Aerial Refueling and Air-to-Air	291.900	USAF CONUS Air Refueling Tracks/Anchors (North of 39 North (Secondary)) Tracks: AR-4A/B (North/South), AR-9/9A (East/West), AR-10 (SE/NW), AR-12L (East/West)	343.100	USAF CONUS Air Refueling Discrete
235.100	USAF Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-3L, AR-11 (East/West), AR-112 (East/West), AR-167 (East/West), AR-200, AR-206L, AR-328 Anchors: AR-605, AR-607, AR-626, AR-634	292.600	USAF CONUS Random Air Refueling Tracks	343.500	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-1, AR-16 (NE/SW), AR-109H (East/West) Anchors: AR-608 and AR-628
236.750	USAF CONUS Random Air Refueling Tracks	293.000	USAF AR-604, AR-605, AR-610, AR-626, AR-628, AR-630, AR-645, AR-717A/B	344.700	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-3H, AR-4A (North/South), AR-12L (East/West), AR-104 (East/West) Anchor: AR-621
238.650	USAF Air Refueling Contingency/Exercise Spare	293.400	USAF CONUS Random Air Refueling Tracks	347.200	USAF CONUS AR-658 High Block Air Refueling Anchor (Primary/Secondary)
238.900	USAF Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-9/9A, AR-13 (East/West), AR-105 (East/West), AR-203 (NE/SW), AR-209 (East/West), AR-212 (NE/SW) Anchors: AR-603, AR-619, AR-620, AR-630, AR-632, AR-636, AR-646, AR-648A/B	295.400	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-7B, AR-19 (North/South), AR-24 (North/South), AR-315 (East/West)	348.900	USAF CONUS Established Air Refueling Tracks/Anchors-East of 96 West (Primary) Tracks: AR-108 (East/West), AR-111 (East/West), AR-206H Anchors: AR-600 and AR-618
242.300	USAF Alaska Air Refueling Random Tracks	295.800	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-8A, AR-106H (East/West), AR-314 (East/West), AR-318 (East/West)	352.600	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-6, AR-12H (East/West), AR-218L, AR-310 (East/West), AR-313 (North/South) Anchors: AR-614, AR-627, AR-635
242.500	USAF Alaska Air Refueling Random Tracks	296.000	Anchors: AR-625H, AR-631, AR-633A/B, AR-650	352.700	USAF CONUS Air Refueling Contingency/Exercise Spare
242.700	USAF Alaska Air Refueling Random Tracks	296.400	USAF AR-629 Air Refueling Anchor (Primary)	356.450	USAF/NATO Air Refueling Routes (Primary) Tracks: AR-8B, AR-106L (East/West), AR-330 (East/West)
243.300	USAF Alaska Air Refueling Random Tracks	296.400	USAF/NATO Established Air Refueling Routes (Primary/Secondary) Great Britain Routes: ARA-6, ARA-10, ARA-11, ARA-13 (Secondary)	358.400	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-613, AR-640A/B, AR-642 (East/West)
243.500	USAF Alaska Air Refueling Random Tracks	297.300	USAF CONUS Air Refueling Tracks	359.100	USAF/NATO Air Refueling Routes Germany Routes: Baumholder (Primary) Great Britain Routes: ARA-3 (Primary) and ARA-7 (Primary) Netherlands Routes: Carol (Secondary)
249.875	USN California (South of 35 North) Aerial Refueling	297.750	USAF/NATO ARA-4 North/South Air Refueling Great Britain (Primary)	360.500	USAF CONUS Random Air Refueling Tracks
250.750	USN California (South of 35 North) Aerial Refueling	297.750	USAF/NATO ARA-4 North/South Air Refueling Great Britain (Primary)	360.900	USAF CONUS Random Air Refueling Tracks
251.475	USN California (South of 35 North) Aerial Refueling	299.600	USAF/NATO Air Refueling Routes Belgium Routes: Dartlie (Primary) Denmark Routes: Hanna (Secondary) Germany Routes: Baumholder (Secondary), Erika (Secondary), Gretchen (Secondary) Great Britain Routes (All routes secondary except ARA-13): ARA-1, ARA-2, ARA-3, ARA-4, ARA-5, ARA-6, ARA-6, ARA-B, ARA-9, ARA-10, ARA-11, ARA-12, ARA-13 (Primary) Netherlands Routes: Carol (Primary)	361.700	USAF CONUS Random Air Refueling Tracks
254.600	USAF CONUS Random Air Refueling Tracks	299.600	USAF CONUS Air Refueling Tracks	365.400	USAF Alaska Random Air Refueling Tracks
255.750	USAF CONUS Random Air Refueling Tracks	299.600	USAF/NATO ARA-8 Air Refueling Route (Primary)	366.300	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-7A, AR-17 (South/North), AR-102 (East), AR-216 (NE/SW), AR-321 Anchors: AR-604, AR-609, AR-655, AR-651
255.750	USAF AR-611A/B Aerial Refueling Anchor Primary	299.600	USAF/NATO ARA-8 Air Refueling Route (Primary)	367.400	USAF CONUS Established Air Refueling Tracks/Anchor Track: AR-14 (East/West) (Secondary) Anchor: AR-623 (Primary)
259.400	USAF CONUS Random Air Refueling Tracks	299.600	USAF CONUS Air Refueling Tracks	367.400	USAF CONUS Established Air Refueling Tracks/Anchor (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
260.200	USAF Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-13 (East/West), AR-101 (North/South), AR-102 (East), AR-103, AR-104 (East/West), AR-108 (East/West), AR-112 (East/West), AR-114, AR-116 (East/West), AR-167 (East/West), AR-302 (East/West), AR-309 (East/West), AR-312, AR-313 (North/South), AR-318 (East/West), and AR-330 (East/West), AR-461 Anchors: AR-614, AR-615, AR-643, AR-646, AR-650, AR-653, AR-654, AR-674	299.600	USAF/NATO ARA-4 North/South Air Refueling Great Britain (Primary)	367.400	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-5L (East/West), AR-10 (SE/NW), AR-114, AR-116 (East/West), AR-218H, AR-302 (East/West) Anchors: AR-606 and AR-624
260.300	USAF AR-113 (East/West) Air Refueling Track (Secondary)	299.600	USAF/NATO ARA-4 North/South Air Refueling Great Britain (Primary)	384.600	USAF AR-331 (East/West) Bermuda Air Refueling Track (Secondary)
263.900	USAF Alaska Air Refueling Established/Random Tracks/Anchors (Secondary) Tracks: AR-505 (East/West), AR-506 (North/South), AR-507 (East/West), AR-508 Anchors: AR-719, AR-720 (NE/SW), AR-721 (NE/SW), AR-722 (NE/SW), AR-723, AR-724, AR-725 (NW/SE), AR-727 (NW/SE)	305.500	USAF CONUS Air Refueling Tracks	384.600	USAF CONUS Established Air Refueling Tracks/Anchor (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
264.900	USAF CONUS Air Refueling Contingency/Exercise Spare	308.000	USAF/NATO ARA-4 North/South Air Refueling Great Britain (Primary)	389.000	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
266.500	USAF CONUS Random Air Refueling Tracks	308.000	USAF/NATO ARA-4 North/South Air Refueling Great Britain (Primary)	391.000	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
270.200	USAF Florida Alpha Refueling Track	308.000	USAF/NATO ARA-4 North/South Air Refueling Great Britain (Primary)	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
270.200	USAF Alaska Air Refueling Established/Random Tracks/Anchors (Primary) Tracks: AR-507 (East/West) Anchors: AR-719, AR-721 (NE/SW), AR-727 (NW/SE)	308.000	USAF/NATO ARA-4 North/South Air Refueling Great Britain (Primary)	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
275.950	USAF CONUS Random Air Refueling Tracks	314.500	USAF CONUS Air Refueling Tracks	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
276.100	USAF AR-611A/B Aerial Refueling Anchor (Secondary)	315.900	USAF Alaska Air Refueling Established/Random Tracks (Primary) Track: AR-505 (East/West)	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
276.400	USAF CONUS Random Air Refueling Tracks	316.350	USAF/NATO ARA-8 Air Refueling Route (Primary)	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
276.500	USAF Alaska Random Air Refueling Tracks	318.000	USAF CONUS Established Air Refueling Track/Anchor Track: AR-462 (Primary) Anchor: AR-658 Low Block (Secondary)	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
276.500	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Tracks: AR-7A, AR-17 (South/North), AR-102 (East), AR-216 (NE/SW), AR-321 Anchors: AR-604, AR-609, AR-655, AR-651	318.100	USAF AR-622 Air Refueling Anchor (Primary)	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
276.700	USAF Alaska Air Refueling Established/Random Tracks/Anchors (Primary) Anchors: AR-720 (NE/SW) and AR-722 (NE/SW)	319.500	USAF CONUS Established Air Refueling Tracks/Anchors-West of 96 West (Secondary) Tracks: AR-1, AR-2, AR-3L, AR-5H/L (East/West), AR-6, AR-7A/B, AR-8A/B, AR-201 (East/West), AR-209 (East/West), AR-310 (East/West), AR-314 (East/West)	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
278.400	USAF Alaska Air Refueling Established/Random Tracks/Anchors (Primary) Anchors: AR-723 and AR-724	319.500	USAF CONUS Established Air Refueling Tracks/Anchors-West of 96 West (Secondary) Tracks: AR-1, AR-2, AR-3L, AR-5H/L (East/West), AR-6, AR-7A/B, AR-8A/B, AR-201 (East/West), AR-209 (East/West), AR-310 (East/West), AR-314 (East/West)	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
279.800	USAF CONUS Established Air Refueling Tracks/Anchors (Primary) Anchor: AR-643	319.700	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-16 (NE/SW), AR-110 (East/West), AR-111 (East/West), AR-200, AR-202 (South/North/Alternate North), AR-203 (NE/	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block
282.700	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-107, AR-204 (NE/SW), AR-205, AR-206H/L, AR-212 (NE/SW), AR-217, AR-218H/L, AR-321	319.700	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-16 (NE/SW), AR-110 (East/West), AR-111 (East/West), AR-200, AR-202 (South/North/Alternate North), AR-203 (NE/	391.800	USAF CONUS Established Air Refueling Tracks/Anchors (Secondary) Tracks: AR-452 (NE/SW) and AR-462 Anchor: AR-658 High Block

Table Two: FAA/Canadian Department of Transportation AR ARCP/ARIP/Exit Frequencies

Key to Abbreviations

AFB	Air Force Base	FTW	Flying Training Wing
AMW	Air Mobility Wing	Intl	International
ANG	Air National Guard	NATO	North Atlantic Treaty Organization
ARG	Air Refueling Group	RAF	Royal Air Force
ARTCC	Air Route Traffic Control Center (FAA)	TW	Test Wing
ARW	Air Refueling Wing	USB	Upper Side Band
CONUS	Continental United States	WG	Wing



(Air Force Photo by Tech. Sgt. Daniel W. Beaudreau)

A KC-135 tanker from Pease Air National Guard Base, N.H., is being made ready to support the Tanker Task Force mission of escorting fighter and cargo planes overseas.

118.600	AR-020 (SW) Air Refueling Track	Exit	Moncton Center
119.000	AR-506 (South) Air Refueling Track	Exit	Anchorage ARTCC
119.100	AR-208 Air Refueling Track		Sacramento TRACON
120.850	AR-101 (North) Air Refueling Track	Exit	Memphis ARTCC
123.750	AR-101 (South) Air Refueling Track	ARCP	Memphis ARTCC
123.900	AR-020 (NE) Air Refueling Track	Exit	Moncton Center
125.200	AR-115 Air Refueling Track	ARCP/Exit	Albuquerque ARTCC
	AR-674 Air Refueling Anchor	ARCP/Exit	Albuquerque ARTCC
126.600	AR-507 (East/West) Air Refueling Track	Exit/ARCP	Anchorage ARTCC
127.100	AR-506 (North/South) Air Refueling Track	ARCP/Exit	Anchorage ARTCC
127.800	AR-508 Air Refueling Track	Exit	Anchorage ARTCC
127.950	AR-639 Air Refueling Anchor	ARCP Low	
128.100	AR-505 (West/East) Air Refueling Track	Exit/ARCP	Anchorage ARTCC
132.250	AR-462 Air Refueling Track	Exit	Oakland ARTCC
132.650	AR-108 (East/West) Air Refueling Track	ARCP/KC-10	Houston ARTCC
132.900	AR-508 Air Refueling Track	ARIP/ARCP	Anchorage ARTCC
133.000	AR-639 Air Refueling Anchor	ARCP High	
133.100	AR-505 (West/East) Air Refueling Track	ARCP/Exit	Anchorage ARTCC
133.375	AR-005H (East/West) Air Refueling Track	Exit	Oakland ARTCC
133.400	AR-108 (East/West) Air Refueling Track	ARCP/Exit	Houston ARTCC
133.450	AR-020 (NE) Air Refueling Track	ARCP	Boston ARTCC
133.550	AR-020 (SW) Air Refueling Track	ARCP	Gander Center eastbound
133.600	AR-507 (East/West) Air Refueling Track	ARCP/Exit	Anchorage ARTCC
133.850	AR-101 (South/North) Air Refueling Track	Exit/ARCP	Memphis ARTCC
	AR-108 (East/West) Air Refueling Track	Exit/ARCP	Houston ARTCC
133.900	AR-020 (SW) Air Refueling Track	ARCP	Gander Center westbound
134.150	AR-005L (East/West) Air Refueling Track	Exit	Oakland ARTCC
134.850	AR-202 (South/North/Ait North) Air Refueling Track	Exit/ARCP	Jacksonville ARTCC
134.975	AR-462 Air Refueling Track	ARCP	Oakland ARTCC
135.000	AR-505 (West) Air Refueling Track	ARIP	Anchorage ARTCC
135.050	AR-202 (South/North/Ait North) Air Refueling Track	ARCP/Exit	Jacksonville ARTCC
239.000	AR-014 (East) Air Refueling Track	ARCP	Denver ARTCC
246.000	AR-315 (West) Air Refueling Track	ARCP/Exit	Indianapolis ARTCC
247.000	AR-020 (SW) Air Refueling Track	ARCP	Gander Center eastbound
251.100	AR-004A/B (North/South) Air Refueling Track	ARCP/Exit	Seattle ARTCC
	AR-009/009A (East/West) Air Refueling Track	ARCP/Exit	Salt Lake City ARTCC
	AR-010 (SE/NW) Air Refueling Track	ARCP/Exit	Seattle ARTCC
	AR-013 (West) Air Refueling Track	Exit	Fort Worth ARTCC
	AR-310 (East) Air Refueling Track	Exit	Albuquerque ARTCC
	AR-602 Air Refueling Anchor	ARCP/Exit	Albuquerque ARTCC
253.500	AR-315 (East) Air Refueling Track	Exit	Indianapolis ARTCC
254.300	AR-633A/B Air Refueling Anchor	ARCP	Atlanta ARTCC
257.600	AR-111 (East/West) Air Refueling Track	ARCP/Exit	Memphis ARTCC
257.900	AR-011 (East) Air Refueling Track	Exit	Denver ARTCC
	AR-019 (North/South) Air Refueling Track	Exit	Denver ARTCC
	AR-216 (NE/SW) Air Refueling Track	Exit/ARCP	Atlanta ARTCC
263.000	AR-321 Air Refueling Track	ARCP/Exit	Chicago ARTCC
263.100	AR-506 (South) Air Refueling Track	Exit	Anchorage ARTCC
	AR-001 Air Refueling Track	Exit	Salt Lake City ARTCC
	AR-010 (SE) Air Refueling Track	Exit	Salt Lake City ARTCC
	AR-222 Air Refueling Track	ARCP	Oakland ARTCC
266.300	AR-020 (SW) Air Refueling Track	Exit	Moncton Center
269.000	AR-104 (East) Air Refueling Track	ARCP/Exit	Fort Worth ARTCC
	AR-105 (East/West) Air Refueling Track	ARCP/Exit	Minneapolis ARTCC
	AR-452 (NE) Air Refueling Track	ARCP/Exit	Oakland ARTCC
	AR-607 Air Refueling Anchor	ARCP/Exit	Minneapolis ARTCC
	AR-626 Air Refueling Anchor	Exit	Seattle ARTCC
	AR-648A/B Air Refueling Anchor	ARCP	Salt Lake City ARTCC
269.100	AR-007A/B Air Refueling Track	ARCP/Exit	Oakland ARTCC
269.300	AR-020 (NE) Air Refueling Track	ARCP	Boston ARTCC
	AR-218L Air Refueling Track	Exit	Cleveland ARTCC
269.400	AR-507 (East/West) Air Refueling Track	ARCP/Exit	Anchorage ARTCC

	AR-009/009A (East) Air Refueling Track	Exit	Salt Lake City ARTCC
	AR-106H/L (East/West) Air Refueling Track	ARCP/Exit	Minneapolis ARTCC
	AR-113 (West) Air Refueling Track	ARCP	Fort Worth ARTCC
	AR-116 (East/West) Air Refueling Track	ARCP/Exit	Kansas City ARTCC
	AR-330 (West) Air Refueling Track	Exit	Kansas City ARTCC
	AR-605 Air Refueling Anchor	ARCP/Exit	Salt Lake City ARTCC
	AR-101 (South/North) Air Refueling Track	Exit/ARCP	Memphis ARTCC
269.500	AR-108 (East/West) Air Refueling Track	Exit/ARCP	Houston ARTCC
269.600	AR-014 (East) Air Refueling Track	Exit	Denver ARTCC
	AR-616A Air Refueling Anchor	ARCP/Exit	Boston ARTCC
270.300	AR-453 Air Refueling Track	ARCP/Exit	Minneapolis ARTCC
	AR-606 Air Refueling Anchor	ARCP/Exit	Minneapolis ARTCC
	AR-619 Air Refueling Anchor	ARCP/Exit	Minneapolis ARTCC
271.200	AR-201 (East/West) Air Refueling Track	ARCP/Exit	Salt Lake City ARTCC
272.700	AR-622 Air Refueling Anchor	Exit	Denver ARTCC
	AR-633A/B Air Refueling Anchor	Exit	Atlanta ARTCC
272.750	AR-012H/L (East/West) Air Refueling Track	ARCP	Salt Lake City ARTCC
277.400	AR-110 (East/West) Air Refueling Track	ARCP/Exit	Kansas City ARTCC
279.500	AR-309 (East/West) Air Refueling Track	Exit/ARCP	Kansas City ARTCC
279.600	AR-008B Air Refueling Track	Exit	Seattle ARTCC
281.400	AR-223 Air Refueling Track	Exit	Oakland ARTCC
	AR-224 Air Refueling Track	ARCP	Oakland ARTCC
	AR-309 (East/West) Air Refueling Track	ARCP/Exit	Kansas City ARTCC
	AR-461 Air Refueling Track	ARCP	Kansas City ARTCC
	AR-617 Air Refueling Anchor	ARCP/Exit	Miami ARTCC
281.500	AR-302 (East/West) Air Refueling Track	ARCP	Houston ARTCC
	AR-622 Air Refueling Anchor	ARCP	Denver ARTCC
282.200	AR-639 Air Refueling Anchor	Exit High	
	AR-204 (NE/SW) Air Refueling Track	ARCP/Exit	Boston ARTCC
	AR-212 (NE) Air Refueling Track	ARCP	Boston ARTCC
284.600	AR-206H Air Refueling Track	ARCP	Cleveland ARTCC
	AR-314 (West) Air Refueling Track	Exit	Albuquerque ARTCC
284.700	AR-505 (West) Air Refueling Track	ARIP	Anchorage ARTCC
	AR-719 Air Refueling Anchor	ARCP/Exit	Anchorage ARTCC
	AR-725 (NW/SE) Air Refueling Anchor	ARCP/Exit	Anchorage ARTCC
285.400	AR-505 (West/East) Air Refueling Track	ARCP/Exit	Anchorage ARTCC
	AR-603 Air Refueling Anchor	ARCP/Exit	Albuquerque ARTCC
	AR-604 Air Refueling Anchor	ARCP/Exit	Salt Lake City ARTCC
285.500	AR-111 (East/West) Air Refueling Track	Exit/ARCP	Memphis ARTCC
	AR-313 (North) Air Refueling Track	ARCP	Fort Worth ARTCC
285.600	AR-013 (East/West) Air Refueling Track	Exit/ARCP	Fort Worth ARTCC
288.300	AR-508 Air Refueling Track	ARIP/ARCP	Anchorage ARTCC
	AR-218H Air Refueling Track	Exit	Cleveland ARTCC
290.300	AR-006 Air Refueling Track	Exit	Oakland ARTCC
290.400	AR-003H (East) Air Refueling Track	Exit	Denver ARTCC
	AR-003H (West) Air Refueling Track	ARIP	Denver ARTCC
290.500	AR-004A/B (North/South) Air Refueling Track	ARCP/Exit	Seattle ARTCC

Table 2 continued on next page

Table Two, continued

	AR-006 Air Refueling Track	ARCP	Oakland ARTCC		AR-114 Air Refueling Track	Exit	Albuquerque ARTCC
	AR-200 Air Refueling Track	Exit	Miami ARTCC		AR-641A Air Refueling Anchor	ARCP/Exit	Los Angeles ARTCC
	AR-452 (SE) Air Refueling Track	Exit/ARCP	Oakland ARTCC	343.700	AR-003L Air Refueling Track	ARCP/Exit	Denver ARTCC
290.550	AR-455 (East/West) Air Refueling Track	Exit/ARCP	Indianapolis ARTCC		AR-116 (East) Air Refueling Track	Exit	Kansas City ARTCC
291.600	AR-011 (West) Air Refueling Track	Exit	Salt Lake City ARTCC		AR-201 (East/West) Air Refueling Track	Exit/ARCP	Denver ARTCC
	AR-014 (West) Air Refueling Track	Exit	Salt Lake City ARTCC		AR-318 (East/West) Air Refueling Track	ARCP/Exit	Kansas City ARTCC
	AR-717A/B Air Refueling Anchor	ARCP/Exit	Seattle ARTCC	343.800	AR-634 Air Refueling Anchor	ARCP/Exit	Oakland ARTCC
291.700	AR-302 (East) Air Refueling Track	Exit	Houston ARTCC	343.900	AR-302 (West) Air Refueling Track	Exit	Houston ARTCC
	AR-313 (South) Air Refueling Track	Exit	Fort Worth ARTCC		AR-310 (East/West) Air Refueling Track	ARCP	Albuquerque ARTCC
294.500	AR-020 (SW) Air Refueling Track	ARCP	Gander Center westbound	346.300	AR-310 (West) Air Refueling Track	Exit	Albuquerque ARTCC
	AR-331 (East/West) Air Refueling Track	ARCP/Exit	Bermuda ATCT	346.400	AR-207SW/NE Air Refueling Track	Exit/ARCP	Jacksonville ARTCC
306.200	AR-005H (East/West) Air Refueling Track	ARCP	Oakland ARTCC		AR-110 (East) Air Refueling Track	Exit	Kansas City ARTCC
	AR-106H/L (East/West) Air Refueling Track	ARCP/Exit	Minneapolis ARTCC	348.700	AR-631 Air Refueling Anchor	ARCP/Exit	Boston ARTCC
306.300	AR-019 (North/South) Air Refueling Track	ARCP	Denver ARTCC	349.000	AR-620 Air Refueling Anchor	ARCP/Exit	Miami ARTCC
	AR-108 (East/West) Air Refueling Track	ARCP/Exit	Houston ARTCC	350.300	AR-011 (East) Air Refueling Track	ARCP	Denver ARTCC
	AR-217 Air Refueling Track	ARCP	Cleveland ARTCC	351.700	AR-312 Air Refueling Track	ARCP/Exit	Albuquerque ARTCC
306.900	AR-101 (North) Air Refueling Track	Exit	Memphis ARTCC		AR-623 Air Refueling Anchor	ARCP/Exit	Albuquerque ARTCC
	AR-636 Air Refueling Anchor	ARCP/Exit	Washington ARTCC		AR-645 Air Refueling Anchor	ARCP/Exit	Seattle ARTCC
307.100	AR-011 (West) Air Refueling Track	ARCP	Denver ARTCC	351.800	AR-613 Air Refueling Anchor	ARCP/Exit	Albuquerque ARTCC
	AR-218L Air Refueling Track	ARCP	Cleveland ARTCC		AR-639 Air Refueling Anchor	Exit Low	
307.200	AR-115 Air Refueling Track	ARCP/Exit	Albuquerque ARTCC	351.900	AR-012H/L (West) Air Refueling Track	Exit	Salt Lake City ARTCC
	AR-200 Air Refueling Track	ARCP	Miami ARTCC		AR-104 (West) Air Refueling Track	ARCP/Exit	Fort Worth ARTCC
	AR-674 Air Refueling Anchor	ARCP/Exit	Albuquerque ARTCC	352.000	AR-207SW/NE Air Refueling Track	ARCP/Exit	Jacksonville ARTCC
307.300	AR-608 Air Refueling Anchor	ARCP/Exit	Boston ARTCC		AR-462 Air Refueling Track	Exit	Oakland ARTCC
	AR-655 Air Refueling Anchor	ARCP/Exit	Miami ARTCC	353.500	AR-223 Air Refueling Track	ARCP	Oakland ARTCC
307.800	AR-202 (South/North/Alt North) Air Refueling Track	Exit/ARCP	Miami ARTCC		AR-224 Air Refueling Track	Exit	Oakland ARTCC
	AR-206L Air Refueling Track	Exit	Cleveland ARTCC		AR-318 (East) Air Refueling Track	Exit	Chicago ARTCC
316.100	AR-216 (SW) Air Refueling Track	Exit	Atlanta ARTCC	353.600	AR-107 Air Refueling Track	ARCP/Exit	Minneapolis ARTCC
317.400	AR-202 (South/North/Alt North) Air Refueling Track	ARCP/Exit	Jacksonville ARTCC	353.700	AR-017 (South/North) Air Refueling Track	Exit/ARCP	Denver ARTCC
	AR-217 Air Refueling Track	Exit	Cleveland ARTCC		AR-019 (North/South) Air Refueling Track	ARCP	Denver ARTCC
317.500	AR-012H/L (East) Air Refueling Track	Exit	Minneapolis ARTCC		AR-024 (South/North) Air Refueling Track	Exit	Denver ARTCC
	AR-722 (NE/SW) Air Refueling Anchor	ARCP/Exit	Anchorage ARTCC		AR-113 (East) Air Refueling Track	Exit	Fort Worth ARTCC
	AR-723 Air Refueling Anchor	ARCP	Anchorage ARTCC	353.800	AR-505 (West/East) Air Refueling Track	Exit/ARCP	Anchorage ARTCC
	AR-725 (NW/SE) Air Refueling Anchor	Exit/ARCP	Anchorage ARTCC		AR-016 (NE/SW) Air Refueling Track	Exit/ARCP	Chicago ARTCC
	AR-727 (NW/SE) Air Refueling Anchor	ARCP/Exit	Anchorage ARTCC		AR-112 (East/West) Air Refueling Track	Exit/ARCP	Fort Worth ARTCC
	AR-637 Air Refueling Anchor	ARCP/Exit	Kansas City ARTCC		AR-623 Air Refueling Anchor	Exit/ARCP	Albuquerque ARTCC
	AR-643 Air Refueling Anchor	ARCP	Denver ARTCC	354.000	AR-721 (NE/SW) Air Refueling Anchor	ARCP/Exit	Anchorage ARTCC
317.600	AR-009/009A (West) Air Refueling Track	ARCP	Salt Lake City ARTCC		AR-722 (NE) Air Refueling Anchor	Exit	Anchorage ARTCC
	AR-724 Air Refueling Anchor	ARCP	Anchorage ARTCC		AR-203 (NE/SW) Air Refueling Track	ARCP/Exit	Memphis ARTCC
319.000	AR-110 (West) Air Refueling Track	ARCP	Kansas City ARTCC	354.100	AR-206H Air Refueling Track	Exit	Cleveland ARTCC
319.100	AR-204 (NE/SW) Air Refueling Track	Exit/ARCP	Boston ARTCC	357.600	AR-222 Air Refueling Track	Exit	Oakland ARTCC
	AR-205 Air Refueling Track	ARCP	Boston ARTCC	360.700	AR-008A/B Air Refueling Track	ARCP	Seattle ARTCC
319.200	AR-600 Air Refueling Anchor	ARCP/Exit	Jacksonville ARTCC		AR-630 Air Refueling Anchor	ARCP/Exit	Seattle ARTCC
	AR-626 Air Refueling Anchor	ARCP	Seattle ARTCC	360.800	AR-720 (NE/SW) Air Refueling Anchor	ARCP/Exit	Anchorage ARTCC
319.800	AR-625H/L Air Refueling Anchor	ARCP/Exit	Oakland ARTCC		AR-635 Air Refueling Anchor	ARCP/Exit	Salt Lake City ARTCC
319.900	AR-221 Air Refueling Track	ARCP/Exit	Oakland ARTCC		AR-113 (East) Air Refueling Track	ARCP	Fort Worth ARTCC
	AR-314 (East/West) Air Refueling Track	ARCP	Albuquerque ARTCC		AR-114 Air Refueling Track	ARCP	Fort Worth ARTCC
	AR-328 Air Refueling Track	ARCP/Exit	Atlanta ARTCC	362.300	AR-016 (NE/SW) Air Refueling Track	ARCP/Exit	Chicago ARTCC
323.000	AR-506 (North/South) Air Refueling Track	ARCP/Exit	Anchorage ARTCC	363.100	AR-002 (East/West) Air Refueling Track	ARCP/Exit	Fort Worth ARTCC
	AR-002 Air Refueling Track	ARCP	Salt Lake City ARTCC		AR-216 (NE) Air Refueling Track	ARCP	Atlanta ARTCC
	AR-102 (East) Air Refueling Track	ARCP	Fort Worth ARTCC		AR-218H Air Refueling Track	ARCP	Cleveland ARTCC
	AR-638 Air Refueling Anchor	ARCP/Exit	Miami ARTCC		AR-618 Air Refueling Anchor	ARCP/Exit	Miami ARTCC
	AR-609 Air Refueling Anchor	ARCP/Exit	Boston ARTCC		AR-716 Air Refueling Anchor	ARCP/Exit	Miami ARTCC
323.100	AR-167 (East/West) Air Refueling Track	Exit/ARCP	Houston ARTCC	363.150	AR-648A/B Air Refueling Anchor	Exit	Salt Lake City ARTCC
323.200	AR-003H (East) Air Refueling Track	ARIP	Los Angeles ARTCC		AR-002 Air Refueling Track	Exit	Salt Lake City ARTCC
	AR-003H (West) Air Refueling Track	Exit	Los Angeles ARTCC	363.200	AR-116 (West) Air Refueling Track	ARCP	Kansas City ARTCC
327.000	AR-330 (East/West) Air Refueling Track	Exit/ARCP	Kansas City ARTCC		AR-653 Air Refueling Anchor	ARCP/Exit	Kansas City ARTCC
327.100	AR-007A/B Air Refueling Track	Exit/ARCP	Seattle ARTCC	368.500	AR-020 (NE) Air Refueling Track	Exit	Monrcton Center
	AR-109H/L (East/West) Air Refueling Track	ARCP/Exit	Minneapolis ARTCC	370.900	AR-318 (West) Air Refueling Track	ARCP	Kansas City ARTCC
	AR-202 (South/North/Alt North) Air Refueling Track	Exit/ARCP	Jacksonville ARTCC	372.000	AR-315 (East) Air Refueling Track	ARCP	Indianapolis ARTCC
327.800	AR-102 (East) Air Refueling Track	Exit	Fort Worth ARTCC	379.100	AR-601 Air Refueling Anchor	Exit	Anchorage ARTCC
335.500	AR-507 (East/West) Air Refueling Track	Exit/ARCP	Anchorage ARTCC		AR-724 Air Refueling Anchor	Exit	Anchorage ARTCC
	AR-101 (South) Air Refueling Track	ARCP	Memphis ARTCC	379.200	AR-627 Air Refueling Anchor	ARCP/Exit	Jacksonville ARTCC
	AR-206L Air Refueling Track	ARCP	Cleveland ARTCC		AR-462 Air Refueling Track	ARCP	Oakland ARTCC
	AR-643 Air Refueling Anchor	ARCP	Denver ARTCC	379.600	AR-628 Air Refueling Anchor	ARCP/Exit	Seattle ARTCC
335.600	AR-621 Air Refueling Anchor	ARCP/Exit	Oakland ARTCC	379.900	AR-455 (East/West) Air Refueling Track	ARCP/Exit	Indianapolis ARTCC
337.400	AR-330 (East) Air Refueling Track	ARCP	Kansas City ARTCC	380.050	AR-611A/B Air Refueling Anchor	ARCP/Exit	Salt Lake City ARTCC
338.200	AR-014 (West) Air Refueling Track	ARCP	Denver ARTCC	380.200	AR-167 (East/West) Air Refueling Track	ARCP/Exit	Houston ARTCC
	AR-017 (South/North) Air Refueling Track	ARCP/Exit	Denver ARTCC	380.300	AR-205 Air Refueling Track	Exit	Boston ARTCC
	AR-019 (North/South) Air Refueling Track	Exit	Denver ARTCC	381.400	AR-601 Air Refueling Anchor	ARCP/Exit	Jacksonville ARTCC
	AR-024 (South/North) Air Refueling Track	ARCP	Denver ARTCC	381.600	AR-013 (East) Air Refueling Track	ARCP	Fort Worth ARTCC
338.300	AR-508 Air Refueling Track	Exit	Anchorage ARTCC		AR-314 (East) Air Refueling Track	Exit	Albuquerque ARTCC
	AR-010 (NW) Air Refueling Track	ARCP	Salt Lake City ARTCC	385.550	AR-614 Air Refueling Anchor	ARCP/Exit	Houston ARTCC
	AR-203 (NE/SW) Air Refueling Track	Exit/ARCP	Memphis ARTCC	385.800	AR-641B Air Refueling Anchor	ARCP/Exit	Los Angeles ARTCC
	AR-610 Air Refueling Anchor	ARCP/Exit	Salt Lake City ARTCC	386.800	AR-003H (East/West) Air Refueling Track	ARCP	Denver ARTCC
	AR-651 Air Refueling Anchor	ARCP/Exit	Los Angeles ARTCC	387.100	AR-005L (East/West) Air Refueling Track	ARCP	Oakland ARTCC
340.900	AR-208 Air Refueling Track	Exit	Sacramento TRACON		AR-461 Air Refueling Track	Exit	Kansas City ARTCC
343.600	AR-113 (West) Air Refueling Track	Exit	Albuquerque ARTCC	397.900	AR-001 Air Refueling Track	ARCP	Salt Lake City ARTCC

Table Three: USAF/USMC Refueling Units Callsigns

U.S. Marine Corps

Draft ##	KC-130	Various Units
Otis ##	KC-130	VMGR-252
Raider ##	KC-130	VMGR-352
Ranger ##	KC-130	VMGR-234
Sumo ##	KC-130	VMGR-152/MAG46
Titan ##	KC-130	VMGR-253
Yankee ##	KC-130	VMGR-452 Grp 49 Det B

MCAS Yuma
MCAS Cherry Point
MCAS El Toro
NAS/JRB Fort Worth
MCAS Futenma, Okinawa
MCAS Cherry Point
Fort Stewart IAP

U.S. Air Force

Adobe ##	KC-10/135	Various	Coronet West Mission Support	
Aspen ##	KC-135	366WG	Mountain Home AFB	
Astra ##	KC-135	92ARW	Fairchild AFB	
Auto ##	KC-135	927ARW	Selfridge ANGB	Air Force Reserve
Backy ##	KC-135	916ARW	Seymour Johnson AFB	Air Force Reserve
Barel ##	KC-135	Various	Deployed Units Pisa	
Beach ##	KC-135	92ARW	Fairchild AFB	
Beak ##	KC-135	92ARW	Fairchild AFB	
Bird ##	KC-135	92ARW	Fairchild AFB	
Blue ##	KC-10/135	Various	Coronet East Mission Support	
Bobby ##	KC-135	Various	Unknown Mission	
Bolt ##	KC-135	6ARW	MacDill AFB	
Boom ##	KC-135	Various	Unknown Mildenhall Mission	
Broke ##	KC-135	319ARW	Grand Forks AFB	
Butch ##	KC-135	319ARW	Grand Forks AFB	
Cacti ##	KC-10/135	Various	Unknown Mission	
Caddo ##	KC-135	22ARW	McConnell AFB	
Caesar ##	KC-10/135	Various	Deployed Units Pisa	
Casino ##	KC-10/135	Various	Deployed Units Joint Guard in Europe	
Chena ##	KC-135	168ARW	Eielson AFB	Alaska ANG
Claw ##	KC-10	305AMW	McGuire AFB	
Coder ##	KC-135	126ARW	Chicago O'Hare Intl	Illinois ANG
Copper ##	KC-135	161ARW	Sky Harbor Intl	Arizona ANG
Count ##	KC-135	Various	Red Flag Mission Support (Tentative)	
Darr ##	KC-135	940ARW	Beale AFB	Air Force Reserve
Deuce ##	KC-10	514AMW	McGuire AFB	
Dixie ##	KC-135	117ARW	Birmingham Intl	Alabama ANG
Drum ##	KC-10/135	Various	Deployed Units Pisa	
Earl ##	KC-135	92ARW	Fairchild AFB	
Eskan ##	KC-135	Various	Deployed Units	
Esso ##	KC-135	Various	Deployed Units Europe	
Expo ##	KC-135	141ARW	Fairchild AFB	Washington ANG
Exxon ##	KC-135	319ARW	Grand Forks AFB	
Falls ##	KC-135	92ARW	Fairchild AFB	
Farad ##	KC-135	117ARW	Birmingham Intl	Alabama ANG
Force ##	KC-10	305AMW	McGuire AFB	
Fuzzy ##	KC-135	107ARW	Niagara Falls Intl	New York ANG
Gassr ##	KC-135	97FTW	Altus AFB	
Gald ##	KC-10/135	Various	Coronet East Mission Support	
Gorky ##	KC-135	121ARW	Rickenbacker ANGB	Ohio ANG
Green ##	KC-10/135	Various	Coronet Mission Support	
Greg ##	KC-135	319ARW	Grand Forks AFB	
Grizzly ##	KC-135	163ARW	March ARB	California ANG
Gumba ##	KC-10	305AMW	McGuire AFB	
Happy ##	KC-135	126ARW	Chicago O'Hare Intl	Illinois ANG
Hazard ##	KC-135	186ARW	Key Field	Mississippi ANG
Hoist ##	KC-10	305AMW	McGuire AFB	
Hoku ##	KC-135	154WG	Hickam AFB	Hawaii ANG
Hoser ##	KC-135	Unknown Unit	McGuire AFB	
Huskr ##	KC-135	155ARW	Lincoln Muni	Nebraska ANG
Indy ##	KC-135	434ARW	Grissom ARB	Air Force Reserve
Irish ##	KC-135	434ARW	Grissom ARB	Air Force Reserve
Jake ##	KC-135	186ARW	Key Field	Mississippi ANG
Jersey ##	KC-135	108ARW	McGuire AFB	New Jersey ANG
Jest ##	KC-135	97FTW	Altus AFB	
Kanza ##	KC-135	931ARG	McConnell AFB	Air Force Reserve
Keys ##	KC-135	186ARW	Key Field	Mississippi ANG
Lobby ##	KC-135	6ARW	MacDill AFB	
Maine ##	KC-135	101ARW	Bangor	Maine ANG
Mash ##	KC-135	434ARW	Grissom ARB	Air Force Reserve
Magas ##	KC-135	319ARW	Grand Forks AFB	
Mover ##	KC-10	Unknown Unit	McGuire AFB	
Okie ##	KC-135	507ARW	Tinker AFB	Air Force Reserve
Opec ##	KC-10	305AMW	McGuire AFB	
Orca ##	KC-10	60AMW	Travis AFB	
Pack ##	KC-135	157ARW	Pease ANG	New Hampshire ANG

Petro ##	KC-10135	Various	Coronet West Mission Support	
Piston ##	KC-135	927ARW	Selfridge ANGB	Air Force Reserve
Pride ##	KC-135	92ARW	Fairchild AFB	
Quest ##	KC-10	60AMW	Travis AFB	
Quid ##	KC-135	100ARW	RAF Mildenhall	US Air Force Europe
Quid 50-59	KC-135	100ARW	RAF Mildenhall	Aerial refueling mission in southern Europe
Quid 60-69	KC-135	100ARW	RAF Mildenhall	Aerial refueling mission in Germany/UK
Quid 70-79	KC-135	100ARW	RAF Mildenhall	Based at Mildenhall, England
Quid 80-99	KC-135	100ARW	RAF Mildenhall	Aerial refueling mission to/from southern Europe
Raid ##	KC-135	319ARW	Grand Forks AFB	
Ralls ##	KC-135	452AMW	March ARB	
Rhetl ##	KC-135	19ARG	Robins AFB	
Rick ##	KC-135	412TW	Edwards AFB	
Ricky ##	KC-135	63ARS	Selfridge ANGB	
Rocco ##	KC-135	108ARW	McGuire AFB	New Jersey ANG
Sandy ##	KC-135	319ARW	Grand Forks AFB	
Shakey ##	KC-135	171ARW	Pittsburgh Intl	Pennsylvania ANG
Shamu ##	KC-10	60AMW	Travis AFB	
Shamu ##	KC-10	305AMW	McGuire AFB	
Sheena ##	KC-135	168ARW	Eielson AFB	Alaska NG
Shell ##	KC-135	Various	Unknown Mission	
Sierra ##	KC-10	60AMW	Travis AFB	
Sluff ##	KC-135	121ARW	Rickenbacker ANGB	Ohio ANG
Snap ##	KC-10/135	Various	Kadena AB Mission Support	
Soda ##	KC-135	134ARW	McGhee Tyson Intl	Tennessee ANG
Spatz ##	KC-135	97FTW	Altus AFB	
Stag ##	KC-135	108ARW	McGuire AFB	New Jersey ANG
Steel ##	KC-135	171ARW	Pittsburgh Intl	Pennsylvania ANG
Strez ##	KC-135	319AMW	Grand Forks AFB	
Tazz ##	KC-135	121ARW	Rickenbacker ANGB	Ohio ANG
Team ##	KC-10	305AMW	McGuire AFB	
Tempo ##	KC-135	190ARW	Forbes Field	Kansas ANG
Topcat ##	KC-135	108ARW	McGuire AFB	New Jersey ANG
Tora ##	KC-135	18WG	Kadena AB	Pacific Air Force
Toro ##	KC-135	319ARW	Grand Forks AFB	
Truce ##	KC-135	117ARW	Birmingham Intl	Alabama ANG
Turbo ##	KC-135	22ARW	McConnell AFB	
Upset ##	KC-135	128ARW	General Mitchell Intl	Wisconsin ANG
Utah ##	KC-135	151ARW	Salt Lake City Intl	Utah ANG
Wooden ##	KC-10/135	Various	Coronet West Mission Support	
Woody ##	KC-135	92ARW	Fairchild AFB	
Zomby ##	KC-135	319ARW	Grand Forks AFB	



(Air Force photo by John Sidoniak, Jr.)

Senior Airman James Harris, 605th Aircraft Generation Squadron, marshals a KC-10 Extender as it prepares to take off at McGuire AFB, N.J.

Behind the Mic at Columbia Square

By Robert Rusk

Once an unknown, Linkletter had to drag his audience in off the street at KNX

KNX NEWSRADIO 10.70 · KCBS · FM93 · KCBS-TV92



Photo Credit: Robert Rusk

When tourists set out to see the sites in Hollywood, the star-studded Walk of Fame and the ornate Chinese Theatre are usually at the top of the list. What many people miss, though, is one of the last remaining landmarks dating back to the Golden Age of radio: Columbia Square, the historic building on Sunset Boulevard that for 60 years has been the home of station KNX-AM and was once the center of the CBS network.

Anyone old enough to remember tuning in such CBS favorites as *The Jack Benny Program* and *The Edgar Bergen and Charlie McCarthy Show* laughed along as the punch lines were delivered live from Columbia Square. Stars like George Burns and Gracie Allen, Frank Sinatra, Bing Crosby, and Eve Arden were also on the variety-packed CBS lineup.

Each night hundreds of fans would gather at Columbia Square, waiting to get inside to attend the broadcasts and see their favorite stars. But not all of the performers were yet big names when they arrived at Columbia Square. In 1944, for example, a fresh-voiced Art Linkletter began hosting *House Party*, an audience participation show. Without the following of a Sinatra or Crosby, Linkletter sometimes had trouble attracting a studio audience.

"We had to have one, so we bribed the ushers to go out on Sunset Boulevard and shanghai any passer-by," Linkletter recently recalled. "A retired fireman came every day for 10 years. He was finally chosen as our oldest, longest fan in history."

Another well-known entertainer who got his big break at Columbia Square was Steve Allen, best known as the original host of TV's

Tonight show. In 1948 Allen created a radio show that was heard on KNX, but was never picked up by the network. He visited with celebrity guests, interviewed audience members, and told jokes — developing the format he would later use on *Tonight*.

Typical of the humor on his KNX show was a story about having gone to dinner at the Hollywood Palladium, where big band leader Tex Beneke was performing. "I called in early and reserved a nice table," Allen quipped to the listeners. "But I had to stand up all night. I forgot to reserve a chair!"

Allen, who was just 27 when he signed on at KNX, originally called the show *Breaking All Records* because of his habit of taking cracked 78 rpm's and smashing them over the edge of a desk.

"It was just a play on words," said Allen. "I've always been fascinated by words, even common words like 'bread' or 'stick.' If a word has anything odd about it, that immediately sounds funny to me."

He even had fun at the expense of his sponsor, the Owl Drug Stores. "One night I said it was time to hear a message from the owl people," remembered Allen. "I suddenly started laughing because that sounded like strange creatures you would find if you took a rocket ship to some planet." He couldn't resist issuing a warning that would more likely be heard in a low-budget science-fiction movie and cracked, "Run for your life, captain, here come the Owl people!"

In the Beginning

The station that would become KNX first went on the air in 1920 (the year commercial radio began) with a five-watt transmitter and the call letters 6ADZ. It was started by Fred Christian, an ex-shipboard wireless operator, who built a makeshift studio in the back bedroom of his Hollywood home.

Station 6ADZ was money in the bank for the Electrical Lighting and Power Company, which Christian managed. The company sold parts to people who wanted to build their own radio receiving sets. "They had to have something to listen to," Christian once explained, "so I put a transmitter together."

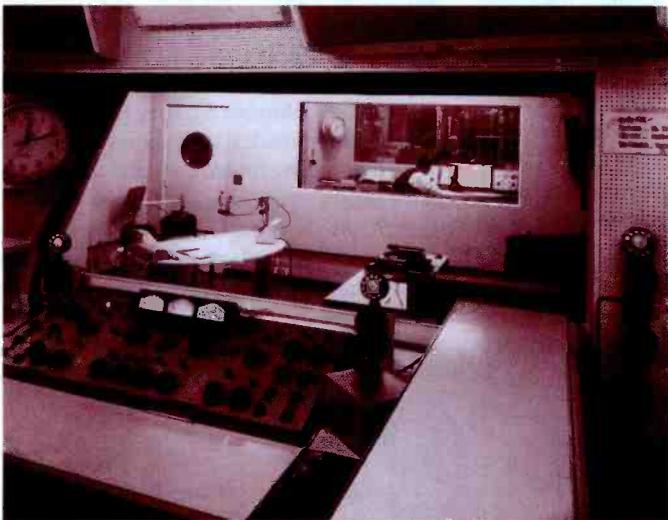
When the U.S. Department of Commerce, then the regulating agency, instituted a classification for broadcast stations, Christian was issued a license in 1921 to operate his station with the call letters KGC on 360 meters (833 kc). At that time the preferred method was to list frequencies in terms of wavelength in meters, but actually, every radio station in the United States shared the single frequency of 360 meters.

In 1922, Christian moved his station to the California Theatre in downtown Los Angeles and began airing live broadcasts of a 60-piece orchestra. That year he also built a new transmitter and increased the station's power output to 30 watts, and changed the call letters to KNX. Although no documentation exists to verify what the call letters stand for, one theory is that KNX refers to the annex at the Spring Street Arcade where the station maintained a studio.

By the summer of 1922 about two dozen other stations had been licensed to operate on 360 meters in the Los Angeles area, and the rivalry between the broadcasters became intense. KNX was usually able to grab the choice hours of 7 to 10 p.m., three nights a week.

Christian sold KNX in 1924, and under the management of the Los Angeles *Evening Express* newspaper the station was moved to the Hoffman Building on Hollywood Boulevard. Other owners and more power increases were to come. In 1929 KNX went to 5,000 watts. In 1932, under the ownership of Western Broadcasting Company, KNX boosted to 10,000 watts and the studios were relocated to the Paramount Pictures lot, where screen queen Mae West was just beginning to make movie magic.

The following year there was a boost to 25,000 watts, and KNX found yet another location on Vine Street. In 1934 the station was



KNX control room and studio, circa 1940s. Photo Courtesy KNX

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Photo Credit: Robert Rusk

authorized to broadcast with 50,000 watts of power, the maximum allowed. A year later KNX was on the move again, this time to 5939 Sunset Boulevard.

Things finally began to settle down in 1936 when the station was purchased by CBS, which today still owns the KNX.

Home at Last

Shortly after CBS bought KNX, network founder William S. Paley began making plans for a new facility to accommodate both the network and station. A square block of Sunset Boulevard real estate was chosen and ground was broken for a \$1.75 million broadcast center that included offices, studios, and theatres. Dubbed Columbia Square, the five-story building was dedicated in an all-day ceremony on April 30, 1938. An all-star lineup was in attendance, including rival NBC funnyman Bob Hope and movie director Cecil B. DeMille, who hosted CBS' long-running *Lux Radio Theatre*.

Although CBS had an impressive lineup of affiliates throughout the country, many listeners in the Western United States tuned in directly to Columbia Square to hear the mighty 50,000 watt nighttime signal of KNX. One such listener was DXer Robert Sims, who grew up in the small town of Klamath Falls, Oregon. "I had a nice radio at the head of my bed and would listen at night to stations around the country," Sims said. "One of them was KNX. I enjoyed hearing shows like *Gunsmoke* and *Jack Benny*."

In 1968, long after original episodes of such programs had faded from the airwaves and the year KNX switched to an all-news format, Sims was hired as a writer at the station. Today Sims is the news director at

KNX.

"It's ironic that I ended up here and have met some of the people who I used to listen to. I have a special feeling for the place," said Sims, who also serves as the unofficial historian of Columbia Square.

When Sims came to KNX several technicians who had worked on the old shows were still on staff, and he enjoyed talking with them and hearing their stories about the golden days. Sims became quite familiar with the layout of the building and is now one of the few people who can find all of its interesting nooks and crannies.

He took this writer on a tour of Columbia Square and as we made our way through the back halls and up some stairs Sims mentioned "a secret place that only a half-dozen people in the building know about." When we finally reached the dimly-lit hideaway, he said, "I'll bet you can't guess what it is. Come and take a look. See if you can figure it out."

He led me into a room about the size of a walk-in closet. The low ceiling immediately caught my eye and I thought maybe the walls were reinforced with steel and this was an above-ground bomb shelter. "No," Sims replied. "Notice that none of the walls are parallel. On the other side is a mirror image of this."

"Sound effects rooms," I guessed. "That's right," Sims said. "These were state-of-the-art, 1938 echo chambers. When Jack Benny would walk into his vault and there was a big echo, the sound was bouncing around in these two rooms. The audio was piped in and the technicians could electronically control how much bounce there would be, to make it sound like anything from a bathroom to Carlsbad Caverns. With the sloped ceilings, the sound bounced up and off at an angle. The technicians could make the sound as big or as little as it needed to be."

Web Tour

The echo chambers were used until the 1950s, when the broadcasting industry went through a major transformation and stars began to leave radio for the bright lights of television. Instead of turning Columbia Square into a center for the CBS-TV network, a new production facility — Television City — was built across town.

Today, in addition to KNX, Columbia Square houses sister stations KCBS-FM and KCBS-TV. With these changes, the in-

terior of Columbia Square bears little resemblance to its previous life as the heart of the radio network. The spot where the stage in the CBS radio theatre was located, for instance, was converted into the newsroom for KCBS-TV. What was the seating area in the theatre was long ago turned into storage space for office equipment such as typewriters and computer screens.

The exterior of the building, however, looks much as it did during the Golden Age of radio. You can take an online tour of Columbia Square by visiting the Web sites of KNX (www.knx1070.com), KCBS-FM (www.arrowfm.com), and KCBS-TV (www.cbs2.com).

If you're interested in seeing on-air studios, the KNX site is the most interesting. Studio 7, a state of the art facility, is shown. A click of the mouse takes you to a photo of the KNX newsroom, "the heart of the largest radio news staff in the Western United States." On the technical side, there is also a shot of the production center, where audio feeds are recorded and dubbed for on-air use.

The KCBS-TV site includes the history of channel 2, which was originally licensed in 1931 as experimental station W6XAO. It is believed this was the first TV station powered by a "transmitter of the present day type." The station was granted commercial designation in 1948, and the call letters were changed to KTSL-TV. After CBS purchased the station in 1951, the call letters were switched to KNXT-TV (to match the KNX-AM call letters). The present KCBS-TV call letters have been used since 1984.

This page has some vintage photos of Columbia Square, located at Sunset Boulevard and Gower Street in the heart of Hollywood. One photo shows the area in the 1880s, when it was rolling hills and farm land.

Even though much has changed through the years at Columbia Square, KNX still presents nightly broadcasts of shows such as *The Whistler* and *The Shadow* — and the two that news director Sims remembers so well: *The Jack Benny Program* and *Gunsmoke*. Perhaps the reruns of these classic shows will catch the ear of another young DXer, who like Sims,

will be inspired to get into radio and carry on the proud broadcasting tradition at Columbia Square.



Photo Credit: Robert Rusk

Robert Rusk worked in radio from 1979-90, and now is a freelance journalist. He is a regular contributor to the trade paper *Radio World*.

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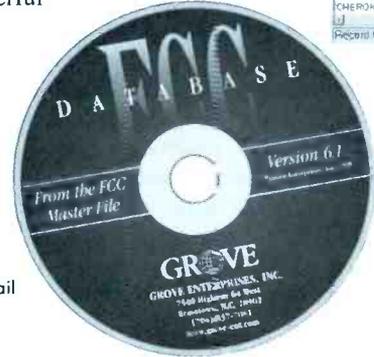
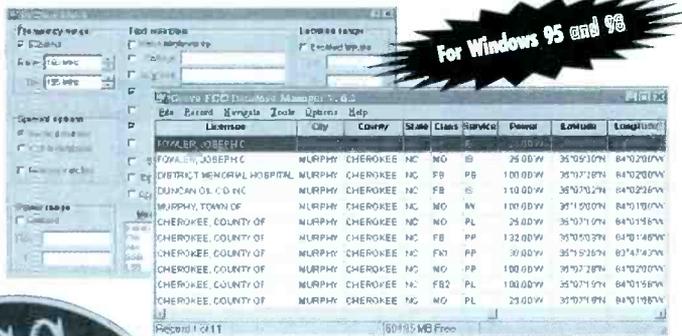
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1998 - The Shortwave Year in Review

by Glenn Hauser

New Stations

Only a few brand-new shortwave stations and services started: Merlin Network One, using spare BBC capacity, first weekly, then nonstop, mostly music. More and more stations originate in Britain — another one is Sunrise Radio, for Asians, but its leader got in trouble with the law.

The United Nations activated Radio Minurca in the Central African Republic, but reviving UN Radio itself for weekday half-hours kept being delayed.

Tannu Tuva, not only an historical postal country but a radio country, now on shortwave with Radio Kyzyl.

Relay Exchanges

New relay deals continued to proliferate, confusing the casual listener about where signals really come from:

Guyana took turns relaying VOA and BBC overnight.

Democratic Voice of Burma kept testing via Palau.

Radio Free Asia bought a new site it could reveal, KHBI Saipan.

Merlin Singapore added Switzerland, Netherlands and Germany besides BBC and Japan.

Voice of Hope gave up on Georgia, and signed up with Germany.

Voice of the Mediterranean, Malta, availed itself of Italy as well as Russia.

Vatican started using Uzbekistan and Kazakhstan; UN Radio started relays via Vatican.

Allegedly from three sites somewhere in Europe, the Shortwave Relay Service proliferated pirate programming.

Adventist World Radio added Madagascar and South Africa, while starting to phase out Costa Rica.

Radio Australia, forever frustrated by government denial of Darwin, its strongest site, made a minor deal for relays via Taiwan.

RVI Belgium finally puts a strong English signal into North America thanks to Bonaire; poor Prague signed on with WRMI and found itself jammed along with everything else, courtesy of communist Cuba.

Off Shortwave in 1998

The list of stations or services quitting shortwave in 1998 is too long for our liking: West Coast Radio Ireland, Canadian Forces Network, VOA Rhodes, Russia's Mayak (but continued a bit longer to keep transmitter buildings warm in winter); English from Norway and Portugal; apparently Radio Saint Helena; Estonian Radio (but Lithuania is getting a new shortwave transmitter); Angola's VORGAN; two of the three shortwave sites in Switzerland, transmitters from Schwarzenburg sold to AWR Italy; Radio France International proudly reduces its shortwave output as a public service — including English to North America; Calvary Chapel in Idaho, which bought the KGEI transmitter, decided against using it, but may sell it to Alaska. HCJB continued to face an uncertain future, threatened by vulcanism and airportism.

And there is no more Feminist International Radio Endeavour nor Radio Nadezhda.

Should Quit Shortwave

Stations which ought to give up unless they fix their modulation so anyone will listen include: Radio Cairo, Radio Moldova International via Romania, Radio Bras, and WJCR.

Shortwave Revivals

But we have an even longer list of shortwave revivals in 98, showing the medium is still viable: Radio Blue Sky, Mongolia; Nei Menggu PBS, Inner Mongolia; RTBF from the French faction in Belgium, realizing they should never have given up shortwave before; Pinochet's old transmitters in Chile got New Life as Voz Cristiana. Iraq sporadically resumed external service including English — until December 16; Qaddhafi forsook Arabia, renaming Libya's shortwave, Voice of Africa, and adding some English.

Other Africans revived were in Guinea, Niger, CRI via Mali, Sierra Leone, Kisangani, Voice of Nigeria, and Radio Morocco's Tangier site, not all of which were still going at year-end.

Ireland's RTE added more relays from Ascension and Singapore, and an additional weekly program; but Emerald Radio's limited run was unlistenable.

AFRTS came back to the delight of shortwave listeners, despite sideband-only and lots of interference.

And despite tearful goodbyes, Tahiti's shortwave frequency lived again.

Funding Shortages

Budget cuts accounted for problems like these:

Radio New Zealand International was about to close down, but finally got enough to keep going on a reduced schedule by cutting most of its own program production, including several rare Pacific languages. Radio Australia also survived by relaying domestic radio more, not necessarily a bad thing.

BBC got 44 megapounds more, but complained it wasn't enough and proceeded to cut favorite programming, so now "Anything Went."

Voice of Russia could not even afford to answer its mail.

Political Interference

Politics rules in Liberia, where Star Radio kept being cut off by the government; Korea North, where Radio Pyongyang tried to involve its listeners with a new competition in the cult of the Kims.

Clandestine Developments

On the clandestine scene, Nigerians proliferated, with Voice of Free Nigeria, Radio NADECO, Radio New Nigeria (becoming Radio SNBS), and Voice of Oduduwa, but the only one lasting, barely, until yearend was the original, Radio Kudirat.

Off the air, Democratic Voice of Iran, but new on the air, Radio Tomorrow's Iran.

The United States expanded its responsibility as a surrogate broadcaster for countries lacking a free press. Radio Free Asia added Uighur but we're still waiting on Wu; despite the jittery Czechs worried about which part of Prague was most expendable to a terrorist attack, since they got all the heat for the studios rather than countries hosting transmitter sites, Britain, Germany and Greece — Radio Free Iraq got underway a sesquimonth before the latest bombing of Baghdad, as did the service to Iran, but we're still standing by

for the start of Radio Democracy for Africa.

It became quite clear that the Voice of Southern Azerbaijan actually comes from Israel. During the year, from Lithuania, Radio Free Tibet came and went, but Lithuania also tried Radio Baltic Waves, for Belarus.

The Voice of the Tigers, Tamil Eelam clandestine, went back on shortwave for Sri Lanka on the coattails of a more respectable Tamil service from London, IBC. Another Tamil station, Radio Asia Canada, had pretensions of competing with RCI as the Radio Voice of Canada, until it mysteriously disappeared following inquiries into its connections with the Tamil Tigers.

Goodbye and good riddance to the Khmer Rouge station whose exact name I've already forgotten.

New Names

Name changes of significance: BRTN became VRT in Belgium; Voice of Free China turned into Radio Taibei (Taipei) International.

Shortwave seasons W and Z were renamed B and A, with a few stations still observing M, J, S and D.

It's News, Now, on VOA almost all the time at the expense of much other programming, and BBC is "modernizing" in the same direction, while dumbing-down its overall quality level.

U S News

Pacifica news finally made it onto shortwave, reluctantly with the persistence of RFPI, but not on WBCQ, which did bring us the satire of Harry Shearer.

Yes, Allan Weiner's dream of his own shortwave station finally came true after a decade, but it turned out to be — licensed!

Meanwhile, the much-promoted Electra radioship project crashed before it ever reached St. Kitts.

The FCC cracked down on pirates including shortwave late in the year, greatly reducing activity on 6955 kHz.

WGTG doubled its capacity with transmitter two, and pushed single sideband as the wave of the future.

The USA gained another shortwave station (what else but religious?), WWBS in Georgia; and yet another fundamentalist is on the way from North Carolina.

Jeff Baker was anything but prophetic in choosing Honduras as the paradise for his followers and a supposed shortwave station in Siguatepeque.

Disasters

A drought in Papua New Guinea cutting off hydroelectric power was one of several reasons for disappearance of regional shortwave stations. But Radio Free Bougainville found a way to operate off...coconut oil.

Notable for comebacks following hurricanes and floods are Radio Cima Cien, Dominican Republic; Caribbean Beacon, Anguilla; and Radio Internacional, Honduras.

Anniversaries

In 1998, every station in the world celebrated an anniversary; but the significant LX milestone was reached by Radio Sweden and YLE Radio Finland. Bhutan made it to XXV.

DX Programs

DX Partyline from HCJB goes on and on, though Ken MacHarg left for Florida; we do not expect Spain's *Distance Unknown*, whose very name was a misnomer, to survive the retirement of Terry Burgoyne. Sheldon Harvey started answering questions about DXing on RCI's mailbag. Merlin Network One gave us the rowdy *Media Zoo*. We were pleased to exchange guest appearances with *Wavescan* on Adventist World Radio, but that show is still so elusive actually to hear.

Verifications and Goodies

On the QSLing front, AWR issued a 3D QSL depending on unfocussing your eyes; another club stepped in to keep cards flowing, ARDXC for Radio Australia. Romania offered 36 different designs; Slovakia had multi-color castle stickers; Belgian DXer Guido Schotmans printed and donated some QSL cards to Zanzibar, whence a few have come back to DXers. But Christian Voice, Zambia, makes QSLing do-it-yourself on their website.

Publications

The American SWL Club is gone, Graham Barclay's Kiwi Radio Weekly from New Zealand has ceased, but the *World Radio TV Handbook* is reborn.

Jamming Honor Roll

Cuba remains the source of jamming in the Western Hemisphere, but even they had the sense to turn it off temporarily for Radio Marti's hurricane warnings. The Maldive Islands join the dubious list of jammers, since

the anti-Islamic FEBA Seychelles dares to broadcast in their language.

Equipment and Technical

The Orban 9105a audio processor gets the blame for much of the distortion and spurious splatter we hear. Voice of Vietnam cleaned up modulation, frequency variation, and left those far-out-of-band frequencies.

RCI made the most of its 15 megadollars, ordering new transmitters, and finally renovating its tiresome jingles.

One more country, Sweden, experimented with digital shortwave, but it's still in the future; while internet broadcasting proliferates in the present. And the World Radio Network leads the way with more relays via NPR, WLIO-TV, and about to go on direct satellite in North America.

Propagation

The new solar cycle is taking off, with eleven meters opening up again, but so far only one international broadcaster, Budapest, is daring to use it; even more so thirteen meters, still with the notable exception of VOA.

Obituaries

We're sad to note the passing of these individuals: Frank Muir, who brought us so much enjoyment on the BBC; longtime Radio Moscow announcer Annabelle Bucar; Pete Myers of Radio Netherlands; Donald Flamm, whose activities led to the VOA; and California shortwave listener Gerald W. Arrington.

People and Programs

Other personalities of note: Rudi Hill lost his shows from New Zealand and was reported very ill. Bob Holness and Dave Lee Travis are fine, but BBC has just cancelled *Anything Goes* and *A Jolly Good Show*.

Co-host of the year on RCI was Maria Echevarria; on RCI, the *Maple Leaf Mailbag* became Marc Montgomery's; Reshida Morali on Voice of Turkey's *Letterbox*. Minnesota's Mindi Ratner became a major voice on China Radio International. Manolo de la Rosa disappeared from Cuban airwaves for reasons never really explained. And a kitty named Paz took over Radio for Peace International.

Credits and sources for most of these items can be found in our *Monitoring Times* columns for 1998 and early 1999; and/or in *Review of International Broadcasting*.

Tuning in to Radio

via Satellite



By Ken Reitz KS4ZR

When it comes to satellite television entertainment, most consumers believe that what they see is all they get. But that's not the whole picture. Unlike their DBS counterparts, C and Ku-band satellites are the industry's workhorses. Here — in addition to typical cable fare, the network feeds, and syndicated programming — are all manner of other analog and digital radio transmissions. Some of these signals require expensive equipment and subscriptions, but with a minimum of receiving gear you can still tune into some very interesting broadcasts.

Among the signals you can hear are those from standard analog subcarriers, many others below the tuning range of most satellite TV receivers, known as FM Squared (FM²)*; very narrowband FM transmissions called Single Channel Per Carrier (SCPC); and new digital audio services from channels you may not know exist.

SEARCHING THE CLARKE BELT

In the case of monitoring communications satellites, our work is made simple by the fact that all of these satellites are in geosynchronous orbit 23,000 miles high in a plane directly over the equator. This belt of satellites is known as the Clarke Belt in honor of Arthur C. Clarke, a world renown visionary who first put forth the theory of communications via satellites in geosynchronous orbit in the 1940s, well before the starting gun of the space race.

Once a C/Ku-band satellite TV receiving system is properly installed, its polar mount tracking mechanism moves the dish from east to west precisely on the Clarke Belt and allows the viewer to stop at any point along the way and tune in. Satellites in our region of sky stretch from SBS 6 at 74 degrees west to

Satcom C1 at 137 degrees west.

Our job of locating these radio signals is made easier still by virtue of the fact that the location of all satellites in geosynchronous orbit is well documented. This is nothing like trying to track Low Earth Orbit satellites for which you need orbital tracking programs for your computer hooked up to azimuth/elevation rotors on the antenna. Most satellite TV receivers can store dozens of satellites in the

on-board memory and return to them every time you require.

To get started you'll need as much current information as you can find. It happens that you are reading the only magazine available today with the most up-to-date information on all manner of satellite radio services. In the Satellite Radio Guide of *MT* you'll find a listing of about 100 analog FM radio services and another 100 or so FM² and SCPC services



Digital Music Express (DMX) brings you non-commercial, uninterrupted, CD quality music 24 hours a day.

all listed by satellite and transponder. It couldn't be easier!

A SIDE LESS SEEN

When satellite television broadcasting first began in the U.S. it was done solely in the C-band. By the early 1980s Ku-band-only satellites were being used, and by the mid-1980s C/Ku-band combination satellites were regularly built. Most satellites launched today are C/Ku-band in which there are typically 24 C-band and 24 Ku-band transponders.

The Ku-band side of most satellites tends to be dedicated to a particular service. For example, GE-3 (87 degrees west) is predominately PBS; GE-1 (103 degrees west) is predominately NBC; the entire Ku-band side of Galaxy 3 (95 degrees west) is used to transmit Galaxy Latin America, a Direct-To-Home programming service; the entire Ku-band side of GE-2 (85 degrees west) is where Primestar programs originate.

Still, there are many other users of Ku-band transponders, ranging from Satellite News Gathering (SNG) found on virtually every Ku-band satellite to sporting events transmitted directly from the site (called "back



The Heil SC-1 SCPC receiver can still be found at hamfests.

hauls"). As you can see, if you don't have Ku-band capability, you're not getting the full use out of your system.

LISTENING TO YOUR DISH

The bandwidth of a satellite transponder is so wide that it's possible to transmit the video with two audio subcarriers (for stereo or for a

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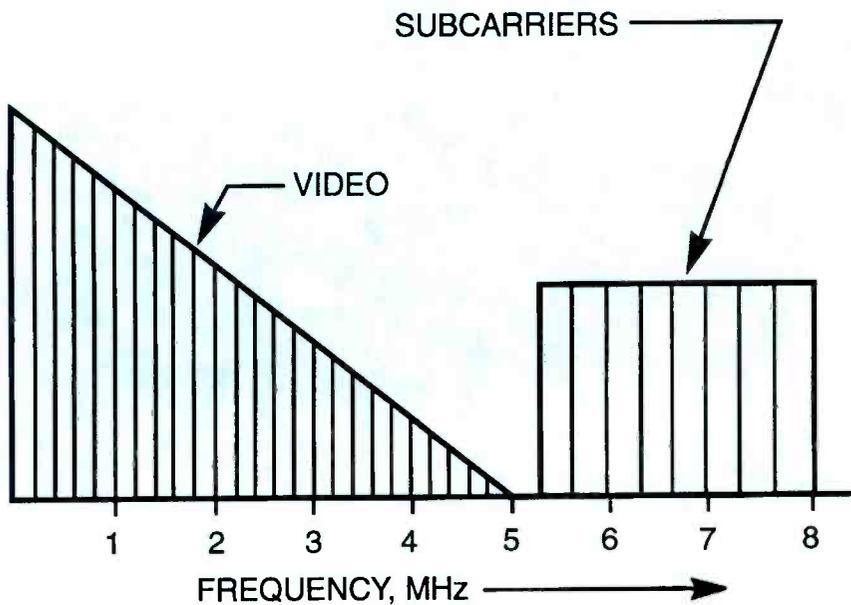
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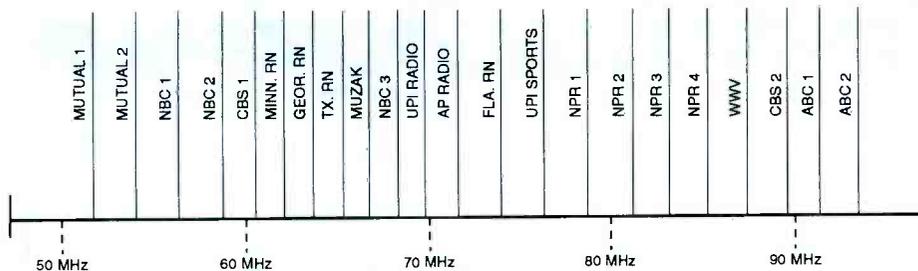
special audio channel for the sight impaired) and still have plenty of room for extra pairs of audio signals. A prime example of this is Channel 21 on Galaxy 5 which transmits the video of Knowledge TV and one subcarrier for the audio, and yet still has room for no fewer than seven pairs of stereo frequencies to transmit their line-up of music formats. These channels are all between 5.00 MHz and 9.00 MHz in the transponder bandwidth.

If you like music, as I do, you can't beat the variety available on the audio subcarriers of the C and Ku-bands. Best of all, it's free! Studying the Satellite Radio Guide a little more, you'll become aware of the amazing spectrum of audio services. From ethnic broadcasters such as Antenna Radio (Greece), Apna Sangeet Radio (India); big time radio stations such as WCBS-AM New York and specialty

stations like Yesterday U.S.A. (nostalgia radio), you'll find a dozen or more favorites. There are commercial-free public radio stations such as KLON-FM, Long Beach and WUSF-FM, Tampa; international shortwave broadcasters like the BBC and Deutsche Welle; religious broadcasters; news stations such as Cable Radio Network, CNN Radio News, Business Radio Network and dozens more.

Did I mention the reading services for the sight impaired? There's Country, Rock, Classical, Jazz, you name it! If you never hooked a TV set up to your dish you would still be getting your money's worth!

By using an outboard subcarrier tuner you can tune below the 5.00 MHz limit of your present receiver and pick up several dozen more services. There's only one consumer grade receiver available which does this, the



Typical (not actual) FM/SCPC single transponder service assignments on a full transponder.

Sources:

Audio Subcarrier/SCPC Receivers

Avcom
500 Southlake Boulevard
Richmond, VA 23236
804-794-2500 FAX: 804-794-8284
(Makes the SCPC-1000D, reviewed in May/June '96 *Satellite Times*)

SatScan Corporation
P.O. Box 1109
Sultan, WA 98294
360-793-7533
www.satscan.com
(Makes the SCPC Explorer)

Universal Electronics
4555 Groves Road
Suite 12
Columbus, OH 43232
614-866-4605 FAX: 614-866-1201
(Makes the SCPC-200, reviewed in Nov/Dec '96 *Satellite Times*, and the SC-50, reviewed in July/Aug '97 *Satellite Times*)

Digital Satellite Receivers

Digital Music Express
11400 W. Olympic Blvd.
Suite 1100
Los Angeles, CA 90064
800-700-4412
www.dmxmusic.com

Digiear
6680 Lincoln Avenue
Lockport, NY 14094
(Sells several receivers and complete systems via the Internet only at www.digiear.com.)
Sales: 800-484-3156
Tech info: 716-622-0770
FAX: 716-639-7779

General Instrument Corp.
6262 Lusk Boulevard
San Diego, CA 92121
619-455-1400
www.4dtv.com

Panarex Electronics
11672 Tuxford Street
Sun valley, CA 91352
(Makes the Pansat 100A reviewed in the Sept. '98 *Satellite Times*)

Samsonic Technology USA, Inc.
2182 Dupont Drive #203
Irvine, CA 92612
888-591-4416
www.samsonic.com
(Makes the DVB-S 2000)

Skyvision
1010 Frontier Drive
Fergus Falls, MN 56537
800-543-3025 FAX: 218-739-4879
www.skyvision.com
(Carries General Instrument 4DTV receiver, has circular polarity feed horns and complete satellite systems.)

*FM² is a registered trademark of Spacecom Systems

Universal SC-50 from Universal Electronics, and it does this very nicely, but to hear stereo you'll need two SC-50s. The SC-50 uses the composite output of your receiver to tune the lower subcarriers.

SCPC RECEPTION

As mentioned earlier, SCPC is another type of FM transmission you'll find on the satellites. SCPC differs from audio subcarriers in two distinct ways. First, these are very narrowband transmissions and are not receivable on any standard satellite TV receiver. Second, these transmissions, unlike the subcarriers mentioned earlier, arrive at the transponder via their own carrier and are not tied to any video. With the addition of an SCPC receiver to your system you can have access to all of the stations and services listed in the Radio Guide under "SCPC Services."

Virtually every college and professional sports network is broadcasting from the stadium to affiliates via satellite. Grand old broadcasters such as WGN Chicago, WSB Atlanta, KOA Denver, KJR Seattle, and many more have a full time presence on satellite via SCPC. When there's not a game on, their regular daily programming is transmitted.

There are plenty of foreign services on SCPC as well. You can tune in to daily programming from XEPRS-AM Tijuana; Western Arctic service of the CBC; the Russian-American Radio Network; Radio Taipai International from Taiwan and more. There are reading services for the sight impaired, Soldier's Radio Network, nearly every radio news network on the air today as well as the U.S. government's Radio Marti.

There are several sources of SCPC receivers, including the aforementioned Universal Electronics company which makes the SCPC-200. Long-time satellite equipment maker Avcom also makes an excellent consumer grade SCPC receiver, though more expensive than the Universal model. They plan to phase out production of their consumer satellite products.

Satscan still maintains a website for their receiver, the SCPC Explorer, but they haven't responded to requests for product information. It's possible to find other makes on the used market at hamfests. Look for the Heil SC-1, a simple but quite functional SCPC radio; and the Universal SCPC-100, an early version of the SCPC-200, though not nearly as good a receiver.

For years there has been a migration of analog SCPC signals to various digital schemes. As yet, no one format has really caught on. The widespread availability of

inexpensive analog SCPC equipment makes it cheaper to use than digital SCPC. While the trend to digital is likely to continue, there's still enough action to justify buying an analog SCPC receiver.

DIGITAL AUDIO

The digital signals of the DBS satellites are well known, but less known are all the other digital signals on C and Ku-band. Many large corporations maintain their own digitally transmitted networks and many C-band transponders carry horse racing for the benefit of Off

Track Betting parlors which jealously guard their signals.

Some networks, such as PBS, have switched to digital via General Instrument's (G.I.) Digicipher scheme and there is a gradual trend toward making G.I.'s Digicipher a satellite-delivered broadcast standard. But, G.I. is not alone and will have to deal with some heavy-weight powers such as Scientific Atlanta (S.A.), which is promoting its own PowerVu brand of the Digital Video Broadcast (DVB) standard. As you might expect, neither standard is compatible with the other.

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CHEROKEE™

SCPC on the Cheap

It's possible to tune in SCPC signals using your current C-band system and a cheap TV band radio. All you need is an old satellite receiver with a 70 MHz loop on the back. Typically, Uniden 5000, 7000 or early G.I. models had such loops on the back to use for terrestrial interference (T. I.) filters which were attached at the loop. If, instead, you use a TV band radio and loop it through in the same fashion, you can tune the low TV band and pick up SCPC signals. The receiver must be new enough to be a 950-1450 MHz block receiver, older 70 MHz models will not work. Newer satellite receivers don't have such a loop because virtually all have the T.I. filter built-in.

Here's what to do: Using a 950-1450 MHz splitter, split the signal from your satellite dish. Feed one leg into your current receiver and the other into the LNB "input" connector on your "new" old receiver with the loop. Now, both receivers have access to the signals coming in from the LNB at the dish.

Remove the 70 MHz loop (it's just a very short piece of coax with two "F" connectors attached). Buy a stan-

dard VHF/UHF TV splitter and three short pieces of coax with "F" connector attached (you can use the loop itself for one of these). Connect one piece from the output of the standard splitter to the satellite receiver where it's labeled "70 MHz IF Loop Out" [see diagram]. Take the second coax and connect it to one of the inputs of the splitter and the satellite receiver where it's labeled "70 MHz IF Loop In." Take the third coax and connect one end to the remaining input of the standard splitter and to the antenna of a TV band radio.

Now, move your dish to Galaxy 6 and tune to channel 3. By turning on the old receiver and the TV band radio set to the low band, you should be able to hear the signals of SCPC channels on the satellite by tuning through channels 2-6.

This method, though crude, is effective. There are drawbacks, however. Tuning will be tedious, signals will tend to drift, the audio won't be all that great, channels will be difficult to separate and you'll be missing a lot of the actual transponder on which there are many more signals. But, it's a great way to get started and extremely low cost!

Digital TV signals are similar to analog scrambling systems in that the data stream is addressable. When the signals are universally addressed, anyone with the proper receiver will be able to see the programming. There are many Digicipher channels "in the clear," which can be seen by anyone with a G.I. 4DTV receiver, including dozens of music channels. There are also many DVB digital channels which transmit additional audio subcarriers of unrelated programming and can be tuned in by using an MPEGII/DVB receiver.

Digital Music Express (DMX) is the digital music service which features more than 90 formats of non-commercial, uninterrupted, CD quality music 24 hours a day. By adding a DMX receiver (made by Comstream and available from satellite TV dealers) to your existing dish, you can subscribe to all the channels for as little as \$15 a month.

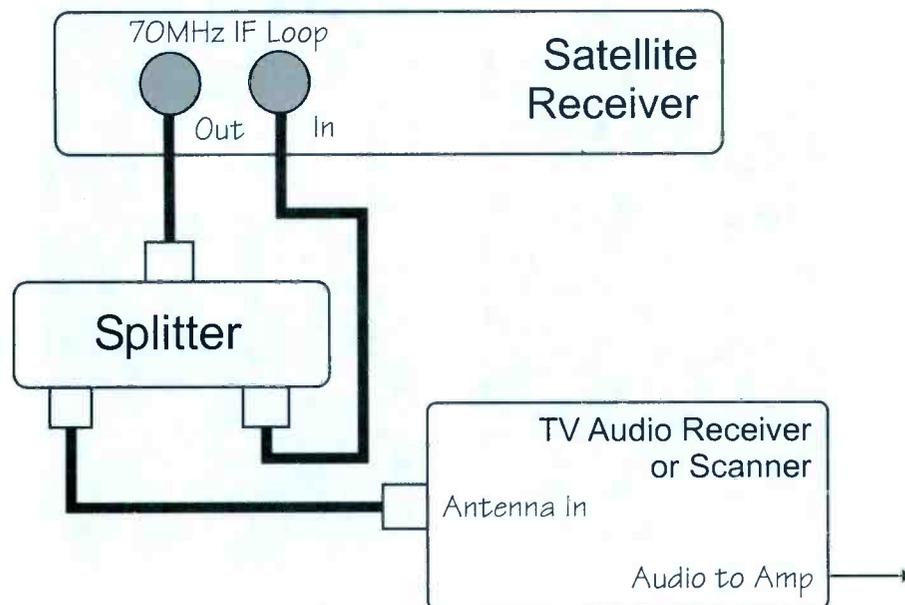
EYES ACROSS THE ATLANTIC

Truly hidden from the view of most of North Americans are the C and Ku-band satellites positioned over the Atlantic and serving as a news and entertainment bridge from the Old World to the New. Most of these satellites are below the horizon of about three quarters of the U.S. Still, many along the East Coast and as far west as parts of the Midwest are able to peer at these least known satellites.

While there is rarely any analog programming on these satellites, they are packed with DVB digital video with some very interesting audio services. The easiest one to receive is Panamsat 5, not only because (at 58 degrees W.) it is closest to our region of the Clarke Belt, but because it uses the horizontal/vertical linear polarity scheme found on our satellites. The Intelsat birds use left and right circular polarity which is not easy to tune on a linear feed horn.

Circular polarity feed horns are available but are expensive. ADL is a company which makes a variety of feed horns including their RP3-CKU International feed. This model handles both circular and linear polarization on both C and Ku-bands. Expect to pay over \$200 for such a feed horn. A cheap substitute is to use a dielectric insert made of Teflon in the throat of the feed horn. These are available from Skyvision for about \$20. However, they're made to fit conventional C-band-only feed horns. If you're using a C/Ku-band feed horn, you'll have to modify the insert to fit into the C/Ku feed horn throat. Even so, results may be disappointing as you'll be losing several dB of gain in the process.

Intelsat 806 at 40.5 degrees west has several interesting audio services from Europe



SCPC on the cheap. Turn your old satellite receiver and a TV-band radio into an SCPC receiver!

and South America, including Radioprogramas del Peru, Radio Panamerica, RFO Radio (France), Radio Italia, "Love 94 Smooth Jazz" (Miami), Radio Cadena Nacional (Bolivia), La Mega (Colombia), VOA Express, VOA in English and Español, and Radio OAS. There's even one analog audio service: Radio Nacional Argentina.

Hispasat at 30 degrees west (and linearly polarized) delivers five video services and four radio stations directly from Spain to Latin America. Hispasat is a Ku-band satellite and has a very strong signal which can be received over the eastern third of the U.S.

A WORLD OF LISTENING PLEASURE

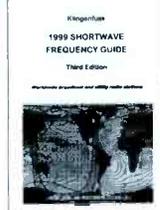
The world's governments are quickly discovering the efficacy of satellite transmissions. Cheap digital transmissions not only cover entire continents with flawless audio fidelity, but small inexpensive satellite systems are fast proliferating even in third world countries. We are truly on the threshold of a technological revolution in radio and this is just the beginning. Once you've explored the varied world of analog and digital audio transmissions on the dozens of satellites perched over your house, you'll wonder how you ever sat through boring sitcoms and tedious chat shows. You'll never look at television the same way again!

.....

This article is updated and adapted from "Find Those Hidden Signals on the Birds," published in *Satellite Times*, May 1998.

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Richard Barnett
ScanMaster@aol.com

Future Railroad Radio



There was an interesting exchange recently on the TrunkCom Internet mailing list regarding railroad communications. Tom Swisher, author of a national trunked radio system guide and safety director at the Ohio Railway Museum, was asked if the nation's railroads might ever consider trunking.

"Trunking was investigated for railroad use, but it was found to be a rather poor idea due to terrain, as well as other problems, not the least of which is the large number of small railroads in the country with limited bank accounts. As you can probably imagine, it's vital that every railroad in the country be able to talk to those around it for interchange, trackage rights and haulage rights.

"On the digital front, the Association of American Railroads has expressed great interest in the APCO-25 digital modulation standard; however, they have stated that it will be several years before the railroads will be ready to make the switch, again due to the large number of small railroads with limited bank accounts. Such a changeover will obviously have to occur 'all at once' so that everyone can continue to talk to everyone else.

"The Norfolk Southern (NS) 'digital' system your friend is concerned about is very likely the yard clerks' data terminals in use over much of the former N&W territory and now being expanded to other parts of the NS system, including the Conrail areas that will become part of NS."

Tom later continued...

"The 900 MHz frequencies are not used for trunking, nor is it likely that the railroads will go to trunking. Also, I seriously doubt that you will see the railroads leave VHF, which offers the best all-around performance for the unique circumstances railroads operate under. (The repeater output side of these frequencies are: 935.8875, 935.9375, 935.9875, 936.8875, 936.9375, 936.9875.)

"The major use of these frequencies is for ATC (Advanced Train Control) systems. Also, NS has been installing directional digital or spread spectrum (I'm not sure which, but spread spectrum is more likely) systems

between lineside signals to replace the lineside poles and wires.

"As far as car and locomotive tracking, this system is already in place in the form of ACI (Automatic Car Identification), which I believe also uses these 900 MHz frequencies. You may have seen the ACI readers out on rail lines; they're placed in pairs, one on each side of the track, usually at choke points such as yard entrances and exits. They're white radomes about 24 inches high and 8-10 inches wide that look very much like the antennas seen on cellular towers. When activated by the passage of a train, the ACI devices work by interrogating small transponders (gray, about 1 inch high and 3 inch long) affixed to the side frame of each car and locomotive; the transponders reply with the car number. The data accumulated from each train is then automatically sent to the railroad's central car tracking computer system, usually in a matter of seconds."

Local transit operations may well use trunked systems. This was a query from Bob Kozlarek to his New Jersey e-mail pals that our MT editor passed along. If anyone has further information for Bob, please let us know.

"I'm just trying to program New Jersey Transit into my Trunk Tracker and I'm discovering that their 'system' contains several data channels, suggesting that it might operate as several systems. The frequencies listed to them are as follows:

- 852.4625
- 854.1625
- 854.2875 *
- 854.4875
- 856-860.2375
- 856-860.3875 *
- 856.860.4125
- 856-860.4875 *
- 866-868.4625
- 866-868.4875
- 866-868.9625
- 866-868.9875 *

(Editors note: The shorthand 856-860.2375 refers to each frequency at 1 MHz intervals, thus 856.2375, 857.2375, 858.2375, 859.2375, 860.2375.)

Those frequencies I have marked with

"*" have active data channels on or within them. The others don't seem to have any active data or communications on them. If you do a quick count you'll see that the entire list above is too large to program into your Trunk Tracker. Several people I have spoken to about this system suggest that while all frequencies may be licensed to NJT, they may not all be in use in this part of the state. Any comments, suggestions or fleet map information would be appreciated." (Please forward them on to us for later publication.)

Chris Dees, however, recently wrote us with this tidbit: "I was in the New Orleans area over the holidays and had a chance to do a lot of trunk tracking. One system, Orleans Parish, had what appeared to be the New Orleans Public Belt Railroad using it for yard and maintenance operations. It's the first railroad I've ever monitored on a trunked system (although there are some transit systems). Here's what I found out: Can anyone in New Orleans confirm the extent that NOPB uses the system and if I've got the block size right?"

Orleans Parish

- Type:** Motorola Type I Hybrid Analog
- Frequencies:** 852.5125, 852.9375, 853-854.3875, 854.1375, 856-860.7125, 856-860.8875
- Used by:** Orleans Parish Sheriff, Government Services, and New Orleans Public Belt Railroad.
- Fleetmap:** b5=s4, All other blocks unknown.
- Talkgroups:**
 - 400-2 New Orleans Public Belt Railroad Yard Channel
 - 400-3 New Orleans Public Belt Railroad Maintenance & Shops

Note that this is a unique situation. The railroad is a public entity and its operations are all within a contained area; thus, using an existing local trunked system makes sense.

■ Your Scanner is only as Good as Your —

Programming? Coax? Antenna? All three are correct, as are other answers. Certainly one of the most foolhardy things you can do as a scanner owner is to invest in an expensive radio and fail to pay attention to that device that "sniffs" the signals out of the air.

Luckily, well-informed scanner users are aware of this fact. One of the most common questions we're asked is "What's the best all-around scanner antenna?" The answer this editor most often provides is the Diamond discone or its equivalent, which is available through Grove and other dealers.

When someone says "all-around" antenna, they're talking about an omnidirectional, all-band antenna. The discone is simple, yet extremely effective for this purpose. Beam or Yagi antennas are more effective at a particular band (or, more precisely, at a particular frequency), but that's a topic we've previously covered. Austin Antenna also makes a fine dipole all-band antenna that we highly recommend. (The discone includes ground-plane radiators while the dipole indicates that it is a "stick.") You can buy the Austin with a built-in preamp which is particularly effective in low signal noise areas.

Another, less well known, all-band omnidirectional scanner antenna has caught the fancy of many scanner hobbyists. The Nil-Jon antenna is quite different from the Austin or the discone in that it is designed with a boom which holds three elements. The boom is 67 inches in length with the longest element being 90 inches (effectively 45 inches on either side of the boom). The antenna weighs 7.5 pounds. Jack Nilsson of Nil-Jon claims that the antenna has minimal directionality (which is what you want in an omni), even when side-tower mounted. The antenna is built of aircraft aluminum, stainless steel and UV stabilized polycarbonate. The antenna will assuredly hold up very well under all types of conditions.

According to Dr. Nilsson, "We use three optimized, off-center-fed dipoles, some calculated as half-wave, some as 5/8-wave extended double zepps, and separated ideally on the boom. Taking those unique electromagnetic-interaction concepts into play, and joining them via phasing harnesses, in final you have tremendously high performance across the entire 25-1300 MHz range. That construction is completely distinct from anything else out there. While a number of antennas have some gain on certain bands, they fall short across the entire spectrum. This is where the Nil-Jon excels." Jack claims

a nominal 6.2 dB gain.

Our initial impression of the performance of the antenna is excellent. It's certainly bulkier than a discone or the Austin, but we're after improved reception rather than looks. The ability to side-tower mount the antenna is a definite plus. We would much prefer "N" or UHF connectors as opposed to the "F" connectors that are supplied with the Nil-Jon. Dr. Nilsson believes that loss with the "F" is minimal at best and provides easier hook-up for the less-sophisticated user. Coax is critical and we recommend either RG-6 or, better yet, 9913-type.

We will offer further commentary on this and other antennas in a later article, including a basic side-by-side reception comparison on specific bands. For the bottom line on the Nil-Jon antenna, though, we'll take the word of a "scanner expert if there ever was one," Dave Marshall of the All Ohio Scanner Club. Dave reports that the Nil-Jon is a "great performer" that pulls in signals 5-10 miles further away than what he hears on other base station antennas.

The regular street price of the Nil-Jon antenna is between \$139 and \$159. For more information or to order, you can contact Rick Wells of North Olmsted Amateur Radio 440-777-9460, email niljon@aol.com, or visit their web site at <http://members.xoom.com/niljon/antennas.html>

■ Frequency File

Now for the completion of the latest updates of Massachusetts frequencies which we began in December. Please forward your new or updated frequency lists for your state to me at the Grove address or, better yet, by e-mail to scanmaster@aol.com.

Massachusetts Monitoring

Freq(MHz)	Service	Tone(Hz)
Lancaster		
37.24	Police	100.0
453.0875	Police-Mobile repeater	192.8
33.94	Fire-F2 Mutual Aid	
37.10	Ambulance	CSQ
Lawrence		
484.925	Police-Future use	
Leominster		
460.550	Fire-F1 Dispatch	77.0
460.575	Fire-F3 Fireground/Fire Alarm	151.4
159.135R	Highway Department	D-125
Lexington		
154.340R	Fire-Future Repeater	
150.805	Fire-Future Repeater input	
155.820	Police-Tactical	
Littleton		
48.38	Electric Light Co	100.0
Lowell		
484.950	Police-Future use	
453.125	Fire-Future use	
453.9625	Housing Authority	D-432
469.500	Police-Auxiliary/Special Ops	127.3
453.2375	Saints Mem Med Ctr-Lowell ALS	123.0

453.175	Saint Johns Hospital	192.8
472.4875	Roadrunner Elder Vans	162.2
464.525	Lowell High School	D-343
166.875	Lowell National Park-Secondary	CSQ
463.3625	Tsongas Arena F1-Administration	D-712
468.3625	Tsongas Arena F2-Administration	D-712
461.8125	Tsongas Arena F3-Administration	D-712
466.1875	Tsongas Arena F4-Security	D-712
467.7875	Tsongas Arena F5-Concessions	D-712
464.6375	Lowell Spinners Baseball	D-026
462.125	Wannalancett Technology Park	D-152
464.475	Sheraton Lowell	131.8

Lunenburg		
154.100	Water Department/Fire-F2	100.0
158.9475R	Water Department	91.5

Lynn		
470.450	Police-Future use	
154.0475	Highway Department	
464.375	School Department	

Lynnfield		
46.06	Fire	79.7

Malden		
154.250R	Fire	179.9
158.985	Fire-Repeater input	74.4

Manchester-by-the-Sea		
158.760	Fire/Highway	127.3

Mansfield		
159.675	Police-MDTs	CSQ

Marblehead		
472.7375	Police	103.5
154.370R	Fire	107.2
159.780	Fire-Repeater input	107.2
156.330	Animal Control/Harbormaster	107.2

Marlboro		
154.570	Solomon Pond Mall Theaters	CSQ
469.550	Embassy Suites Hotel	162.2

Marshfield		
453.4375	Fire-Dispatch F1	
453.5625	Fire-Fireground F2	
453.5875	Highway Department	
453.6625	Police-Future use	
453.7625	Town Operations	

Martha's Vineyard		
33.46	Fire-West Tisbury	173.8
158.745	Highway/Water Departments	110.9
155.880R	Emergency Management (& 155.895, 155.925)	
155.235	Regional Transit	

Mashpee		
155.835	Beach Patrol/Harbormaster	CSQ
153.995	Elder Vans	

Medfield		
471.700	Police-Future Use	
482.475	Police-Future Use	

Medford		
45.72	Highway Department	71.9

Medway		
39.26	Police-Operations "K"	136.5
39.42	Police-Area net	136.5

Melrose		
154.3925R	Fire	127.3
150.7875	Fire-Repeater input	127.3

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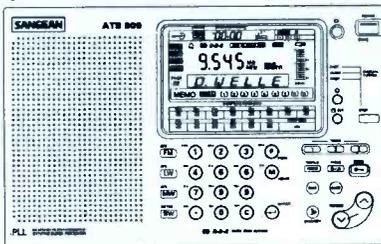
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More Israeli Intelligence Frequencies

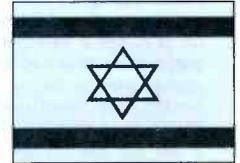
Takashi Yamaguchi, a Japanese ham, is chief surgeon at Yurino Hospital in Nagasaki. During the late hours of his duty night, when things get slow, he looks for "numbers" stations with an Icom ICR72. He notes, however, that the sudden arrival of severely injured patients in ambulances can abruptly interrupt such listening.

Over the past couple of years, Dr. Yamaguchi has built up the most complete log of Israeli intelligence broadcasts that I have seen in a long time. These broadcasts are most definitely of the "numbers" type, meaning that long sequences of codes are given over the air. As always, we do not know why, or for whom, or even if it really ever has any substantial content. In numbers, everything is always theoretical. Presumably, though, the numbers are coded instructions to spies, infiltrators, or provocateurs operating in foreign countries.

Israel's numbers are distinctive. They operate on a daily schedule, around the clock. Start times are always on the quarter hour, as in 00, 15, 30, and 45 minutes after. Frequency schedules, once established, change slowly, with some frequencies lasting years. Multiple frequency simulcasts are common.

Transmission mode is usually reported as straight amplitude modulation (AM) though some hear upper sideband (USB). The good signal strengths worldwide indicate that relay transmitters outside Israel are likely. The Republic of South Africa and the United States have been suggested as possible host nations.

The agency responsible is probably Mossad, from a long name which translates as "Institute for Intelligence and Special Tasks." It's a large police, spy, and counterterrorist group. There's a lesser possibility that the numbers could be from Shin Bet, Israel's General Security Service, or Aman, a military intelligence agency.



Whoever they may be, they always start the broadcasts with three to five minutes' repetition of a three-letter group in international, military phonetics. A female voice is used, in English, though "she" comes from a machine. The initial three letters may be a callsign, or a target group. A number is often added. "1" means that the message is a test. "2" means that no message follows.

The meaning of the "abnormal" callsigns, which can include long strings of seemingly random characters, is not known. These might be coded traffic themselves, or routing instructions, or nothing at all.

For whatever it's worth, which may not be much, there was a large spate of KPA abnormal between October 11 and 15, 1998. Valeriano Martin, a regular contributor to the "Spooks" mailing list on the Internet, found an odd pattern to what otherwise seemed like chaos in the KPA50L series. The next digit or two comprised a message number, incremented by one with each broadcast, followed by a Z and another

Table One: Probable Mossad Frequencies

Frequency	Callsigns	Abnormal Callsigns	Frequency	Callsigns	Abnormal Callsigns
2270.0	JSR SYN		6498.0	PCD	
2626.0	FTJ MIW		6500.0	PCD	
2743.0	ULX		6575.0		HNCU*
2953.0	SYN ULX KPA VLB		6650.0	MIW*	
3091.0	CIO*		6658.0	CIO KPA SYN MIW VLB	
3150.0	PCD		6745.0	ELB MIW SYN VLB KPA*	Many KPA-*
3152.0	PCD		6826.0	EZI*	
3270.0	SYN KPA MIW	KPA30Z1OQ18201 KPA59*	6840.0	EZI	
3417.0	ART		7322.0	FTJ	
3640.0	CIO SYN		7445.0	MIW CIO SYN	
3840.0	YHF		7540.0	JSR	
4165.0	CIO KPA VLB SYN MIW		7605.0	CIO KPA COE ELB SYN VLB VLD CIO16L12	
4168.0	VLB		7760.0	ULX*	
4270.0	PCD		7811.0	CIO*	
4360.0	CIO MIW SYN		7913.0	Repeating 5 letter groups	
4461.0	FTJ*		7918.0	YHF	
4463.0	FTJ KPA YHF*		8025.0	MIW*	
4560.0	YHF		8124.0	CIO*	
4604.0		ROVS	8127.0	VLB* KPA*	KPA20T1Z20T2*
4660.0	FTJ*		8465.0	CIO MIW SYN	SYNOK2
4665.0	MIW SYN VLB KPA	KPA30Z1OQ18201 KPA59*	8641.0	ELB VLD KPA MIW VLB CIO	MIW22B16P56
4780.0	KPA MIW VLB	KPA26L53	8641.0	SYN*	
4880.0	ULX		8645.0	SYN	
5091.0	MIW JSR ULX		9130.0	EZI	
5170.0	CIO		9402.0	YHF	
5230.0	MIW SYN CIO KPA*	CI016L12, many KPA-*	10125.0	KPA MIW VLB	
5238.0	Repeating 5 letter groups		10352.0	CIO KPA	
5337.0	Repeating 5 letter groups		10533.0	EZI	
5339.0	ART		10648.0	YHF	
5430.0	ART		10970.0	MIW	MIW22B16P56
5435.0	ART		11565.0	EZI	
5437.0	ART		11580.0	EZI	
5530.0	CIO MIW*		12747.0	MIW CIO	MIW22B16P56
5628.0	SYN		12950.0	CIO	
5629.0	SYN VLB KPA CIO		13533.0	EZI	
5820.0	YHF		14750.0	VLB*	
6270.0	ULX		15980.0	EZI	
6370.0	SYN VLB MIW KPA	KPA30Z10Q18201	15983.0	EZI*	
6378.0	KPA		17410.0	EZI	
6437.0	PCD		19715.0	EZI	

Hugh Stegman

number, perhaps a standard message or group call-up. The KPA59 and KPA20 sequences were slightly similar. It appears that at least some of these numbers are sequential.

Following the call-up, any subsequent message is also in phonetic letters, using groups of five. Broadcasts end with the machine-spoken, "End of message; end of transmission."

As with many "numbers" stations, frequencies can slip a few kilohertz either way. In Israel's case, it shows a deliberate pattern, attempting to avoid jamming or other interference. It's apparent that someone is actually listening to their own signal. Also, as is typical with numbers, the engineering ranges from slick to abysmal. Stations have often started up with the "wrong" tape, cutting abruptly to the "right" one for that frequency and time.

Dr. Yamaguchi has heard some other good numbers traffic that we're rarely lucky enough to share stateside. This includes nightly schedules from North Korea, using the same transmitters and frequencies as Radio Pyongyang. This includes mediumwave and out-of-band frequencies, even when they fall into international aero or distress ranges. Also, he hears what he thinks are Chinese tactical stations in Morse code (CW), using such calls as 2RC8 and 6PXJ.

Table One is a list of Israeli numbers frequencies. All loggings of specific callsigns are by Dr. Yamaguchi unless I have added a star (*). This means that the callsign came from someone else, in such short-wave publications as this one. Note that there are not very many of these. We really do thank Dr. Yamaguchi for such a thorough job.

Abbreviations used in this column

AFB	Air Force Base	FEC	Forward Error Correcting teleprinter system
AM	Amplitude Modulation	FEC-A	One-way traffic FEC teleprinter system
ARQ	Synchronous transmission and automatic repetition teleprinter system	JIAF-E	Joint Inter-Agency Task Force-East (US drug interdiction)
ARQ6-90	Single-channel 6-character ARQ teleprinter system	LDOC	Long Distance Operational Control
CAMSLANT	Coast Guard Area Master Station, Atlantic	Metro	Meteorology
CG	Coast Guard	MFA	Ministry of Foreign Affairs
CIA	US Central Intelligence Agency	Mhz	Megahertz
CJCS	Chairman, Joint Chiefs of Staff	Pol-ARQ	5-character ARQ teleprinter system, used by Polish embassies
ComSubGroup	Commander, Submarine Group	RAF	Royal Air Force
CP	Command post	RSA	Republic of South Africa
CQ	General call: "Hello all stations"	RTTY	Radio Teletype
CW	Morse code telegraphy ("Continuous Wave")	Selcal	Selective calling tones
DEA	US Drug Enforcement Agency	STS	Space Transportation System ("space shuttle")
DoD	Department of Defense	Unid	Unidentified
EAM	Emergency Action Message	UK	United Kingdom
FAPSI	Federal Agency for Government Communications & Information (Russian)	US	United States
FAX	Facsimile	VFT	Voice Frequency Telegraph teleprinter system
		VOLMET	Aviation weather observations

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

- 2749.0 Halifax-Canadian Coast Guard, Nova Scotia, with weather broadcast at 0144. (Ron Perron-MD)
- 4002.0 YRR2-Bucharest Metro, Rumania, with RTTY weather, at 0000. (Ary Boender-Netherlands)
- 4056.0 VG6Q-Czech Republic border guards, with RTTY test slip, at 1645. (Boender-Netherlands)
- 4214.0 IDR2-Italian navy, Roma, with RTTY bulletins, at 0046. (Boender-Netherlands)

- 4227.0 IGJ42-Italian navy, Augusta, with RTTY bulletins, at 0044. (Boender-Netherlands)
- 4250.0 PCH20-Scheveningen Radio, Holland, with CW marker at 0817, and then CQ call for crossband amateur farewell at 1554. Following this, the station left the air forever. (Boender-Netherlands)
- 4322.0 MJG-Royal Navy, Faslane, UK, RTTY broadcast, at 1648. (Boender-Netherlands)
- 4325.0 "R"-Russian Navy single-letter CW marker, Ustinov, Russia, at 0019. (Boender-Netherlands)
- 4461.0 FTJ-Mossad, Israel, phonetic call-up and 5-letter groups, in AM, at 2200. (Boender-Netherlands)
- 4546.0 Unid-Russian Man, Russian intelligence, AM numbers in Russian, at 2210. (Boender-Netherlands)
- 4560.0 Unid-English Man, Russian intelligence AM numbers in English, at 2140. (Boender-Netherlands)
- 4585.0 Jefferson 401-VA Civil Air Patrol, checking in with Jefferson 26, at 2333. (Ron Perron-MD)
- 4604.0 Red Thunder 215-OH Civil Air Patrol, checking in with Red Thunder 645, at 2332. (Perron-MD)
- 4606.0 Unid-Russian Man, AM numbers in Russian, at 2100. (Boender-Netherlands)
- 4610.0 GFA22-Bracknell, Germany, weather fax, at 0006. (Boender-Netherlands)
- 4610.0 Unid-The Buzzer, possibly Russian, just one continuous buzz, purpose unknown, at 0020. (Boender-Netherlands)
- 4613.0 Unid-Russian CW numbers, 5-number groups, then 000 000, at 2206. (Boender-Netherlands)
- 4742.0 Architect-Royal Air Force, UK, with weather for RAF Leuchars. (Perron-MD)
- 4950.0 Unid-CW call-up to "523," then numbers, at 1818. (Boender-Netherlands)
- 5027.0 Unid-CW 5-figure numbers in progress, at 1718. (Boender-Netherlands)
- 5028.0 Unid-Czech Lady, numbers from Czech Republic, parallel on 4485, at 1355. (Boender-Netherlands)
- 5049.0 Portuguese Police Department-Barreiro, Portugal, with ARQ bulletins on stolen cars, at 1858. (Boender-Netherlands)
- 5080.0 German Lady-Russian intelligence AM numbers in German, at 2130. (Boender-Netherlands)
- 5080.0 Unid-English Man, AM numbers in English, at 1600. (Boender-Netherlands)
- 5178.0 Unid-Backwards Music Station, weird tones from open circuit or jammer, at 1856. (Boender-Netherlands)
- 5268.0 HEP5-Kantonspolizei (provincial police), Zurich, Switzerland, with CW marker, at 1855. (Boender-Netherlands)
- 5322.0 Unid-Russian Man, Russian intelligence, AM numbers in Russian, at 2150. (Boender-Netherlands)
- 5363.0 Unid-Russian Man, Russian intelligence, AM numbers in Russian, at 2130. (Boender-Netherlands)
- 5376.0 Unid-German Lady, Russian intelligence AM numbers in German, at 2110. (Boender-Netherlands)
- 5417.0 Unid-Cuban "Atencion" numbers in AM, at 0729. (Mary Villano-CA)
- 5427.0 Unid-Russian intelligence CW numbers, at 2210. (Boender-Netherlands)
- 5520.0 Unid-Numbers station in CW, at 0830. (Boender-Netherlands)
- 5535.0 Speedbird 202-British Airways 747-300, on company long-distance channel, following unscheduled landing at Gander, Newfoundland, Canada, with an engine oil pressure problem, at 0751. (John Mayson-TX)
- 5696.0 Coast Guard 2135-US Coast Guard helicopter working CAMSLANT Chesapeake in search for possible downed aircraft off Cape Canaveral, FL, at 0645. (Allan Stern-FL)
- 5714.0 Architect-Royal Air Force, Upavon, UK, with "Celebrity" broadcast, at 2100. (Boender-Netherlands)
- 5732.0 Unid-Parkhill encrypted voice on US Customs net frequency, at 0323. (Perron-MD)
- 6215.0 Vessel *Argonata* working *Star Light*, went to 6230 at 1308. (Perron-MD)
- 6357.0 SAA-Karlskrona Radio, Sweden, CW marker, at 0811. (Markus Buttinger-Austria)
- 6501.0 NMN-US Coast Guard CAMSLANT Chesapeake, coordinating 10 MHz RTTY with CG vessel "O-6-N," at 0113. (Perron-MD)
- 6502.0 TBB6-Ny Ankara, Turkey, CW VVV marker, at 0814. (Buttinger-Austria)
- 6556.0 Monarch-Monarch LDOC, London, UK calling "MN," no joy, at 0817. (Buttinger-Austria)
- 6577.0 New York-NY Radio, air traffic control on Caribbean route net, at 0149. (Perron-MD)
- 6712.0 CTM 2959-French Air Force, calling Circus Vert (Villacoublay), no joy, at 0507. (Perron-MD)
- 6715.0 Halifax Military-Canadian Forces, Nova Scotia, working Rescue 303, at 0206. (Jeff Haverlah-TX) Halifax Military, working US Navy P-3 "S-4-J-Q," at 1257. (Perron-MD)
- 6739.0 Pack 93-US Air Force KC-135, unsuccessful patch attempt via Hickam to Bangor Command Post, at 2210. (Perron-MD)
- 6745.0 KPA2-Mossad, Israel, with numbers, at 0521. (Perron-MD)

- 6758.0 MKL-Royal Air Force, Kinloss, UK, with CW airfield conditions, at 1700. (Boender-Netherlands)
- 6816.0 Unid-Backwards Music Station, making strange, whale-like noises, at 0235. (Villano-CA)
- 6825.0 FAV22-French army, Mt. Valerien, France, with CW training at 1010. FAV22 with markers at 1543. (Boender-Netherlands)
- 6845.7 MFA, Cairo, Egypt, with ARQ messages to embassies, at 1837. (Boender-Netherlands)
- 6871.0 HEP7-Zurich, Switzerland, police with CW VVV marker, at 1546. (Boender-Netherlands)
- 7555.0 Unid-Cuban "Atencion" numbers in AM, same frequency as KJES religious broadcast from New Mexico, at 0309. (Villano-CA)
- 7918.0 Faint "Yankee Foxtrot," probably Mossad "YHF" numbers, at 0240. (Villano-CA)
- 8025.0 MIW2-Mossad, Israel, numbers, at 0518. (Perron-MD)
- 8030.0 Unid-English Man, Russian Intelligence, AM numbers in English, at 1500. (Boender-Netherlands)
- 8110.0 GXQ-British Army, London, UK, with foxes in VFT, at 1634. (Boender-Netherlands)
- 8170.0 Unid-English Man, Russian intelligence, AM numbers in English, at 1333. (Boender-Netherlands)
- 8188.0 Unid-Swedish Rhapsody numbers station, in progress, at 1202. (Boender-Netherlands)
- 8336.0 "B-E-M"-Spanish traffic with "B-N-W," possibly Mexican navy, at 2322. Similar Spanish military traffic for "Capitan," concerning helicopter and aircraft, at 2337. (Perron-MD) *Ron hears similar traffic, in the clear, all over HF. These do sound like Mexican military with new frequencies. Interesting. -Hugh.*
- 8350.0 Unid-Possible Cuban, working unid Miami station in CW, just small talk on weather, etc. but sounded more like coded traffic. (K2POF-NY)
- 8368.0 V3SX-Unknown vessel calling UAT, Moscow Radio, in CW, at 1446. (Boender-Netherlands)
- 8389.0 ELRP9-M/V *Falcon Carrier*, testing in ARQ, at 1439. (Boender-Netherlands)
- 8434.5 SAB-Goteborg Radio, Sweden, with traffic list in FEC, at 1435. (Boender-Netherlands)
- 8453.0 FUG-French Navy, La Regine, France, RTTY marker, at 1629. (Boender-Netherlands)
- 8454.0 UIW-Kaliningrad Radio, Russia, RTTY navigational warnings, at 1629. (Boender-Netherlands)
- 8622.0 PCH41-Schveningen Radio, Holland, similar CW marker to 4250, at 0819. (Boender-Netherlands)
- 8722.0 WOM-AT&T High Seas Radio, Miami, FL, voice synthesized announcements, at 0502. (Perron-MD)
- 8803.0 WLO-Mobile Radio, AL, with recorded announcements, at 1501. (Perron-MD)
- 8837.0 Unid-Air controller giving weather data in Hebrew, at 0230. (Perron-MD)
- 8855.0 Manaus-Brazilian air route control, working unid aircraft in Portuguese, at 0453. (Perron-MD)
- 8864.0 Gander-Gander Aeradio, Canada, checking selcal with unid airliner, at 0655. (Buttinger-Austria)
- 8992.0 Reach 6001-US Air Force C-17, patch via Andrews AFB to Hilda West (Air Mobility Command), reporting departure from Gander, Newfoundland, at 0008. (Perron-MD)
- 9016.0 Yardbird calling Nightwatch 01 (airborne CP), at 0120. (Perron-MD)
- 9016.0 Sunspot checking into net with Nightwatch 01 (airborne CP) also using Z190 (10204), at 1530. Sunspot, with EAM from "CJCS" (Chairman, Joint Chiefs of Staff), simulcast on 8992, at 1546. (Jeff Haverlah-TX) *The "CJCS" designator is new to these nets, and Jeff has heard it several times since. -Hugh*
- 9120.0 Shark 21-US Air Force, probably a C-130, making arrival arrangements with Lobo (Howard AFB, Panama), at 2231. (Perron-MD)
- 9996.0 RWM-Russian standard time station, Moscow, CW pips, at 1449. (Boender-Netherlands)
- 10046.0 4XZ-Israeli navy, Haifa, CW marker, at 1447. (Boender-Netherlands)
- 10090.0 Tashkent-Tashkent Meteorological, VOLMET in English, at 1444. (Boender-Netherlands)
- 10100.8 DDK2-Hamburg Meteorological, Germany, with RTTY test slip, at 1511. (Boender-Netherlands)
- 10200.0 MKK-Royal Air Force, London, UK, with RTTY test slip, at 1455. (Boender-Netherlands)
- 10215.0 HZN48-Jeddah Meteorological, Saudi Arabia, RTTY weather, at 1536. (Boender-Netherlands)
- 10254.0 Unid-Encrypted messages in RTTY, at 1404. (Boender-Netherlands)
- 10314.0 SNN299-MFA, Warsaw, Poland, Pol-ARQ news in Polish, at 1800. (Bob Hall-RSA)
- 10780.0 DoD Cape-US Department of Defense, Cape Canaveral, FL, advising US Coast Guard Cutter *Mohawk* that Range Control is also using 20390 kHz for STS-88 launch, at 2031. (Stern-FL)
- 10872.0 "P," "C," and "S"-Russian navy single-letter markers from Kaliningrad, Moscow, and Arkhangelsk, in CW at 1127. (Boender-Netherlands)
- 10917.7 RFTJ-French Navy, Port Bouet, France, RTTY traffic, at 1851. (Boender-Netherlands)
- 10996.0 FDI22-French air force, Narbonne, France, with CW marker, at 0825. (Buttinger-Austria)
- 11035.0 DKAR-French Embassy, Dakar, with coded FEC-A traffic to Paris, France, at 1758. (Hall-RSA)
- 11175.0 "S-4-V"-US Navy auxiliary research submarine, also using callword "Dolphin," with patch via Hickam to "Comsubgroup Niner" regarding failure of satellite antenna after a deep dive. Wanted further advisories over nonsecure ("red") HF, minus the classified parts. This began at 1912. (Haverlah-TX)
- 11232.0 Canforce 2107-Canadian Forces aircraft, patch to Winnipeg via Trenton Military for malfunction writeups, at 2202. (Perron-MD)
- 11244.0 Nose Cone with EAM. Operator cracked up laughing, and had trouble getting through it, at which point SELSCAN (Selective Scan) tones were heard from his other receiver, possibly on 11494, all at 2155. (Haverlah-TX)
- 11270.0 Unid-Russian Man, AM numbers in Russian, at 0820. (Boender-Netherlands)
- 11297.0 Moscow Meteorological, Russia, with VOLMET at 1018. Rostov, Russia, VOLMET at 1025. St. Petersburg, Russia, VOLMET at 1036. (Boender-Netherlands)
- 11309.0 Santa Maria-Santa Maria Aeradio, Azores Islands, working aircraft at 1216. (Boender-Netherlands)
- 11318.0 Samara-Samara Meteorological, Russia, VOLMET at 1045. Tyumen, Russia, VOLMET at 1050. Syktyvar, Russia, VOLMET at 1100. Jekaterinburg, Russia, VOLMET at 1105. Novosibirsk, VOLMET at 1110. (Boender-Netherlands)
- 11330.0 New York-NY Radio, Caribbean air route control with various aircraft, at 1625. (Perron-MD)
- 11720.0 Unid-Russian Man, AM numbers in Russian, at 0820. (Boender-Netherlands)
- 12183.4 Unid-FAPSI, Russian, RTTY numbers broadcast and extensive operator chatter, possibly link 20043, at 1653. (Hall-RSA)
- 12193.0 Unid-FAPSI, Moscow, with RTTY call-up to "KUL," then no message, at 1410. (Boender-Netherlands)
- 12370.0 NMC-US Coast Guard, San Francisco, CA, with very clear weather fax chart, at 1620. (Hall-RSA)
- 12603.0 Lincolnshire Poacher, M6, Cyprus, numbers then tune and sign-off, parallel on 13375, at 1615. (Villano-CA)
- 12780.0 D3E 51/62-Luanda Radio, Angola, with CW marker giving an RTTY listening frequency. (K2POF-NY)
- 12835.5 GKB-Portishead Radio, UK, with CW marker. (K2POF-NY)
- 12887.5 EAD-Madrid Radio, Spain, with CW traffic list. (K2POF-NY)
- 13015.5 IAR-Roma Radio, Italy, with CW traffic, gave other frequencies including 17206. (K2POF-NY)
- 13059.0 EBA-Spanish navy, Madrid, with navigational area warnings in CW. (K2POF-NY)
- 13191.0 EHY-Madrid Radio, Spain, with phone patch, at 0830. (Buttinger-Austria)
- 13205.0 Berna-Berne Radio, Switzerland, selcal check with "801," at 0834. (Buttinger-Austria)
- 13291.0 Gander Control-North Atlantic air route control, Gander, Canada, working Emory 174, at 1448. (Perron-MD)
- 13306.0 Shanwick-Shannon/Prestwick Aeradios, UK, working various aircraft, at 1913. (Boender-Netherlands)
- 13342.0 Stockholm-Stockholm Radio, Sweden, working unid aircraft in English and German, at 1258. (Perron-MD)
- 13375.0 Lincolnshire Poacher, M6, Cyprus, numbers, then tune and sign-off, parallel on 12603, at 1615. (Villano-CA)
- 13560.0 BMB-Taipei Meteorological, Taiwan, CW weather codes, with a lot of gale warnings, at 1630. (Hall-RSA)
- 14487.0 Lincolnshire Poacher-British intelligence, Cyprus, with numbers, at 1300. Lincolnshire Poacher, numbers at 1600. (Boender-Netherlands)
- 14656.0 SPW-Warszawa Radio, Poland, working unheard station, at 0841. (Buttinger-Austria)
- 14686.0 Flint 521-DEA/JIATF-E aircraft, giving Atlas (US Customs/JIATF-E) an arrival time for Flint Base (DEA, Dallas, TX), at 2033. (Perron-MD)
- 14890.0 Unid-Russian Man, AM numbers in Russian, at 0800 and 0815. (Boender-Netherlands)
- 15016.0 Incirlik-US Air Force, Turkey, patch from Reach 6241 (US Air Mobility Command aircraft -Hugh) to EDAR CP, at 0912. (Buttinger-Austria)
- 16086.0 Unid-CIA Counting Station, with numbers in English, at 1100. (Boender-Netherlands)
- 16985.6 CTP-Oeiras Naval, with military broadcast and marker, RTTY, at 1557. (Hall-RSA)
- 18271.7 "kdakrf"-Egyptian MFA, Cairo, with urgent, Arabic broadcast to all embassies regarding Operation Desert Fox, ARQ at 0555. (Hall-RSA)
- 19131.0 Atlas-US Customs/JIATF-E, calling Trackman at 1735. (Perron-MD)
- 22108.0 Cherry Ripe-British intelligence, Guam, numbers, at 1300. (Boender-Netherlands)
- 23053.7 Portuguese embassy, Kinshasa, with 5-letter code groups in ARQ to MFA, Lisbon, Portugal, at 1510. (Hall-RSA)
- 23370.0 HZN50-Jeddah Meteorological, RTTY weather codes at 1457. (Hall-RSA)
- 23461.0 Cherry Ripe-British intelligence, Guam, numbers in progress, loud signal for a change, at 1108. Cherry Ripe, numbers at 1200. (Boender-Netherlands)
- 24370.0 P6Z-MFA, Paris, France, calling L9C, French embassy in Buenos Aires, Argentina, FEC-A, at 1505. (Hall-RSA)
- 24578.8 P6Z-French MFA, Paris, coded traffic to Lagos embassy in ARQ6-90, at 1448. (Hall-RSA)



Twinplex — SITOR ARQ on the Double

This month we take a look at perhaps one of the simpler “complex” modes. Twinplex, or more correctly F7B4 Twinplex SITOR-A, is a four frequency duplex system using four tones rather than the two as used in regular SITOR-A. Effectively a “twin channel” SITOR-A, hence the name Twinplex, two of the tones are used by the sending station, with the other two being used by the receiving station. This arrangement allows the link to achieve twice the throughput (rate of data transfer) than standard SITOR-A whilst running at the same baudrate. Twinplex was developed by the Danish telecommunications company Thrane & Thrane.

Although Twinplex is capable of being used in a variety of different ways by changing the shift between the four tones, or interleaving the characters sent on each channel differently, the majority of Twinplex users send traffic with the schemes as shown in Table 1 below:

Table 1: Typical Twinplex Traffic

User	Speed	Shift	Tone Displacement	Type	Interleave
Danish Diplo	100 bd	400 Hz	-400/-200/+200/+400 Hz	F7B-1	Word
Norwegian Diplo	100 bd	400 Hz	-400/-200/+200/+400 Hz	F7B-1	Word
Pakistani Diplo	100 bd	200 Hz	-300/-100/+100/+300 Hz	F7B-1	Word
Spanish Diplo	100 bd	140 Hz	-200/-85/+85/+200 Hz	F7B-1	Word

A typical Twinplex signal will be most commonly found running at 100 baud (bd). Speeds of 200 bd or 300 bd are possible but rarely found.

Although the diplomatic services of Denmark, Norway, Spain and Pakistan are the remaining users of Twinplex, the United Nations (UN), Interpol, and the Australian Ministry of Foreign Affairs (MFA) have been logged using this mode before. The Dutch MFA used Twinplex extensively until a few years ago, when all HF communications were replaced by satellite equipment.

Just like the usually heard single channel SITOR-A, Twinplex uses the standard four-letter selcal scheme by which sending and receiving stations can call each other and establish communications. You will notice that MFA Copenhagen and MFA Oslo use exactly the same signal parameters — a fact that often leads to confusion as to which is being heard. This is not helped by the very similar encryption schemes used by these organizations to protect sensitive messages. This is where selcals (selective calling) come to our rescue again. Table 2 shows the common selcals used by the organizations listed above.

Table 2: Selective Calling Codes

Danish Diplo: KFxx
Norwegian Diplo: TPxx
Pakistani Diplo: KMEU, AMAR, BMY, DBYC, DOPX, EAFX, EUCP, FMCA, MBKC
Spanish Diplo: QEMP, TQxx

■ Tuning in to Twinplex

The decoders from Hoka and Wavecom all include modules to read Twinplex. However, even with the sophisticated signal analysis tools found on these decoders, your ears can help, too. Twinplex has the same rhythmic chirp-chirp-chirp of standard SITOR-A, but the bursts of data sound much more burbled, some might even say distorted.

If you do have a Twinplex-capable decoder, with the help of the signal spectrum display, carefully tune your receiver to the center of the signal (the mid-point between the 2nd and 3rd tones), set the decoder’s

signal shift parameters as appropriate (with the Hoka decoders you can select these from a pre-configured list with the [S] key), and then set the type and interleave according to the list above.

If you don’t have one of the decoders listed, you can at least determine who you’re listening to by using standard SITOR-A (with the correct shift — using the “Shift” column of Table 1) and catching the selcals used before and between messages.

Finally, here are some Twinplex frequencies commonly logged in US and Europe. Frequencies indicated are the mid-point of the 2nd and 3rd tone:

- Danish Diplo:
11341.9, 16209.9, 16406.9, 18513.9, 18576.9, 18583.9, 19108.9
- Norwegian Diplo:
16073.9, 16103.9, 16128.9, 18443.7, 18445.4, 18487.9, 19807.9
- Pakistani Diplo:
13446.7, 16051.7, 16386.7, 18051.7, 19031.7, 20011.7, 20017.0
- Spanish Diplo:
8080.5, 9946.5, 11016.5, 12112.5, 13414.5, 15946.5, 18597.5

If those frequencies listed above prove to be too elusive at your location, try this URL for a few recorded samples of Spanish, Danish and Pakistani Twinplex signals. While you are there, browse around the other pages and samples found at this very good signal site.

<http://rover.wiesbaden.netsurf.de/~signals/WAV/TWINPLEX.HTML>

■ Who Is It?

This month let’s take a look at a mystery signal that was first heard in early 1998. Clearly audible in North America and Europe, this new signal operates on the following frequencies at various times throughout the weekdays and weekends.

- 9910.91 kHz
- 10291.91 kHz
- 11647.91 kHz
- 12376.91 kHz
- 13564.91 kHz
- 14779.91 kHz
- 15793.91 kHz
- 16605.91 kHz

Tuning into the signal, you will recognize it by its rough “burbling” sound, and like so many complex signals it can easily be mistaken for some sort of interference. Notice that this signal shares a recognizable four tone arrangement like that of Twinplex. The difference is that this one has a distinctive “white noise” sound. Further analysis shows the following signal parameters:

- Baudrate: 195.31bd
- No. of tones: 4
- Separation: -400/-195/+195/+400 (from center)
- Auto Correlation: 425 or 426

Early indications are that this is a new sequential, duplex ARQ system; duplex since the signals always appear on two separate frequencies. For example, the combination 9910.91 and 11647.91 kHz is often heard here on the East Coast.

Further investigation has shown a source in the Eastern Mediterranean, which brings a number of interesting possibilities into play... For now, the mystery continues.

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France Snubs Western Hemisphere English Speakers

Radio France Internationale (RFI) has cancelled its French Guiana relay, 15530 for English to North America at 1200; also less Spanish and French to Americas, as M. Bochent of Télédiffusion de France (TDF) confirms; unheard when checked Jan 3. At 1200 the best frequency now may be 15155 for Europe, says Joe Hanlon, PA.

Grrr, we can't be surprised due to previous developments; I guess we were lucky they kept it going until yearend. It appears to be impossible to reason with these people. Whatever excuses they may make, I'm convinced it's basically chauvinism, and an anti-American attitude — who needs 'em? Answer: Everybody needs

such a vital means of communication and understanding between major nations. I checked all the other frequencies listed at 1200 and could not hear RFI on any of them. At *1359 17560 came on with a pretty good signal, but heavy flutter and offbeam echo (gh)

Portuguese listeners get one sesquihour a day in the Americas and there are a few hours daily in Spanish and in French beamed to the Americas. RFI's director was on French-language *Club RFI* in December and bemoaned budget cuts and expense of local retransmission of RFI in various cities. An RFI executive I met last year warned of drastic cuts in shortwave broadcasts to the Americas and said Cuba was the prime reason that any broadcasts remained (Mike Cooper, Atlanta, GA, *World of Radio*)

ANGOLA [non?] Radio Vorgan sliced the airwaves of Angola once again — the first time since it was silenced last April as mandated by the UN-brokered peace accords. And the station that was repeatedly condemned by the United Nations is back on shortwave. Portuguese television reported, according to Rui Pires (CT1FAK), that the grey clandestine station run by rebel movement UNITA resumed SW on January 6 — less than a week after a second United Nations cargo plane was shot down. Its frequency and schedule, however, are unknown. Whether or not the station is employing the 10 kW broadcast containers supplied by the United States during the Cold War is also undetermined. (Nick Grace C., *Clandestine Radio Watch*)

BOUGAINVILLE Sam Voron has just returned to Australia after an exciting trip to Bougainville that included lots of radio news. Here is what he had to say about the political and radio scene there:

There is to be a reconciliation government in Bougainville starting on January 1st. There is still a group that hasn't joined the peace process, but there is a fragile truce in place, with unarmed peace monitors from Pacific nations between the two groups. Rebel groups are operating on radio as follows:

3850 - Radio Independence Bougainville is run by a group called the Meekamui 'government.' Meekamui means "holy land" in the language of central Bougainville and it is the word they use for the island. This group of rebels has refused to join the peace process because they do not believe that the Papua New Guinea (PNG) government will ever grant independence to Bougainville. They have hydro power for their transmitter so they are on at 0900-1130 daily in AM with a power of 6 (six) watts. I am hearing them here in Sydney most evenings. There was a faction of the rebels that once operated Radio Free Bougainville, but they have now joined the peace process.

3865 - Radio Paru Paru is named for an area of Bougainville. They only have solar power so they are on about every third day at 0900-1100 and they are recharging batteries on other days. They are using a converted Morse code transmitter with 6 [six] watts in AM and I have heard them in Sydney. I suspect that they are just keeping the frequency warm for Radio Free Bougainville.

3865 - Radio Free Bougainville is off the air for the moment. When they return, they will probably rename the station Radio New Bougainville. This is to be the voice of the reconciliation government, a group of former government and rebel groups coming together. The national government of PNG has recognized this government, which they hope will bring stability. The station is building a small hydro power plant to power the station, which will be on from 0900 until 1130 in AM. They have a lot of transmitter parts, including a 2 kW and a 600 watt amplifier, but I suspect that they will operate at a lower power. All of these stations use this frequency range because it is free of interference from big stations.

The national government continues to operate Radio North Solomons on 3325 [Radio United Bougainville is no more], but the people on Bougainville see this as a national government station and want their own local station, so that is

why they are working on Radio Free [New] Bougainville. Sam adds that they are looking for anyone interested in helping out with their work, either in expertise or donations. You can write him at 2 Griffith Avenue, Roseville NSW 2069, Australia. (via Hans Johnson, (c) *Cumbre DX*)

BRAZIL R. Educadora de Limeira, SP, reactivated on 2380, heard in evenings; likes to hear from listeners; fax is (019) 441-3760 (Celio Romais, RS, *radioescutas*)

CANADA Radio Canada Int'l (RCI) expected two new digital-capable transmitters to be delivered to Sackville in Feb. And are negotiating with Canadian Broadcasting Corp. (CBC) to move back into their previous Montreal building once it is renovated in the spring of 2000. Major target for program changes in 1999: South America (Bob O'Reilly, RCI head on VOA *Communications World*)

CENTRAL AFRICAN REPUBLIC 9900 - Radio MINURCA (Mission des Nations Unies en Republique Centrafricaine) broadcasts from United Nations (UN) headquarters in Bangui, Camp Beal (a former French army camp), in a building that has been adapted for radio, says David Smith, director, R. MINURCA. There is a Canadian transmission team here as part of the MINURCA mission; however, they are not linked to us, apart from sharing the same camp and working as part of the overall peacekeeping mission.

The station is here for the elections (amongst other things). The vast majority of our programming is in Sango and French. We are on the air 24 hours a day and only 2 hours and fifteen minutes of that day are in English (relays of BBC Africa service during the week, and Reggae Night on Saturday evenings). No, English is not spoken widely here; however there is a general desire to learn. We offer English courses for Francophones on weekdays at 13h30.

There is a widely accepted belief that the country has been too isolated from the "rest" of the world due to its dependence on/close links to France. Our local radio staff listens to *Focus on Africa* and *Network Africa* (BBC) daily in an attempt to hear another angle on stories covered (or not covered) on RFI (which has an FM relay in Bangui). Radio MINURCA also carries programmes produced by RFI, and the Panos Institute in Bamako. We are likely to include Radio Netherlands programming in the near future. We're adding Andy Kershaw's *World of Music* to our Saturday night line-up. It's followed by our own World Music programme, *TGV Musique avec Carlos*.

The Security Council will likely decide in mid-January what, if anything, to do about MINURCA. The locals want us to stay for the presidential election, scheduled for August or September 1999.

(Regarding the previously published news that MINURCA would most likely be moving to the Philippines:) The Philippines! First time I've heard that one. Many possible "next" destinations are mentioned, but Manila has *never* been one of them.

No plans are likely to be made for another couple of months. (David Smith, director, R. MINURCA, via Hans Johnson *Cumbre DX*)

CONFEDERATE STATES OF AMERICA (?) *Dixie Rising* is on WWCR UT Suns 0230 on 5070. It's a moderate sounding show, but caters to those who haven't quite figured out that the civil war is over. Promotes groups like the League of the South, Sons

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; J-98=May-Sept; Z-98=Summer season; W or B-98=Winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there.*

of the Confederacy. On segregation: "People (just) like to be with their own kind." Callers to program concerned about illegality of Federal government in the South. Strangely deluded bunch thinks the Confederacy can be resurrected: Don't seem to realize the only realistic solution is for the American colonies to revert to British Crown rule (Fred Waterer, January *DX Ontario*)

COSTA RICA Latest versions of Adventist World Radio (AWR) schedules no longer show any English on TIAWR. Well, that takes care of trying to keep track of when *Wavescan* may or may not appear (gh)

Radio for Peace Int'l (RFPI) very much needs a backup generator, in case anyone is in a position to donate one. Ideally, 60 kW would power everything including all the SW transmitters, but 25-30 kW would keep the station on the air with the lower-powered and the studio/office. Hopes to get a grant for solar and wind generator to power the office at least (RFPI *Mailbag*)

ECUADOR David Lewis is no longer at HCJB Quito. HCJB related e-mail, including Frequency Management issues should be sent to Doug Weber at dweber@hcjb.org.ec (HCJB, via BC-DX)

HONDURAS The 4930.6 station in San Pedro Sula is no longer R. Internacional, but relaying the MW station called Evenecer 12-20, heard at 0437 (Santiago San Gil, Venezuela) Also at *1204 (gh)

IRAN[non] On the now defunct Democratic Voice of Iran: we have looked at their web site (<http://www.dvi.org>) and see that it is very clear that they are certainly *not* pro-Western in the conventional sense. They are blaming the ending of their broadcasts on the "hidden hands of global arrogance" (i.e. the USA). They are also opposed to the current Iranian government. This would fit with them being pro-Shah, as some supporters of the Shah blame the West for his downfall (Chris Greenway, BBC Monitoring for *CRW*)

R. Tomorrow's Iran (Persian: *Radio-ye Iran-e Farda*) was heard testing in Dec on 5830 at 1800-1830/1900, believed via Central Asia; says it supports "the struggle of clerics and religious forces who wish to see the separation of religion and government" (BBCM)

From WWCR-1, 12160 kHz, posted sked since December: Tue 1100-1200 *Perspective on Iran* (K) CHAIR/Eric Javadi; Fri 1100-1200 *Perspective on Iran* (Pe) CHAIR/Eric Javadi; Sat 1100-1200 *Perspective On Iran* (Pe) CHAIR/Eric Javadi.

I was finally able to confirm this on Sat Jan 9; when 12160 came up at 1100 it was barely audible, but built up to good level by 1125 when I started taping during Persian program. Certainly does not sound Christian-religious; mostly talks in Persian interrupted every 5-7 minutes by same canned sesquimintue ID by woman with music bed, sounds like "Radyo Posesh." This program may well be in the clandestine category, and needs to be monitored by Persian (and Kurdish) speakers. So far WWCR has not posted a link to the program, and we don't know who, what, or where CHAIR and Eric Javadi be, nor their agenda (gh)

IRAQ 5935 - Domestic Service - found them on this new frequency at 2218. Talk in Arabic about American and British aggression and the brave Iraqi people. Martial music starting at 2312 and still on at 2315 (Hans Johnson, FL, Dec 19, *Cumbre DX* Special) Also reported after the bombing on new 3900, 9715 (gh)

ISRAEL Kol Israel schedule in the January *MT* has a few errors in it somehow. The correct schedule can be found at gopher://israel-info.gov.il/00/cul/media/950900.med New prime-time English news to NAM started testing in early Jan at 0030-0035 on 7495 and 9395, but 1645 English cancelled. (Daniel Rosenzweig)

KIRIBATI Radio Kiribati - Bill Reiher, Manager of Radio Kiribati, told *Cumbre DX* of the latest happenings at his station: The reason shortwave listeners have not heard us recently is because our transmitter has been off and on for a few months. We have a problem with a printed circuit board. We have ordered a replacement and we should be on by the end of the year or early 1999.

This service is for Christmas Island. Sometimes, they are not happy with reception and we have to switch frequencies. So listeners should look for us on 9825 if they don't hear us on 9810. We come on at 1830. From 2130 until 2400 we have school broadcasts. At 0000-0130 we have our national service, and then we sign off. At 0500 we sign back on and operate until about 1000: it depends upon how many music requests we get from listeners. This transmitter is run by [the local] telecom and is an interim service. It is running at about 1 kW into a log periodic antenna pointed at Christmas Island. We are buying a new transmitter of 10 kW power that we hope to put on the air next year (via Hans Johnson, © *Cumbre DX*)

KOREA SOUTH KBS Radio One, Seoul has a 24h SW frequency, 3930 (BBC Monitoring)

LITHUANIA A new 100kW SW transmitter from Continental Electronics (USA) will be installed at the Sitkunai site in the first quarter of 1999. It will be used primarily for R. Vilnius broadcasts to NAM, replacing the present relay via Germany. Future plans are new antennas for NAM and Eu, and a resumption of R. Vilnius transmissions to Europe (Bernd Trutenau, Lithuania, DSWCI *DX Window*)

MOLDOVA Fax from R. Moldova International (RMI) asks for listener support against increasing government moves toward closing down the station. To help keep RMI on the air so that world public opinion will not be deprived of first-hand news about Moldova, please write to:

Mr. Petru Lucinschi, President of the Republic of Moldova; Ave. Stefan Cel mare, 154; Chisinau, Republic of Moldova

Ministry of External Affairs; 31 of August St., 80; Chisinau, Republic of Moldova
To contact RMI itself: Radio Moldova Internacional; Str. Miorita 1; 277028 Chisinau, Republic of Moldova; Tel.: 3732 723379 / 723385; Fax.: 3732 723307; Telex: 163210 (Iurie Moraru, Director of Department, RMI, via Ruben Guillermo Margenet, Argentina)

NICARAGUA I just received a verie letter from Radio Miskut, 5770, in which station director Evaristo Marcado Perez says that sometime after the first of the year they'll be getting their new Henry 3 kW transmitter on the air on this frequency, with (he hopes) better reception as the result. He also says the new SW transmitter, as well as the station's FM equipment, were donated by Mr. John Freeman of the USA. (This reply took 7 sesquimonths *without* a follow-up - Randy Stewart, MO, *Review of International Broadcasting*)

NIGERIA [non] In late December, R. Kudirat, 11540 via South Africa at 1925 said it would "soon be undertaking temporary mandatory maintenance of its equipment starting Friday 1 January," apologizing in advance for inconvenience, and to return with "renewed vigour" at no specified date heard (gh)

While they may be telling their audience that they are going off for maintenance, I suspect that the real reasons are political, rather than technical. There are plenty of transmitters at Sentech in South Africa to carry this program, so I don't think it is maintenance. Rather, the acceptance of the current Nigerian regime in the West plus the return to Nigeria from exile of the Nigerian writer, Wole Soyinka, Kuridat's 'father,' have ended the for appeal of, and the need for, the station (Hans Johnson, FL, *Cumbre DX*)

Heard at *1900 on Dec 31st and announcing that it would be their last broadcast. Repeated the following announcement several times during the transmission: "Radio Kudirat of Nigeria will be closing down for its annual maintenance. Our nation is going through such an important phase that the voice of Radio Kudirat should daily boom throughout the length and breadth of Nigeria."

"We must be honest [with you]. Because of the need perhaps to locate the station to a different place, we might not even come back as soon as we thought we would... Radio Kudirat will be back." Wole Soyinka, head of the United Democratic Front of Nigeria, said: "This time, the maintenance period will be somewhat longer than usual as it is a maintenance not only of technical equipment, but of human and other resources and their replenishment. The tiny staff on whose shoulders transmission, production, and research have rested day after day, almost without a break, also feel the need to recharge their batteries and renew physical contact with the social and political realities from which they were obliged to, uh, [beat] a tactical retreat during the present struggle." (Hans Johnson, FL, *Cumbre DX*)

PAPUA NEW GUINEA The absence of readily available spare parts to most National Broadcasting Corporation radio transmitters has caused disruptions to communications. During the past few months several radio stations have been forced out of operation because faulty or damaged broadcast equipment could not be replaced quickly. In some cases the delay had been for months. Radio Madang is the latest to go off air because of a breakdown. Spare parts would have to be ordered from the US which would take up to four weeks to arrive (*The National*, Port Moresby via Matt Francis, *Cumbre DX*)

PERU Freddy Alberca Jibaja of Radiodifusora Huancabamba has complained that the advertising agencies in Lima do not want to help him. They don't see any profit in working with such a remote station and prefer to invest in FM or TV. National ads already reach the remote town. Radiomar Plus has installed a repeater in Huancabamba (and also Ayabaca) and the town is connected by satellite to national TV stations (also Ayabaca). Alberca says he cannot continue his station and wants to sell it. However, some outside agencies, including Udepare working with the station in special projects that are bringing in a limited income.

Meanwhile, La Voz de las Huarinjas celebrated its first anniversary (June 7th) by

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being off the air as the transmitter failed. This caused problems with their attempts to get a legal license, which director Alfonso García says they are on the point of receiving. However, it does not appear that García is being totally truthful about the license attempt. García continues to accuse Alberca (of Radiodifusora Huancabamba) of wanting to maintain a monopoly on shortwave in the town. At the moment, there are plans to revive Radio Huancabamba, which closed in 1995. García has offered to work with this station to combat Alberca's "monopoly" (Nelson Penaherrera Castillo, *Noticias DX* via Don Moore, *Cumbre DX*)

R. Uno in Distrito Tongod replaces R. Visión 2000 on 5131, heard at 2215-2346. R. Moderna is new from Celendín, 4499.8 announcing 1100-0200 schedule, heard at 0015-0100 (Rafael Rodríguez R., Colombia)

QATAR It has been a pleasure to hear Qatar daily at *0245n on 7210 kHz — until it is wiped out by TWR on 7215 at 0330. The amount of ham traffic and tune-up hets on top of Qatar is very disconcerting, however. I am merely trying to enjoy my hobby in trying to glean some semblance of culture from a far-away place — why must it be ruined by a bunch of guys tuning up or insisting on using the frequency, when I'm sure that Qatar is as much interference to them as they are to Qatar's signal (Bruce Cooley, Victoria, BC, *Review of International Broadcasting*)

SOLOMON ISLANDS SIBC: Cornelius Teasi told *Cumbre DX* about the latest happenings. We are only on 5020 as our transmitter on 9545 has completely broken down. It is difficult to find spares for the remaining transmitter so while it is rated at 10 kW, we are only operating it at 5 or 6 kW. This transmitter is fixed in frequency and is a service for our nation. Although this is a nighttime frequency, most listeners don't tune in until after work so it is heard well enough. It signs on at 1900 and runs until 1200. We still have our license for 9545 and would like to get another transmitter. We used this frequency to broadcast to our island neighbors. It seems that no one wants to make low power transmitters that cover this frequency so we have not been able to find a transmitter (via Hans Johnson, (c) *Cumbre DX*)

SPAIN In December, Terry Burgoyne on REE's *Distance Unknown* said that would be his last program since management only wanted younger people on the air. Repeats ran for several weeks, saying he was "irreplaceable," and then hints of a new show which "could never be as good" (John H. Carver, John Norfolk, Pete Costello, gh)

SRI LANKA V. of the Tigers, clandestine of the Liberation Tigers of Tamil Eelam, revived SW, on same frequency as IBC, 7460 and immediately following it at 0100, per notices on their website (gh)

We asked Jeff Cohen of World Radio Network (WRN), which arranges broadcasts for Tamil Media's International Broadcasting Corp. (IBC), about this:

IBC is now on 7460 kHz 0000-0100. I am very interested to know if another group is using 7460 at 0100-0130 in order to inherit IBC's listeners. Since this Voice of Tigers station is indeed on and has been heard in Sri Lanka on 7460, IBC will be moving to another frequency. IBC does not have any connection with the Tigers or any other Tamil group. IBC holds a UK Government broadcasting license which precludes any political ties or bias. WRN keeps a close watch on such things and is sure IBC staff retains the same editorial policy as when they were previously at the BBC (© *Cumbre DX*)

I have been listening to V. of Tigers 7460 0100-0230. Judging from the signal strength, seems to be about 5 kW possibly located in the rebel base in Mullaitivu jungle in Sri Lanka's north eastern province. All in Tamil (Sarath Weerakoon, Sri Lanka, 4S5SL, UADX, via BC-DX)

TINIAN is an island in the Northern Marianas, a couple miles from Saipan. The U.S. International Broadcasting Bureau (IBB) transmitting station there will open with three 500 kW transmitters, and curtain antennas to provide service primarily to Asia. Recent tests were to allow checking of the antennas. Initial transmission of Voice of America (VOA) and Radio Free Asia (RFA) programming should occur late in January. The exact schedule was not yet determined (Dan Ferguson, IBB)

TURKESTAN EAST [non] Radio Free Asia, a US-funded service, began broadcasting to China in the Uyghur language on December 14. The half-hour, twice-weekly short-wave broadcasts delivering news, commentary and feature stories, are intended to reach an estimated 10 million Uyghur listeners, an RFA statement said. Uyghurs, a Turkic-speaking people, mostly live in China's western Xinjiang province, bordered by China, Mongolia, Russia, Kazakhstan, Afghanistan, Pakistan and India (AFP via SCDX/ *MediaScan*) RFA's new Uyghur service is Tue and Fri only at 0100-0130 on 15405 KHB1, Saipan, and secret site on 7485 (Kim Elliott, VOA *Communications World*)

UK o GB a NI Lost in the shuffle of British Broadcasting Corp. World Service (BBC WS) programme changes: *From the Weeklies*. This was a little gem, 15 minutes a week often with humorous touches with excerpts from the British weekly magazines. We'll miss it.

Gained in the shuffle: *Wright Round the World*. I monitored the premiere of this Sat Jan 9 at 1205-1300 on 15220. It's supposed to replace *Anything Goes* and *A Jolly*

Good Show, but at the outset Wright acknowledged only the latter show on British pop music. First music played was Prince, and it appears this will go little beyond that narrow genre. Pandering to youth, included bizarre news (not that funny), phone-out to a 21-year-old Chinese, asking her if she is beautiful, in need of a pen pal, and a guest appearance by Phil Collins (yawn). Once again BBC has "fixed" something that was much better in the first place. The dumbing-down marches on (gh)

[non] No to the Nazis! British fascists are negotiating airtime on a US shortwave station to broadcast their far right hate message to UK listeners. A team from the National Front is said by the *Sunday Express* (13/12/98) to be holding secret talks in New Orleans with an American broadcast company (*The News*, UKoGBaNI via Alan Fossey)

New programs from the United Kingdom: WWCR is pleased to air three new programs from the London Radio Service every week. *Eco-Watch* is a 15 minute weekly program dealing with major environmental and conservation issues, Sat 1245 on 12160. *New Horizons* is a 15 minute weekly program dealing with the latest research and developments in science, technology, medicine and computing from the UK. The program is aimed at both the scientific community and the general listener, Mon 0545 on 5070. *Pulsando las Noticias* is a 15 minute weekly program for the Latin American-Spanish audience, covering a wide range of topical stories from the United Kingdom (WWCR)

I checked the new London Radio Service show via WWCR 9475, Thu at 2230-2245, *Pulsando las Noticias*. M&W co-hosts, and the woman, Ana Lia Guimarães had a heavy Brazilian accent, always amusing to Spanish speakers. At closing indicated they also produce shows in Arabic, Russian, Portuguese. This is on behalf of the British government, which cannot program via BBC (gh)

USA WMLK, 9465, is running on about 20 kW while installing a new antenna, a vertical array for Europe; night broadcast at 0400-0700 is off, but most days at 1600-2100 or 1500-2000. Once new antenna is up, next job is to increase power back to 50 kW (Elder Jacob O. Meyer, WMLK, *Cumbre DX*)

WWBS, Macon, GA, loud and clear UT Sunday 0100 ID; seems nothing but local preachers (as if there were any demand whatsoever outside Macon to hear them!); 0129 another break, ID, asking for reports to wwbsradio@aol.com or P O Box 18174, Macon, GA 31209. At closing 0200* UT Sun had Joanne Josey identifying herself as hostess for the evening, and admitting they "had some problems with interference in the neighborhood." When resolved they hope to expand to more nights than just Saturday and Sunday. She has a pronounced southern accent, sounds quite pious and sincere in her faith (gh)

The owner of the station, Mr. Charles C. Josey verified my report from the address: charlesk4nl@juno.com. He said that he has built himself both the transmitter and the antenna! The transmitter is 50 kW and mode USB with carrier. The antenna is a 4-element Yagi 140 feet high beamed at 330 degrees. Hours of operation is 0000-0200Z on Sundays and Mondays (UT) only (Mauno Ritola, Finland, *hard-core-dx*)

Namibians, beware! Namibian Broadcasting Corp. (NBC) is no longer the sole broadcast occupant worldwide of 3270. Dave Frantz at WGTG tipped me that the Federal Communications Commission (FCC) just authorized that frequency for him to use on USB; it seems he hit it lucky by picking a channel which apparently has no US government or military usage, and specifying single sideband (SSB) makes it easier to get since less bandwidth and hence possible conflicts are involved. Evidently the existence of NBC did not even figure as it was news to him. Perhaps on some nights in the 0400-0600 period NBC will provide a nice carrier for him, which he'd rather not have in his SSB promotion. Need for this is that 6890-USB (upper sideband) for WGTG-2 has been fading down around 0300 so switches to 3270 in the 0300-0700 period. He later announced he had checked with NBC and they said there was no problem in their target area (gh)

WEWN is the cause of numerous false signals on our receivers' higher bands, due to overload from its excessively high field strength on what is in effect a domestic shortwave broadcast beamed westward from Alabama. But here is one which seemed actually to be transmitted and propagated, as it faded in and out: 25490, which is 11875 plus 13615, at 1820; also stronger on 27230 = 2 x 13615, which may have been receiver-produced due to overload, but not heard on 23750 = 2 x 11875. The 25490 was audible on four different receivers, including indoor reel-out antennas (gh)

WORLD OF RADIO: For March, the Thu 2130 broadcast on WWCR should be back on 15685 ex-9475; 2330 Sat replaced by 0330 Sun on 5070. WGTG has been dropped due to unreliability (gh)

VIETNAM V. of Vietnam observed on new 15110 *0900-1127* including 1000 English, all //12020. Spurs on 15100 and 15120. (Pavel Miroshnikov, Russia, BC-DX)

Until the Next, Best of DX and 73 de Glenn!
<http://www.angelfire.com/ok/worldofradio>

Broadcast Loggings



Gayle Van Horn

0015 UTC on 9845

NETHERLANDS ANTILLES: Radio Netherlands Bonaire relay. *Research File* program on computers to match shoes with custom-wearers. (Bob Fraser, Cohasset, MA) // 6165, 0015 Report on Radio Free Asia. (James Boynton, Newton, MA)

0015 UTC on 7345

CZECH REP.: Radio Prague. Report on Czech architectural treasures being preserved by UNESCO. (Fraser, MA) Heard 2038 on 9525 to station ID at 2045, better to monitor in LSB (lower side band) to avoid interferences. (Harold Frodge, Midland, MI)

0100 UTC on 5930

SLOVAKIA: Radio Slovakia Intl. English to North America with terrible over modulation from WWCR on 5935, from 5928-5942 kHz, // 7300, 9440 also suffering from interferences. (Lee Silvi, Mentor, OH)

0100 UTC on 5940

RUSSIA: Voice of Vietnam relay. News report on Cambodia, fair signal. Program report 0230, 0330. (Boynton, MA)

0230 UTC on 6155

CANADA: Radio Canada Intl. *Maple Leaf Mailbag* program, repeat at 2130 on 5995. (Boynton, MA) **BBC World Service** Canadian relay on 5965 at 1130. (Fraser, MA)

0311 UTC on 9165.06

AZERBAIJAN: Radio Dada Gorgud. Open carrier at 0311, interval signal three times at 0315. Station ID and presumed national anthem. Poor to fair copy. (Walter Salmaniw, Victoria, BC Canada/*Hard Core DX*)

0314 UTC on 4820

BOTSWANA: Radio Botswana. Chicago's tune, *You're the Inspiration* to male announcer's vernaculars and English promo, "coming to you from One FM station." Lite pops, interference from Radio Ukraine. (Mark Veldhuis, Borne, Netherlands) **VOA** relay on 7415 at 0300. (Boynton, MA)

1025 UTC on 4748.3

PERU: Radio Huanta 2000. Announcer's Spanish "Radio Huanta Dos Mil" ID and chat. Fair quality. Peru's **Radio Altura** on 6479.72 at 0007; tentative on **Ondas del Mararon** on 6520.14 at 0005; tentative on **Radiodifusoras Huancabamba** at 2335-2356 on 6535..75. (Bill Harms, USA/*HCDX*)

1241 UTC on 7365

USA: KNLS Alaska. Per schedule Mandarin service to 1300 English. Many IDs, monitored to 1359*. (Silvi, OH)

1254 UTC on 9810

THAILAND: Radio Thailand. English service with item on Asian elephants in Thailand. Female announcer's brief summary and ID to 1258*. Moderate signal strength, no interferences until **VOA** sign on at 1230. (Stokes Schwartz, Madison, WI) Noted 0030 on 13695 with news and features. (Boynton, MA) Audible 2035-2046+ on 9535. (Frodge, MI)

1400 UTC on 5995

AUSTRALIA: Radio Australia. Fading for English programming of pops, IDs and newscast at 1500. (Silvi, OH) Asia-Pacific program with regional news 9580 at 1130. (Fraser, MA)

1540 UTC on 6900

TURKEY: Turkish State Meteo Service (tentative) Turkish pop songs and announcements, audible at 1650 recheck. (Passman, Germany/*HCDX*) **VO Turkey** on 9655 at 2310, // 7280. (Fraser, MA)

1630 UTC on 4060

CLANDESTINE: VO the People of Kurdistan. Spoken text in Arabic. Station ID at 1703, "*Sawt al shabbi Kurdistan*." VO Iraqi Kurdistan noted on 4085, 1634 with Kurdish text to "*Sawt al-Kurdistan al Iraq*." (Willi Passmann, Muelheim, Germany, *HCDX*)

1700 UTC on 15210

FRANCE: Radio France Intl. World news and current affairs, // 11615. (Boynton, MA; Fraser, MA)

1723 UTC on 21549.9

CHILE: Voz Christiana. Best monitored in lower sideband, with lite Spanish and English religious vocals. (Frodge, MI)

1725 UTC on 11805

OMAN: (tentative) Radio Oman. Announcer's Arabic chat between regional music. Good signal to Belgium's Radio Vlaanderen Intl's *1857. (Silvi, OH)

1730 UTC on 15435

LIBYA: Voice of Africa. Fair to poor copy of signal, // 15235, 15415. (Frank Hillton, Charleston, SC) Good reception in English with news. (Salmaniw, CAN/*HCDX*)

1859 UTC on 9690

GREAT BRITAIN: Merlin Network One. Noisy signal, suddenly up in mid ID. **Rock Radio Network** program of hard rock music to interview with Terrizer magazine person. Noted 11755, 2004-2010+. (Frodge, MI)

1930 UTC on 4890

PAPUA NEW GUINEA: NBC. Pop music to local six o'clock check, station ID and NBC network news. (Karl van Rooy, Netherlands/*HCDX*) Audible 1200-1315, numerous IDs to "PNG Top 20" countdown. (Silvi, OH) PNG's **Radio Enga** on 2410 at 1252-1258*, including hymns and chat to sign off. (Frodge, MI)

1936 UTC on 11540

SOUTH AFRICA: Radio Kudirat. English commentary on minorities in Nigeria to 1940 to pop music. Station ID into local language text, noted on 6205 at 1915. (Frodge, MI)

1950 UTC on 3905

INDONESIA: RRI-Merauke. Indonesian. Pop music to 2000 announcement. No interval signal noted at program pause. Heard daily here with fair to good signal quality. (van Rooy, NLD/*HCDX*)

1955 UTC on 9900

CENTRAL AFRICAN REP.: Radio Minurca (tentative) No announcer's text noted and no break at 2000. Significant pauses between Cuban style vocals, highlife, reggae and mostly rap music. Cleaner signal noted in sideband. (Frodge, MI)

2010 UTC on 9435

ISRAEL: Kol Israel. Item on Bank of Israel anti-inflation policy angers the government // 7465. (Fraser, MA)

2024 UTC on 9650

ALBANIA: Radio Tirana. News and program *Review of the Albanian Press* to 2028. Numerous IDs into French service. (Frodge, MI) News update on Kosovo on 7160, // 6025 at 2230. (Boynton, MA)

2030 UTC on 7285

POLAND: Polish Radio Warsaw. Panorama program on daily life in Poland. (Boynton, MA)

2038 UTC on 9525

CZECH REP.: Radio Prague. Features on various governments abuses and atrocities. Station ID at 2045, better monitored in lower sideband due to strong interferences. (Frodge, MI)

2114 UTC on 7210

QATAR: QBS. Arabic. News wrap up at tune in, into recitations to 2127. Closing ID and mentions of "Doha," choral national anthem to 2129*. (Frodge, MI)

2138 UTC on 6250

EQUATORIAL GUINEA: Radio Nacional/Radio Malabo. Spanish. Peppy Afro vocals to ID as, "Radio Malabo" at 2201, national anthem at 2202-2203*. (Frodge, MI)

2220 UTC on 3985

ITALY: IRRS. English spot for UN Radio. English and multilingual oldies, spot for IRRS and "Milan 88.85 FM," continuing in Italian. (Frodge, MI)

2233 UTC on 4955

COLOMBIA: Radio Nacional. Noise interferences during cumbias music. "Colombia Radio Nacional" ID at 2258, newscast at 2301 and mentions of "Santa Fe de Bogota." Also noted 0138-0148*. (Frodge, MI)

2300 UTC on 15130

NORTH KOREA: Radio Pyongyang. National news and commentary on Kim Jong IL, // 11710, 11335, 13760. (Boynton, MA)

2305 UTC on 5011

DOMINICAN REP.: Radio Cristal. Signal lost in USB (upper side band) with news and ID spots at 2311, "Radio Cristal Internacional la Republica Dominicana...banda a tropical, sesenta metros." (Frodge, MI)

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.

Sign of the Times?

Add another station to the ever increasing list of those that have discontinued QSLing. Budget restrictions over recent years have forced BBC to eliminate QSLing and other promotional materials previously available. It shouldn't surprise any of us, considering other international broadcasters are suffering similar funding restrictions. Reports of unusual or persistent interference on specific frequencies might be considered, and supposedly will be forwarded to the engineers, but is it worth your time and postage? Probably not.

Consider, too, how many stations now accept and will reply to



reports via email, but is it the same as the anticipation of a postcard or letter? I don't think so.

Remember your first QSL? Twenty years ago, mine was Voice of America, and if that wasn't enough to send me reeling, Radio South Africa (Channel Africa), Radio Moscow (Voice of Russia) and Radio Peking (China Radio International), arrived the same day! Countless others have arrived since then, all with their own story to tell.

Is the hobby changing? That's obvious, but who or what is to blame? Budget cutbacks, demanding hobbyists, satellite communications, or the Internet? Perhaps all of the above.

AUSTRALIA

693 kHz AM. Verification letter signed by Peter Verhoeven-General Manager. Received in 22 days for a taped AM report. Station address: P.O. Box 693-Stones Corner, Brisbane, QLD 4120, Australia. Aussie QSL # 211. (Patrick Martin, Seaside, OR)

855 kHz AM-3CR. Verification letter signed by Gina Pilren-Volunteer Worker. Received in 17 days for a taped AM report. Station address: 21 Smith St., Fitzroy, Victoria 3065, Australia. (Martin, OR)

1413 kHz AM-2EA. Verification letter signed by Yuan Chan-Chief Engineer, plus station souvenirs. Received in 16 days for a taped AM report. Station address: SBS Corporation, Locked Bag 028, Crows Nest, NSW 2065, Australia. (Martin, OR)

1575 kHz AM-2RF, Wollongong, Australia. Full data verification card signed by John Wright. Received in 15 days for a taped AM report. Noted station is 500 watts. Station address: Unit 4-33 Kerrie Gesent, Peakhurst 2210, NSW Australia. (Martin, OR)

1674 kHz AM. Emu Plains Prison Camp. Verification letter signed by Peter M. Schultz-Engineer. Received in 15 days for a taped AM report. Noted station is 400 watts. Station address: 24 Kurri St., Loftus, NSW 2232, Australia. Aussie QSL # 212. (Martin, OR)

BELARUS

Radio Minsk/Radio Belarus Intl, 11960 kHz. Independence Square postal card signed by Irina Polozhentseva-English Program Editor, plus personal letter, sticker and schedule. Received in 59 days for an English report. Station address: ul. Chyrvonaya 4 (or ul. Krasnaja 4J), 22087 Minsk, Belarus. (Mickey Delmage, Edmonton, Alberta, Canada)

BOLIVIA

Radio Santa Cruz, 6135 kHz. Full data letter on IRFA (Instituto Radiofonica Fey y Alegria) letterhead signed by Maria Yolanda Marco-Secretaria, plus nylon pennant. Received in 54 days for a Spanish report and one U.S. dollar. Station address: Casilla 672-6213, Santa Cruz, Bolivia. (Randy Stewart, Springfield, MO)

CANADA

Radio Canada Intl, 9755 kHz. Full data RCI card signed by Bill Westenbauer, plus RCI sticker, program schedule and CIDX club info. Received in 30 days for an English report. Station address: P.O. Box 6000, Montreal, Canada H3C 3A8. Website <<http://www.rcinet.ca>> email: <rci@montreal.src.ca> (John Vercellino, Downers Grove, IL)

ERITREA

Voice of the Broad Masses, 7175 kHz. Full data card with illegible signature, stamped with ministry seal. Received in 38 days for a taped report and one U.S. dollar. Station address: Ministry of Information and Culture, Technical Branch, Box 243, Asmara, Eritrea. (Stewart, MO)

FM

WJLR-91.5 kHz, Westport, Indiana. Full data prepared QSL card verified by Marty Pieratt-President/General Manager, plus bumper sticker and station logo pen. Received in one month for an FM report and mint stamps. Station address: c/o Pieratt Communications Inc., 507 North State St., North Vernon, IN 47265. (Robert S. Ross, London, Ontario, Canada/AmFmTvDx)

WBUK-107.5 kHz, Fort Swaane, Ohio. Full data prepared QSL card verified by Steve McCoy, plus station sticker. Received in three weeks for an FM report and mint stamps. Station address: c/o Jacor Broadcasting Corp., 565 Metcalf St., P.O. Box 1484, Lima, OH 45802-1484. Station website: <www.wbulk.com> email: <bbunch@wbuk.com> (Ross, CAN)

GUATEMALA

Radio Buenas Nuevas, 4800 kHz. Full data color card with Quetzal bird graphic, signed by Israel Rodas Merida-Gerente, plus station data sheet, and aerial photo of station grounds. Received in 47 days for one U.S. dollar. Station address: 13020 San Sebastian, Huehuetenango, Guatemala. (Jeff Yanko, USA/The Four Winds)

JAPAN

Mishima Marine Lighthouse Station, Mishima Island, Japan, 1670.5 kHz. Full data verification card signed by Wrihting Jun Hashimoto, plus letter and tourist info sheet. Received in 45 days for a taped report. Station address: Hagi Kouro Hyousiki Jimusho 5699-2, Ooaza Chintou Hagi City, Yamaguchi Pref., 758-0011, Japan. #107 Japanese station verified. (Martin, OR)

Tappisaki Lighthouse Station, 1670.5 kHz. Beautiful color card of aerial view of the station unsigned. Station is 50 watts, my sixth Japanese lighthouse verified. Received in 80 days. Station address: Tappisaki Beacon Office, Tappi Minmaya-Mura-Higashitsugaru-gunn, Aomori Ptef. 030-1711, Japan. (Martin, OR)

MEDIUM WAVE

WPHG, 1620 AM kHz. Frequency only QSL card unsigned, with extensive station technical info included. Received in 47 days for an AM report and a SASE (unused for reply). Station address: Maranatha Ministries Inc., 805 N. Main St., Atmore, AL 36502. (Bob Lewallyn, GA)

KAYK, 1690 AM kHz. Date/frequency verification on station letterhead, signed by Julia Newton-Admin. Asst. Letterhead list 1690 call letters as "KDDZ," body of letter notes "KAYK." Mickey magnet and Radio Disney sticker enclosed. Received in 19 days for an AM report and an SASE (used for reply). Station address: 730 W. Hampden Ave., Suite 300, Englewood, CO 80110. (Frodge, MI)

XERED, 1110 AM kHz. Partial data English letter signed by Ana Rosa Gomez Q. Received in 120 days for a taped follow up report and mint stamps after contacting the station via email <redam@grc.com.mx> about previous unanswered reports. Station address: Grupo Radio Centro, Av. Constituyentes 1154, Tercer Piso, Colonia Lomas Altas, C.P. 11950, Delegacion Miguel Hidalgo, Mexico Distrito Federal, Mexico. (Delmage, CAN)

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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 Standard Time) 5, 6, 7, or 8 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 (7:30 pm Eastern, 4:30 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

COMPILED BY JIM FRIMMEL

• **RADIO WAVES.** Back in December, Radio Exterior de España announced that Terry Burgoyne, program host of *Distance Unknown*, retired suddenly. Terry, however, in his last show, made comments to the effect that he was being let go in favor of a younger man. The program was not yet dead, announced REE.

As promised, a new version that REE hoped would be up to the standards set by *Distance Unknown* was introduced on Jan 17th. **Radio Waves**, the new program hosted by Justin Coe, occupies the same time slots as *Distance Unknown*. It got off to a good start and the music at the end of the segment was great. Let's support this new program.

• **VOICE OF AMERICA.** The VOA English to Africa Service has always been a different production than the rest of VOA World Service in English. The Africa Service has

been producing its own news and feature programs since August 1963 under Director Edward R. Murrow.

Today, in this age of full-time news broadcasts called *VOA News Now*, the VOA English to Africa Service still retains that semblance of individuality that sets it slightly apart from the rest of VOA's English Service. Weekday news programs such as *Daybreak Africa* (0300, 0430, 0600) and *Africa World Tonight* (1630, 1800, 2000) can still be heard, and *Nightline Africa* is still around on weekends (1600, 2000).

A new half-hour news program, *African Perspective*, can be heard weekdays at 1900. In the feature program department, *World of Music* is still heard weekdays (1930) and *Music Time in Africa* and *Voices of Africa* are available on weekends (1700, 1900).



VOA News Now is still in the schedule, but it is not as redundant as the other English services. Fortunately, all VOA English to Africa

transmissions are easily heard in North America.

• **THE EARTH FROM SPACE.** You can see a view of the earth from the position of most satellites in earth orbit <www.fourmilab.ch/earthview/satellite.html>. Select a satellite from a scrolling field and get an image of the earth as seen from that satellite. The view seen gives you an idea of the satellites coverage area (footprint). While at the website, check out the earth and moon viewer at <www.fourmilab.ch/earthview/vplanet.html>.

• **ART BELL UPDATE.** Since his return to late night

radio in December, Art Bell has been gaining listenership using innovative scheduling that has been attracting more and more stations. The scheme involves broadcasting the previous night's program as an introduction to the present late-night broadcast, thus permitting listeners to hear what they otherwise would have missed because of sleep time. The show is also a popular RealAudio offering on **Broadcast.com**, which promises that Art will soon be available on the Internet in RealVideo (G2 Player required).

• **SELECTED PROGRAMS.** Featured this month is the new program schedule for BBC World Service to Europe and the Americas. Also included is the schedule for World Harvest Radio (Angels 1-5 in Indiana, Hawaii and Maine), and Merlin Network One.

FREQUENCIES

0000-0100	Anguilla, Caribbean Beacon	6090am							
0000-0100 vl	Australia, ABC/Katherine	5025do							
0000-0100 vl	Australia, ABC/Tent Creek	4910do							
0000-0100	Australia, Radio	9660pa	12080as	15240pa	17715pa				
		17795pa	21740pa						
		7375na	9485na						
0000-0100	Bulgaria, Radio	11940as							
0000-0015	Cambodia, Natl Radio Of	9625do							
0000-0100	Canada, CBC N Quebec Svc	6070do							
0000-0100	Canada, CFRX Toronto	6030do							
0000-0100	Canada, CFVP Calgary	6130do							
0000-0100	Canada, CHNX Halifax	6160do							
0000-0100	Canada, CKZN St John's	6160do							
0000-0100	Canada, CKZU Vancouver	6160do							
0000-0029 twfha	Canada, R Canada Intl	6040am	9535am	11865am					
0000-0059	Canada, R Canada Intl	5960am	9755am						
0000-0100	Costa Rica, RF Peace Intl	6975am	15050am	21460am					
0000-0027	Czech Rep, R Prague Intl	7345na	9465na						
0000-0100	Ecuador, HCEB	9745na	12015na	21455va					
0000-0030	Egypt, Radio Cairo	9900am							
0000-0100	Germany, Overcomer Ministr	11660as							
0000-0100 vl	Guatemala, Radio Cultural	3300do							
0000-0100	Guyana, GBC/Voice of	3290do	5950do						
0000-0045	India, All India Radio	5010do	7410as	9705as	9950as				
		11620as	13625as						
		6155eu	6180eu	9665af	11705na				
		11810as	13650as						
0000-0015	Japan, Radio/NHK	5100do							
		7295do							
		7160do							
		5980do							
		3270af	3289af						
		6165na	9845na						
		17675pa							
		11845am	13650am	15230am					
		9675do							
		15450as							
		6150do							
		6055am							
		7460as							
		9655af	9680va	11905af					
0000-0100	Liberia, LCN/R Liberia Int	5100do							
0000-0100	Malaysia, Radio	7295do							
0000-0100	Malaysia, RTM Sarawak	7160do							
0000-0100 vl	Malaysia, RTM KotaKinabatu	5980do							
0000-0100 vl	Namibia, NBC	3270af	3289af						
0000-0100	Netherlands, Radio	6165na	9845na						
0000-0100	New Zealand, R NZ Intl	17675pa							
0000-0100	North Korea, R Pyongyang	11845am	13650am	15230am					
0000-0100 vl	Papua New Guinea, NBC	9675do							
0000-0100	Philippines, FEBC/R Intl	15450as							
0000-0100	Singapore, R Corp Singapore	6150do							
0000-0100	Spain, R Exterior Espana	6055am							
0000-0100	Sri Lanka, IBC Tamil	7460as							
0000-0030	Thailand, Radio	9655af	9680va	11905af					
0000-0100	UK, BBC World Service	3915as	5965as	5970sa	5975am				
		6175na	6195as	7110as	9410as				
		9590am	9915sa	11945as	11955as				
		12095sa	15280as	15310as	15360as				
		17790as							
0000-0100	UK, Merlin Network One	3985eu	9560na						
0000-0100	Ukraine, R Ukraine Intl	4820eu	5905eu	6020eu	7205eu				
		7420eu							
0000-0100	USA, KAJ Dallas TX	5810na							
0000-0100	USA, KLTN Salt Lk City UT	7510am							
0000-0100	USA, KWHR Naalehu HI	17510as							
0000-0100	USA, Voice of America	7215as	9890as	11760as	15185as				
		15290as	17735pa	17820as					
0000-0100 twfha	USA, Voice of America	5995ca	6130ca	7405sa	9455ca				
		9775sa	11695ca	13740sa					
0000-0030	USA, Voice of America	5995ca	6130ca	7405sa	9455ca				
		9775sa	11695ca	13740sa					
0000-0100	USA, WBCQ Monticello ME	7415na							
0000-0100	USA, WEWN Birmingham AL	5825va	5850eu						
0000-0100 stwhfa	USA, WGTG McCaysville GA	5085am	6890na						
0000-0100	USA, WHRA Greenbush ME	7395af							
0000-0100	USA, WHRI Noblesville IN	7315am							
0000-0100 twfha	USA, WHRI Noblesville IN	5745am							
0000-0100 sm	USA, WHRI Noblesville IN	5755am							
0000-0100	USA, WINB Red Lion PA	11950ca							
0000-0100	USA, WJCR Upton KY	7490na	13595as						
0000-0100	USA, WRMI/R Miami Intl	9955sa							
0000-0100	USA, WRNO New Orleans LA	7355am							
0000-0100 vl	USA, WSHB Cypress Crk SC	7535am	9430am						
0000-0100 as	USA, WWBS Macon GA	11900na							
0000-0100	USA, WWCR Nashville TN	3215na	5070na	5935na	7435na				
0000-0100	USA, WYFR Okeechobee FL	6085na	9505na						
0000-0030 vl	Vanuatu, Radio	4960do							
0010-0020	Kyrgyzstan, Kyrgyz Radio	4010do	4050do						
0015-0100	Japan, Radio/NHK	6155eu	6180eu	9665af	11705na				
0030-0100	Austria, R Austria Intl	7325na							
0030-0100	Iran, VOIRI	6060na	9022eu	9685am					
0030-0035	Israel, Kol Israel	7495va	9395va						
0030-0100	Lithuania, Radio Vilnius	6120na	9835na						
0030-0100 vl	Solomon Islands, SIBC	5020do							
0030-0100	Sri Lanka, Sri Lanka BC	6005as	9730as	15425as					
0030-0100	Thailand, Radio	9655as	11905as	13695na					
0050-0100	Italy, RAI Intl	6010na	9675na	11800na					

SELECTED PROGRAMS

Sundays

0000 Merlin Network One: The MNO Music Jam.
 0000 UK, BBC London (am/au): The World Today. The World Service breakfast program.
 0000 USA, WHRA (Angel 5 Maine): USA Radio News. A five-minute (or less) news bulletin.
 0000 USA, WHRI (Angel 1 Indiana): Family Moments Music. Jenae.
 0000 USA, WHRI (Angel 2 Indiana): The Prophecy Club. Stan Johnson discusses bible prophecy from Topeka, Kansas.
 0005 USA, WHRA (Angel 5 Maine): Turn Your Radio On. Bill Brasier plays southern gospel music.
 0030 UK, BBC London (am/au): Science Extra. Either Soundbyte (virtual games and the Internet) or Seeing Stars (a look at the night skies).
 0030 USA, WHRI (Angel 2 Indiana): Christ at the Door. Hal Miller.
 0045 UK, BBC London (am/au): Waveguide (4). The latest information on international broadcasting with reviews of receivers and news about reception.
 0045 UK, BBC London (am/au): Write On. Air your views about World Service; write to PO Box 76, Bush House, Strand, London WC2B 4PH.
 0045 USA, WHRI (Angel 2 Indiana): Wind of the Spirit. Barbara Jennison.

Mondays

0000 Merlin Network One: The MNO Music Jam.
 0000 UK, BBC London (am/au): Chimes of Big Ben (1). Hear the famous bells at this time on the first Monday of each month.
 0000 UK, BBC London (am/au): The World Today. See S 0000.
 0000 USA, WHRA (Angel 5 Maine): USA Radio News. See S 0000.
 0000 USA, WHRI (Angel 2 Indiana): Black Robe Brigade (live). John Lewis.
 0002 USA, WHRA (Angel 5 Maine): 20 The Countdown Magazine. See S 0102.
 0030 UK, BBC London (am/au): Variable Feature. See S 0530.

Tuesdays

0000 Merlin Network One: The MNO Music Jam.
 0000 UK, BBC London (am/au): The World Today. See S 0000.
 0000 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii/Angel 5 Maine): USA

Radio News. See S 0000.
 0000 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.
 0005 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): Music. See S 0215.
 0005 USA, WHRA (Angel 5 Maine): For the People (repeat). See M 2305.
 0030 UK, BBC London (am/au): Health Matters. See M 1405.
 0030 USA, WHRI (Angel 2 Indiana): Radio Liberty (live). The story behind the story and the news behind the news.
 0055 UK, BBC London (am/au): My Century. See S 1630.

Wednesdays

0000 Merlin Network One: The MNO Music Jam.
 0000 UK, BBC London (am/au): The World Today. See S 0000.
 0000 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii/Angel 5 Maine): USA Radio News. See S 0000.
 0000 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.
 0005 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): Music. See S 0215.
 0005 USA, WHRA (Angel 5 Maine): For the People (repeat). See M 2305.
 0030 UK, BBC London (am/au): Discovery. See T 1405.
 0030 USA, WHRI (Angel 2 Indiana): Radio Liberty (live). See T 0030.
 0055 UK, BBC London (am/au): My Century. See S 1630.

Thursdays

0000 Merlin Network One: The MNO Music Jam.
 0000 UK, BBC London (am/au): The World Today. See S 0000.
 0000 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii/Angel 5 Maine): USA Radio News. See S 0000.
 0000 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.
 0005 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): Music. See S 0215.
 0005 USA, WHRA (Angel 5 Maine): For the People (repeat). See M 2305.
 0030 UK, BBC London (am/au): One Planet. See W 1405.
 0030 USA, WHRI (Angel 2 Indiana): Radio Liberty (live). See T 0030.
 0055 UK, BBC London (am/au): My Century. See S 1630.

Fridays

0000 Merlin Network One: The MNO Music Jam.
 0000 UK, BBC London (am/au): The World Today. See S 0000.
 0000 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii/Angel 5 Maine): USA Radio News. See S 0000.
 0000 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.

0005 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): Music. See S 0215.
 0005 USA, WHRA (Angel 5 Maine): For the People (repeat). See M 2305.
 0030 UK, BBC London (am/au): The Works. See H 1405.
 0030 USA, WHRI (Angel 2 Indiana): Radio Liberty (live). See T 0030.
 0055 UK, BBC London (am/au): My Century. See S 1630.

Saturdays

0000 Merlin Network One: The MNO Music Jam.
 0000 Merlin Network One: The MNO Music Jam.
 0000 UK, BBC London (am/au): The World Today. See S 0000.
 0000 USA, WHRA (Angel 1 Indiana/Angel 3 Hawaii/Angel 5 Maine): USA Radio News. See S 0000.
 0000 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.
 0005 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): Music. See S 0215.
 0005 USA, WHRA (Angel 5 Maine): For the People (repeat). See M 2305.
 0030 UK, BBC London (am/au): Science in Action. See F 1405.
 0030 USA, WHRI (Angel 2 Indiana): Radio Liberty (live). See T 0030.
 0055 UK, BBC London (am/au): My Century. See S 1630.

Macintosh Software

SHORTWAVE NAVIGATOR
 FREQUENCY VALET • UTCLOCK

FREQUENCIES/PROGRAMS/COMPUTER CONTROL
 (DRAKE • KENWOOD • JRC)

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 WILLOW PARK, TX 76087

FREQUENCIES

0200-0300	Anguilla, Caribbean Beacon	6090am				0200-0300 vl	Solomon Islands, SIBC	5020do			
0200-0300 twhfa	Argentina, RAE	11710am				0200-0300	Sri Lanka, R Korea Intl	7275am	11725am	11810am	15575am
0200-0300 vl	Australia, ABC/Katherine	5025do				0200-0300	Sri Lanka, Sri Lanka BC	6005as	9730as	15425as	
0200-0300 vl	Australia, ABC/Tent Creek	4910do				0200-0300	Taiwan, Radio Taipei Intl	5950na	7130as	9680na	11740am
0200-0300	Australia, Radio	9660pa	12080as	15240pa	15415as			11825pa	15345as		
		15510pa	17715pa	17750as	21725pa	0200-0300	UK, BBC World Service	5970sa	5975am	6175na	6185am
		4880as						9410as	9605as	9770af	9915sa
0200-0210	Bangladesh, Bangla Betar	9625do						11855as	15280as	15310as	15360as
0200-0300	Canada, CBC N Quebec Svc	6070do				0200-0300	UK, Merlin Network One	3985eu			
0200-0300	Canada, CFRX Toronto	6030do				0200-0300	USA, KALJ Dallas TX	5810am			
0200-0300	Canada, CFVP Calgary	6130do				0200-0300 vl	USA, KJES Mesquite NM	7555am			
0200-0300	Canada, CHNX Halifax	6160do				0200-0300	USA, KTBN Salt Lk City UT	7510am			
0200-0300	Canada, CKZN St John's	6160do				0200-0300	USA, KWHR Naalehu HI	17510as			
0200-0300	Canada, CKZU Vancouver	6160do				0200-0300	USA, Voice of America	7115as	7200as	9740as	9850as
0200-0259	Canada, R Canada Intl	6155am	9535am	9755am	9780am			11705as	15250as	15300as	17740as
		11865am						17820as			
0200-0300	Costa Rica, RF Peace Intl	6975am	15050am	21460am		0200-0300	USA, WBCQ Monticello ME	7415na			
0200-0205	Croatia, Croatian Radio	6130na				0200-0300	USA, WEWN Birmingham AL	5825va			
0200-0300	Cuba, Radio Havana	6000na	9820na	13605na		0200-0300 stwhfa	USA, WGTG McCaysville GA	5085am	6890na		
0200-0300	Ecuador, HCJB	9745na	12015na	21455va		0200-0300	USA, WHRA Greenbush ME	7385af			
0200-0300	Egypt, Radio Cairo	9475na				0200-0300	USA, WHRI Noblesville IN	7315am			
0200-0250	Germany, Deutsche Welle	6035as	7225as	7285as	9615as	0200-0300 twhfas	USA, WHRI Noblesville IN	5745am			
		9765as	9815as			0200-0300 sm	USA, WHRI Noblesville IN	5755am			
		11660as				0200-0300	USA, WINB Red Lion PA	11950ca			
0200-0300	Germany, Overcomer Minist	11660as				0200-0300	USA, WJCR Upton KY	7490na	13595as		
0200-0300	Guyana, GBC/Voice of	3290do	5950do			0200-0300	USA, WRMI/R Miami Intl	9955sa			
0200-0230	Hungary, Radio Budapest	6135na	9835na			0200-0300	USA, WRNO New Orleans LA	7355am			
0200-0300	Kenya, Kenya BC Corp	4935do				0200-0300 vl	USA, WSHB Cypress Crk SC	5850am	7535am		
0200-0300	Malaysia, Radio	7295do				0200-0300	USA, WWCR Nashville TN	3215na	5070na	5935na	7435na
0200-0250	Myanmar, Radio	7185do				0200-0300	USA, WYFR Okeechobee FL	6065na	9505na		
0200-0300 vl	Namibia, NBC	3270af	3289af			0215-0220	Nepal, Radio	3230as	5005as		
0200-0300	New Zealand, R NZ Intl	17675pa				0230-0245	Pakistan, Radio	9470as	11975as	15235as	15485as
0200-0300 vl	Papua New Guinea, NBC	9675do				0230-0300 vl	Philippines, R Pilipinas	11805as	15120as	15270as	
0200-0300	Philippines, FEBC/R Intl	15450as				0230-0300	Sweden, Radio	7280am	9455am		
0200-0300	Romania, R Romania Intl	5990na	9570na	11740as	11830na	0230-0257	Vietnam, Voice of	5940na			
		11940as	15380as			0245-0300	Albania, R Tirana Intl	6115na	7160na		
0200-0300	Russia, Voice of Russia WS	7180na	9875na	12020na	15595na	0250-0300 sf	Greece, Voice of	7450na	7475na	9375na	9420na
0200-0230	Serbia, Radio Yugoslavia	7130na				0250-0300	Vatican State, Vatican R	7305ca	9605am		
0200-0300	Singapore, R Corp Singapore	6150do									

SELECTED PROGRAMS

Sundays

- 0200 Merlin Network One: The MNO Music Jam.
- 0200 UK, BBC London (am/au): The World Today. See S 0000.
- 0200 USA, KWHR (Angel 3 Hawaii): The Bread of Life Broadcast. Ron Kresge preaches from the Church of God at Norwalk, Connecticut.
- 0200 USA, WHRA (Angel 5 Maine): USA Radio News. See S 0000.
- 0215 USA, KWHR (Angel 3 Hawaii): Music. Contemporary christian music and inspiration.
- 0230 UK, BBC London (am/au): Agenda. This series examines the latest ideas and trends.

Mondays

- 0200 Merlin Network One: The MNO Music Jam.
- 0200 UK, BBC London (am/au): Newsday. Coverage of the breaking stories and a background briefing on the main news issues of the day.
- 0200 USA, KWHR (Angel 3 Hawaii): World Harvest Country Style. See S 1230.
- 0200 USA, WHRA (Angel 2 Indiana/Angel 5 Maine): USA Radio News. See S 0000.
- 0205 USA, WHRA (Angel 2 Indiana/Angel 5 Maine): Radio Free America (live). Tom Valentine hosts this talk/interview program.
- 0230 UK, BBC London (am/au): Variable Feature. See S 0530.
- 0230 USA, KWHR (Angel 3 Hawaii): The Voice of Power. RW Schambach preaches from Tyler, Texas.

Tuesdays

- 0200 Merlin Network One: The MNO Music Jam.
- 0200 UK, BBC London (am/au): The World Today. See S 0000.
- 0200 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): USA Radio News. See S 0000.
- 0200 USA, WHRA (Angel 5 Maine): Politics and Religion (repeat). Irvin Baxter Jr. hosts this call-in program.
- 0200 USA, WHRI (Angel 2 Indiana): The Prophecy Club. See S 0000.
- 0205 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): Music. See S 0215.
- 0230 UK, BBC London (AE): Warm World (2nd, 9th, 16th, 23rd). Exploring the effects of global warming.
- 0230 UK, BBC London (am/au): Variable Music Feature. Different features of 15, 30, and 45 minutes length with a musical theme.
- 0230 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.

Wednesdays

- 0200 Merlin Network One: The MNO Music Jam.
- 0200 UK, BBC London (am/au): The World Today. See S 0000.
- 0200 USA, KWHR (Angel 3 Hawaii): USA Radio News. See S 0000.

- 0200 USA, WHRA (Angel 5 Maine): Politics and Religion (repeat). See T 0200.
- 0200 USA, WHRI (Angel 1 Indiana): USA Radio News. See S 0000.
- 0200 USA, WHRI (Angel 2 Indiana): The Prophecy Club. See S 0000.
- 0205 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): Music. See S 0215.
- 0230 UK, BBC London (am/au): Variable Feature. See S 0530.
- 0230 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.

Thursdays

- 0200 Merlin Network One: The MNO Music Jam.
- 0200 UK, BBC London (am/au): The World Today. See S 0000.
- 0200 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): USA Radio News. See S 0000.
- 0200 USA, WHRA (Angel 5 Maine): Politics and Religion (repeat). See T 0200.
- 0200 USA, WHRI (Angel 2 Indiana): The Prophecy Club. See S 0000.
- 0205 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): Music. See S 0215.
- 0230 UK, BBC London (am/au): Everywoman. See M 0630.
- 0230 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.

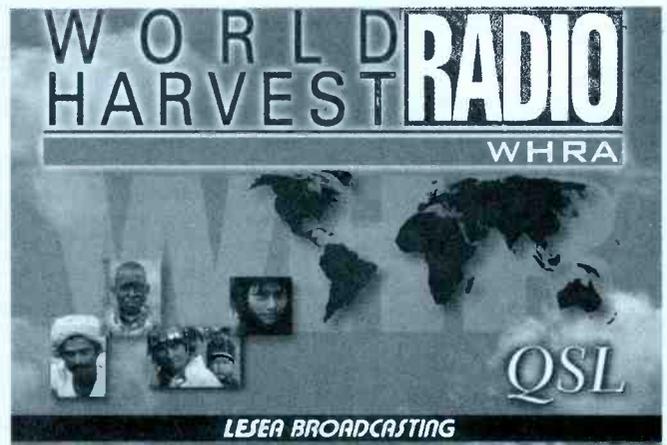
Fridays

- 0200 Merlin Network One: The MNO Music Jam.
- 0200 UK, BBC London (am/au): The World Today. See S 0000.
- 0200 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): USA Radio News. See S 0000.
- 0200 USA, WHRA (Angel 5 Maine): Politics and Religion (repeat). See T 0200.
- 0200 USA, WHRI (Angel 2 Indiana): The Prophecy Club. See S 0000.
- 0205 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): Music. See S 0215.
- 0230 UK, BBC London (am/au): Focus on Faith. Alison Hilliard talks to church leaders about their hopes for the future.
- 0230 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.

Saturdays

- 0200 Merlin Network One: The MNO Music Jam.

- 0200 UK, BBC London (am/au): The World Today. See S 0000.
- 0200 USA, KWHR (Angel 1 Indiana/Angel 3 Hawaii): USA Radio News. See S 0000.
- 0200 USA, WHRA (Angel 5 Maine): Politics and Religion (repeat). See T 0200.
- 0200 USA, WHRI (Angel 2 Indiana): The Prophecy Club. See S 0000.
- 0205 USA, KWHR (Angel 3 Hawaii): Bible Pathway. See S 1220.
- 0205 USA, WHRI (Angel 1 Indiana): Music. See S 0215.
- 0215 USA, KWHR (Angel 3 Hawaii): Focus on the Kingdom. See M 0530.
- 0230 UK, BBC London (am/au): People and Politics. Background to the British political scene.
- 0230 USA, KWHR (Angel 3 Hawaii): DXing with Cumbre. See S 0400.
- 0230 USA, WHRI (Angel 2 Indiana): The Hour of Courage. See M 1230.



FREQUENCIES

0600-0700	Anguilla, Caribbean Beacon	6090am				0600-0635	S Africa, Trans World R	11735af			
0600-0700 vl	Australia, ABC/Katherine	5025do				0600-0700	Singapore, R Corp Singapore	6150do			
0600-0700 vl	Australia, ABC/Tent Creek	4910do				0600-0700 vl	Siomon Islands, SIBC	5020do			
0600-0700	Australia, Radio	9660pa	12080as	15240pa	15415as	0600-0700	UK, BBC World Service	3955eu	5975am	6005af	6175am
		15510pa	17715pa	17750as	21725pa			6180eu	6190af	6195eu	7145pa
0600-0700 vl	Botswana, Radio	4820do	4830do	7255do				7160af	7325eu	9410eu	9740as
0600-0700 vl	Canada, CBC N Quebec Svc	9625do						11760me	11765af	11940af	11955pa
0600-0700	Canada, CFRX Toronto	6070do						12095eu	15310as	15360as	15420af
0600-0700	Canada, CFRP Calgary	6030do						15565eu	15575as	17640af	17760as
0600-0700	Canada, CHNX Halifax	6130do						17790as	17885af	21660as	
0600-0700	Canada, CKZU Vancouver	6160do				0600-0700	UK, Merin Network One	6110eu	13720pa		
0600-0629 mtwhf	Canada, R Canada Intl	6090va	6150va	9670af	9780va	0600-0700	USA, KAIJ Dallas TX	5810na			
		11905va				0600-0700	USA, KTVN Salt Lk City UT	7510am			
0600-0700	Costa Rica, RF Peace Intl	6975am	15050am	21460am		0600-0700	USA, KWHR Naalehu HI	17780as			
0600-0700	Cuba, Radio Havana	9550na	9820na	9830na		0600-0630	USA, Voice of America		6035af	6080af	7170af
0600-0700	Ecuador, HCJB	9745na	12015na	21455va				7285af	11805af	11825eu	11905af
0600-0650	Germany, Deutsche Welle	6045af	7225af	9565af	11785af			12080af	15205me	15600af	
		17820af				0600-0700	USA, WBCQ Monticello ME	7415na			
0600-0700	Germany, Sunrise Radio	5850eu				0600-0700	USA, WEWN Birmingham AL	5825va			
0600-0700	Germany, Overcomer Ministr	13810as				0600-0700 stwhfa	USA, WGTG McCaysville GA	3270na	5085am		
0600-0700 vl	Ghana, Ghana BC Corp	3366do	4915do			0600-0700	USA, WHRA Greenbush ME	7435af			
0600-0700	Guyana, GBC/Voice of	3290do	5950do			0600-0700	USA, WHRI Noblesville IN	5755am	7315am		
0600-0700 vl	Italy, IRRS	3985va				0600-0700	USA, WINB Red Lion PA	11950am			
0600-0700	Japan, Radio/NHK	5975eu	7230eu	9835na	11740as	0600-0700	USA, WJCR Upton KY	7490na	13595as		
		11840as	11850pa	15310sa	15590as	0600-0700	USA, WRNO New Orleans LA	7395am			
0600-0700	Kenya, Kenya BC Corp	4885do				0600-0700	USA, WWCN Nashville TN	2390na	3210na	5070na	5935na
0600-0700 vl	Kiribati, Radio	9825do				0600-0700	USA, WYFR Okeechobee FL	5985na	7355eu		
0600-0700	Kuwait, Radio	15110as				0600-0700 vl	Vanuatu, Radio	4960do			
0600-0700 vl	Lesotho, Radio	4800do				0600-0620	Vatican State, Vatican R	4005eu	5880eu	7250eu	
0600-0700	Liberia, LCN/R Liberia Int	5100do				0600-0700	Yemen, Rep of Yemen Radio	9780do			
0600-0700	Malaysia, Radio	7295do				0600-0700	Zambia, Christian Voice	3330af	6065af		
0600-0700	Malaysia, RTM Sarawak	7160do				0600-0700	Zambia, Natl BC Corp	6165do	6265do		
0600-0700	Malaysia, Voice of	6175as	9750as	15295au		0600-0700 vl	Zimbabwe, Zimbabwe BC	4828do	5012do		
0600-0700 vl	Namibia, NBC	3270af	3289af			0605-0700	Swaziland, Trans World R	6100af	9500af		
0600-0700	New Zealand, R NZ Intl	17675pa				0630-0700	Austria, R Austria Intl	6015na			
0600-0700 vl	Nigeria, Radio/Ibadan	6050do				0630-0700 mtwhfa	Malta, VO Mediterranean	7155eu			
0600-0700 vl	Nigeria, Radio/Kaduna	4770do				0630-0700	Switzerland, Swiss R Intl	6165eu			
0600-0700	Nigeria, Radio/Lagos	3326do				0630-0700 mtwhf	UK, BBC European Service	3955eu	6195eu		
0600-0700	Nigeria, Voice of	7255af	15120va			0630-0700 as	UK, BBC World Service	3955eu	6195eu		
0600-0700 vl	Papua New Guinea, NBC	9675do				0630-0700	USA, Voice of America	5995af	7170af	11825eu	11950af
0600-0700	Romania, R Romania Intl	7105eu	9510na	9625eu	11775eu			15205me			
		17790af	21480na			0630-0700 as	USA, Voice of America	5970af	6035af	6080af	7285af
0600-0700	Russia, Voice of Russia WS	15460au	15525au	17570au	17665au			11805af	12080af	15600af	
		21790au				0630-0700	Vatican State, Vatican R	9660af	11625af	13765af	
0600-0630	S Africa, Channel Africa	15215af				0641-0656	Romania, R Romania Intl	9550eu	9625eu	9665eu	11885eu

SELECTED PROGRAMS

Sundays

- 0600 Merlin Network One: The MNO Music Jam.
- 0600 UK, BBC London (am/au): The World Today. See S 0000.
- 0600 USA, WHRA (Angel 5 Maine): Sipes Evangelism. John and Rosealie Sipes.
- 0600 USA, WHRI (Angel 1/2 Indiana): The Joy of Living Broadcast. Ms. Hurst and Ms. Smith evangelize with words and song.
- 0615 USA, WHRI (Angel 1 Indiana): Heartfelt Ministries. Advice from the heart.
- 0615 USA, WHRI (Angel 2 Indiana/Angel 3 Hawaii): Taste God's Goodness. Lela Pendergrass teaches about the coming rapture.
- 0630 UK, BBC London (am/au): In Praise of God. Weekly programme of worship and meditation.
- 0630 UK, BBC London (am/au): Play of the Week (Am). A different radio drama program each week (alternative programming for the Americas).
- 0630 USA, WHRA (Angel 5 Maine): Gospel Crusade Ministries. See S 0400.
- 0630 USA, WHRI (Angel 1/2 Indiana): The Mercies of God Radio Broadcast. Pastor Peter Notier from Michigan preaches mercy for lost sinners.
- 0645 USA, KWHR (Angel 3 Hawaii): Truth for the World. Churches of Christ spokesman Jim Dearman examines Scripture.

Mondays

- 0600 Merlin Network One: The MNO Music Jam.
- 0600 UK, BBC London (am/au): The World Today. See S 0000.
- 0600 USA, WHRA (Angel 5 Maine): World Harvest. Steve Sumrall with a full hour of music and a ministry update.
- 0600 USA, WHRI (Angel 1 Indiana): John Hagee Today. Evangelizing by John Hagee of the Cornerstone Church in San Antonio, TX.
- 0600 USA, WHRI (Angel 2 Indiana): Blow the Trumpet in Zion. Paul Sorko-Ram.
- 0630 UK, BBC London (am/au): Everywoman (Am). Features and reports on the activities of women across the globe.
- 0630 UK, BBC London (AS): The Music Studio. See T 1630.
- 0630 USA, WHRI (Angel 1/2 Indiana): In Touch. See S 1300.
- 0655 USA, WHRI (Angel 1/2 Indiana): Family Forum. Jay Kessler.

Tuesdays

- 0600 Merlin Network One: The MNO Music Jam.
- 0600 UK, BBC London (am/au): The World Today. See S 0000.
- 0600 USA, WHRA (Angel 5 Maine): World Harvest. See M 0600.
- 0600 USA, WHRI (Angel 1 Indiana): John Hagee Today. See M 0600.
- 0600 USA, WHRI (Angel 2 Indiana): Blow the Trumpet in Zion. See M 0600.
- 0605 USA, WHRI (Angel 2 Indiana): In Touch. See S 1300.
- 0630 UK, BBC London (am/au): On Screen (Am). See T 0130.
- 0630 USA, WHRI (Angel 1 Indiana): In Touch. See S 1300.
- 0655 USA, WHRI (Angel 1/2 Indiana): Family Forum. See M 0655.

Wednesdays

- 0600 Merlin Network One: The MNO Music Jam.
- 0600 UK, BBC London (am/au): The World Today. See S 0000.
- 0600 USA, WHRA (Angel 5 Maine): World Harvest. See M 0600.
- 0600 USA, WHRI (Angel 1 Indiana): John Hagee Today. See M 0600.
- 0600 USA, WHRI (Angel 2 Indiana): Blow the Trumpet in Zion. See M 0600.
- 0630 UK, BBC London (am/au): Sports International (Am). Live commentaries and interviews, features and discussions.
- 0630 USA, WHRI (Angel 1/2 Indiana): In Touch. See S 1300.
- 0655 USA, WHRI (Angel 1/2 Indiana): Family Forum. See M 0655.

Thursdays

- 0600 Merlin Network One: The MNO Music Jam.
- 0600 UK, BBC London (am/au): The World Today. See S 0000.
- 0600 USA, WHRA (Angel 5 Maine): World Harvest. See M 0600.
- 0600 USA, WHRI (Angel 1 Indiana): John Hagee Today. See M 0600.
- 0600 USA, WHRI (Angel 2 Indiana): Blow the Trumpet in Zion. See M 0600.
- 0630 UK, BBC London (am/au): Assignment (Am). A weekly examination of a topical issue.
- 0630 USA, WHRI (Angel 1/2 Indiana): In Touch. See S 1300.
- 0655 USA, WHRI (Angel 1/2 Indiana): Family Forum. See M 0655.

Fridays

- 0600 Merlin Network One: The MNO Music Jam.

- 0600 UK, BBC London (am/au): The World Today. See S 0000.
- 0600 USA, WHRA (Angel 5 Maine): World Harvest. See M 0600.
- 0600 USA, WHRI (Angel 1 Indiana): John Hagee Today. See M 0600.
- 0600 USA, WHRI (Angel 2 Indiana): Blow the Trumpet in Zion. See M 0600.
- 0630 UK, BBC London (am/au): Short Story (Am). Fifteen-minute dramas written by listeners from around the world.
- 0630 UK, BBC London (am/au): Variable Feature (Am). See S 0530.
- 0630 USA, WHRI (Angel 1/2 Indiana): In Touch. See S 1300.
- 0645 UK, BBC London (AE): Human Remains (variable). See S 0030.
- 0645 UK, BBC London (am/au): Science Feedback (5) (Am). Listeners' questions, comments and queries about World Service science programs are answered.
- 0655 USA, WHRI (Angel 1/2 Indiana): Family Forum. See M 0655.

Saturdays

- 0600 Merlin Network One: The MNO Music Jam.
- 0600 UK, BBC London (am/au): The World Today. See S 0000.
- 0600 USA, KWHR (Angel 3 Hawaii): DXing with Cumbre. See S 0400.
- 0600 USA, WHRA (Angel 5 Maine): Sipes Evangelism. See S 0600.
- 0600 USA, WHRI (Angel 1/2 Indiana): DXing with Cumbre. See S 0400.
- 0630 UK, BBC London (am/au): People and Politics. See A 0230.
- 0630 USA, KWHR (Angel 3 Hawaii): The Word of God Broadcast. Sister Polly preaches from the Knoxville House of Faith in Tennessee.
- 0630 USA, WHRA (Angel 5 Maine): Biblical Studies Institute. See M 1105.
- 0630 USA, WHRI (Angel 1 Indiana): World Harvest Country Style. See S 1230.
- 0630 USA, WHRI (Angel 2 Indiana): A Temple of Jesus Christ. Cleveland Waters.
- 0645 USA, KWHR (Angel 3 Hawaii): Truth for the World. See S 0645.

FREQUENCIES

0700-0800	Anguilla, Caribbean Beacon	6090am			
0700-0800 vl	Australia, ABC/Katherine	5025do			
0700-0800 vl	Australia, ABC/Tent Creek	4910do			
0700-0800	Australia, Radio	9660pa	12080as	15240pa	15415as
		15510pa	17715pa	17750as	21725pa
		4820do	4830do	7255do	
0700-0800 vl	Botswana, Radio				
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	6975am	15050am	21460am	
0700-0800	Ecuador, HCJB	9640pa	9775eu	21455va	
0700-0800 as/vl	Eq Guinea, R East Africa	15186af			
0700-0800 mtwhf	Eq Guinea, Radio Africa	15186af			
0700-0800	Germany, Sunrise Radio	5850eu			
0700-0800	Germany, Voice of Hope	5975eu			
0700-0800 s	Germany, Good News World R	13740as			
0700-0800	Germany, Overcomer Ministr	13810as			
0700-0800 vl	Ghana, Ghana BC Corp	3366do	4915do		
0700-0715 f	Greece, Voice of	7430eu	7450eu	9375eu	9420eu
		9775au			
0700-0800	Guyana, GBC/Voice of	3290do	5950do		
0700-0730 vl	Italy, IRRS	3985va			
0700-0800	Kenya, Kenya BC Corp	4885do	4935do		
0700-0800 vl	Kinbati, Radio	9825do			
0700-0800	Kuwait, Radio	15110as			
0700-0800 vl	Lesotho, Radio	4800do			
0700-0715	Liberia, LCN/R Liberia Int	5100do			
0700-0800	Malaysia, Radio	7295do			
0700-0800	Malaysia, RTM Sarawak	7160do			
0700-0800	Malaysia, Voice of	6175as	9750as	15295au	
0700-0800	Myanmar, Radio	9730do			
0700-0715 vl	Namibia, NBC	3270af	3289af		
0700-0705	New Zealand, R NZ Intl	17675pa			
0700-0800 vl	Nigeria, Radio/Ibadan	6050do			
0700-0800 vl	Nigeria, Radio/Kaduna	4770do			
0700-0800 vl	Nigeria, Voice of	7255af	15120va		
0700-0800	Palau, KHBN/Voice of Hope	9965as	9985as	13840as	15725as
0700-0730 vl	Papua New Guinea, NBC	9675do			
0700-0800	Romania, R Romania Intl	17735af	21480af		
0700-0800	Russia, Voice of Russia WS	15460au	15525au	17495au	17570au
		17665au	21790au		
0700-0800	Singapore, RCorp Singapore	6150do			
0700-0730	Slovakia, R Slovakia Intl	11990au	15460au	21705au	
0700-0800 vl	Solomon Islands, SIBC	5020do			
0700-0705	Swaziland, Trans World R	4775af	6100af	9500af	
0700-0800	Taiwan, Radio Taipei Intl	5950na			
0700-0800	UK, BBC World Service	5975am	6005af	6175am	6180eu
		6190af	6195eu	7145pa	7325eu
		9410eu	9740as	11760me	11765af
		11835af	11940af	11955pa	12095eu
		1531015	15360as	15485eu	15565eu
		15575as	17640eu	17760as	17790as
		17830af	21660as		
0700-0800 as	UK, BBC World Service	17885af			
0700-0800	UK, Merlin Network One	6110eu	9915eu	13720pa	17630eu
		21550af			
0700-0800	USA, KAIJ Dallas TX	5810na			
0700-0800	USA, KTVB Salt Lk City UT	7510am			
0700-0800	USA, KWHR Naalehu HI	11565as	17780as		
0700-0800	USA, WBCQ Monticello ME	7415na			
0700-0800	USA, WEWN Birmingham AL	5825va			
0700-0800	USA, WHRA Greenbush ME	7435af			
0700-0800	USA, WHRI Noblesville IN	5755am	7315am		
0700-0800	USA, WINB Red Lion PA	11950am			
0700-0800	USA, WJCR Upton KY	7490na	13595as		
0700-0800	USA, WRNO New Orleans LA	7395am			
0700-0800	USA, WWCR Nashville TN	2390na	3210na	5070na	5935na
0700-0745	USA, WYFR Okeechobee FL	7355eu	9455va	9985eu	
0700-0800 vl	Vanuatu, Radio	4960do			
0700-0800	Zambia, Christian Voice	6065af			
0700-0800	Zambia, Natl BC Corp	6165do	6265do		
0700-0800 vl	Zimbabwe, Zimbabwe BC	4828do	5012do		
0705-0710 mtwhfa	Croatia, Croatian Radio	6235eu	7305eu	9830eu	13820au
0706-0800	New Zealand, R NZ Intl	9700pa			
0710-0715 s	Kyrgyzstan, Kyrgyz Radio	4010do	4050do		
0715-0800 vl	Namibia, NBC	6060af	6175af		
0730-0800	Finland, YLE/R Finland	9840va	21670as		
0730-0800	Georgia, Georgian Radio	11910eu			
0730-0740	Greece, Voice of	7430eu	7450eu	9375eu	9420na
		9775au			
0730-0800 as/vl	Italy, IRRS	3985va			
0730-0800 vl	Papua New Guinea, NBC	4890do			
0730-0800	Switzerland, Swiss R Intl	9885af	11860af	13635af	
0730-0745 m-f/vl	Vatican State, Vatican R	4005va	5880va	6185va	7250va
		9645va	11740va	15595va	
0740-0800	Guam, TWR/KTWR	15200as			

0800 UTC

0745-0800 s	Albania, Trans World R	9685eu			
0745-0755 as	Monaco, Trans World Radio	9870eu			
0755-0800 mtwhf	Monaco, Trans World Radio	9870eu			
0800-0900	Albania, Trans World R	9685eu			
0800-0900	Anguilla, Caribbean Beacon	6090am			
0800-0830 vl	Australia, ABC/Katherine	5025do			
0800-0830 vl	Australia, ABC/Tent Creek	4910do			
0800-0900	Australia, Radio	5995pa	9580pa	9710pa	12080as
		15415as	15510pa	17750as	21725pa
		4820do	4830do	7255do	
0800-0900 vl	Botswana, Radio				
0800-0900 vl	Canada, CBC N Quebec Svc	9625do			
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	6975am	15050am	21460am	
0800-0827	Czech Rep, R Prague Intl	11640eu	15260eu		
0800-0900	Ecuador, HCJB	9640pa	9775eu	21455va	
0800-0900 as/vl	Eq Guinea, R East Africa	15186af			
0800-0900 mtwhf	Eq Guinea, Radio Africa	15186af			
0800-0900	Germany, Sunrise Radio	5850eu			
0800-0900	Germany, Voice of Hope	5975eu			
0800-0900	Germany, Overcomer Ministr	13810as			
0800-0900	Guam, TWR/KTWR	15200as	15330as		
0800-0900	Guyana, GBC/Voice of	3290do	5950do		
0800-0900	Indonesia, Voice of	9525as	11765as	15510as	
0800-0830 as/vl	Italy, IRRS	3985va			
0800-0900	Kenya, Kenya BC Corp	4885do	4935do		
0800-0900 vl	Lesotho, Radio	4800do			
0800-0900	Liberia, LCN/R Liberia Int	5100do			
0800-0900	Malaysia, Radio	7295do			
0800-0830	Malaysia, Voice of	6175as	9750as	15295au	
0800-0900 vl	Malaysia, RTM KotaKinabalu	5980do			
0800-0900	Monaco, Trans World Radio	9870eu			
0800-0830	Myanmar, Radio	9730do			
0800-0900 vl	Namibia, NBC	6060af	6175af		
0800-0900	New Zealand, R NZ Intl	9700pa			
0800-0900 vl	Nigeria, Radio/Ibadan	6050do			
0800-0900 vl	Nigeria, Radio/Kaduna	4770do			
0800-0900	Nigeria, Radio/Lagos	3326do			
0800-0900	Palau, KHBN/Voice of Hope	9985as	13840as	15725as	
0800-0900 vl	Papua New Guinea, NBC	4890do			
0800-0900	Russia, Voice of Russia WS	9905au	15525au	17495au	17665au
		21790au			
0800-0900	Singapore, RCorp Singapore	6150do			
0800-0900	South Korea, R Korea Intl	9570au	13670eu		
0800-0900	UK, BBC World Service	7145pa	7325pa	9410eu	9740as
		11940af	11955pa	12095eu	15310as
		15360as	15400af	15485eu	15565eu
		17640eu	17760as	17790as	17830af
		21660as			
0800-0900 as	UK, BBC World Service	15575as	17885af		
0800-0900	UK, Merlin Network One	9915eu	13660eu	13720pa	17630eu
		21550af			
0800-0900	USA, KAIJ Dallas TX	5810na			
0800-0900	USA, KNLS Anchor Point AK	7365as			
0800-0900	USA, KTVB Salt Lk City UT	7510am			
0800-0900	USA, KWHR Naalehu HI	9930as	11565as		
0800-0900	USA, WBCQ Monticello ME	7415na			
0800-0900	USA, WEWN Birmingham AL	5825va			
0800-0900	USA, WHRI Noblesville IN	5755am	7315am		
0800-0900 sm	USA, WHRI Noblesville IN	5755am			
0800-0900	USA, WJCR Upton KY	7490na	13595as		
0800-0900	USA, WRNO New Orleans LA	7395am			
0800-0900 vl	USA, WSHB Cypress Crk SC	7535eu	9845au		
0800-0900	USA, WWCR Nashville TN	2390na	3210na	5070na	5935na
0800-0900 vl	Vanuatu, Radio	4960do			
0800-0900	Zambia, Christian Voice	6065af			
0800-0900	Zambia, Natl BC Corp	6165do	6265do		
0800-0900 vl	Zimbabwe, Zimbabwe BC	4828do	5012do		
0805-0810 s	Croatia, Croatian Radio	6165eu	7185eu	9830eu	13820af
0805-0810	Pakistan, Radio	11975as	15485as		
0815-0900 f	Seychelles, FEBA Radio	15540as			
0830-0900 vl	Australia, ABC/Alice Spgs	2310do			
0830-0900 vl	Australia, ABC/Katherine	2485do			
0830-0900 vl	Australia, ABC/Tent Creek	2325do			
0830-0900	Austria, R Austria Intl	6155eu	13730eu	17615as	21765au
0830-0856	Belgium, R Vlaanderen Int	9925eu	9940au		
0830-0900 as/vl	Italy, IRRS	7120va			
0830-0900 vl	Solomon Islands, SIBC	5020do			
0830-0900	Switzerland, Swiss R Intl	9885as	13685as		

GRUNDIG

Gives you the World

Grundig leads shortwave radio into the new Millennium!

When radio was introduced, back in the 1920's — to pluck voices and music out of thin air — people thought it was magic. With Grundig, it still is! No other manufacturer rivals Grundig for *"that European sound."* Voices have an *"in-the-room"* quality and clarity — even from half a world away.

German-engineered quality... German-engineered sound... when people think of shortwave, they think of Grundig. Grundig has specialized in shortwave since the late 1950's, and in North America, shortwave radios are all we sell.

Critics reviews of Grundig models include *Best of Category... Superior Performance... Ergonomically Better... Superb Sound Quality... An Excellent Choice*

We listen, too.

We're very good at listening — to our customers. Our engineers design each model so it's easy, intuitive, and convenient to use. Critics call this *"great ergonomics!"* And Grundig models always deliver top performance for the price. Critics call this *"bang for the buck."*

GRUNDIG

The Latest in Technology

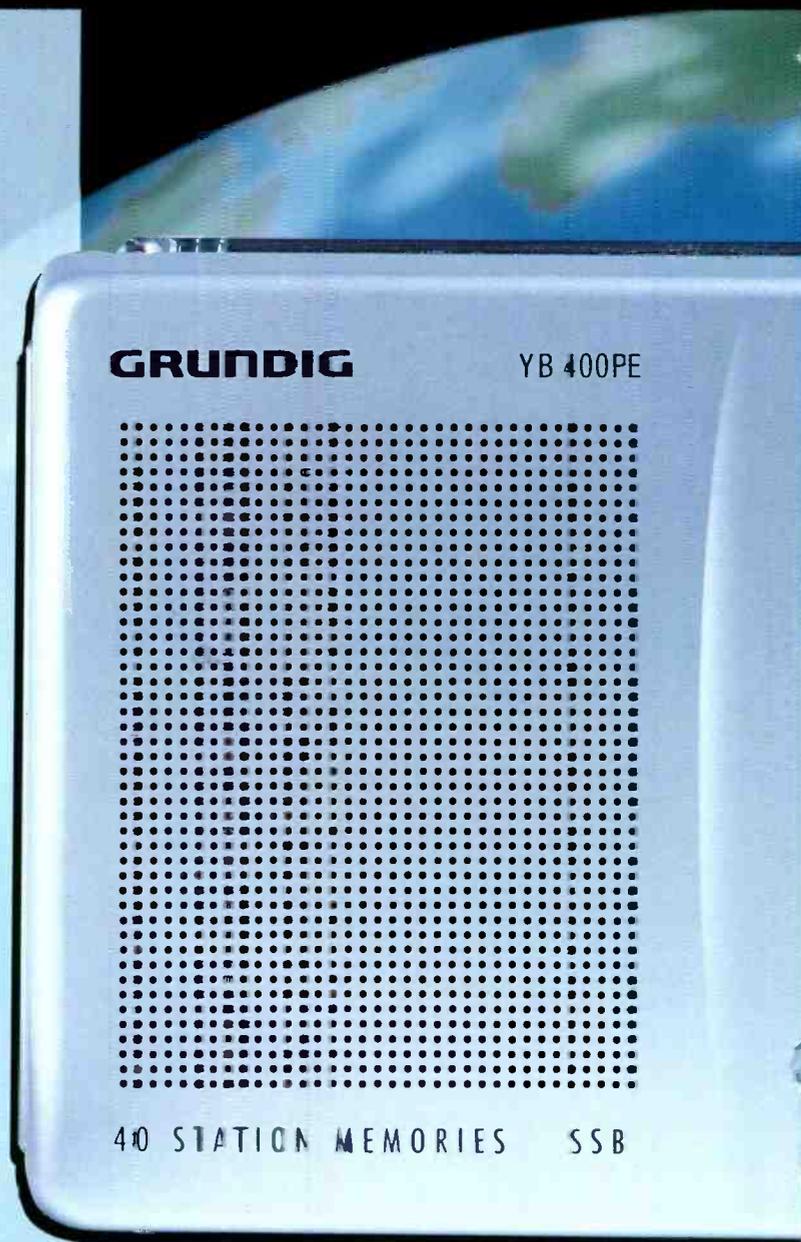
Rated Best in Its Class.

Grundig's Yacht Boy 400PE has received rave reviews from the shortwave press for combining a wealth of sophisticated features in a sleek titanium-look package that doesn't cost a fortune. It incorporates features found on stationary shortwave systems that cost thousands, such as outstanding audio quality, precise 1 kHz increment tuning, up/down slewing, frequency scanning, signal strength indication, and single-sideband signal demodulation.

But the advantage mentioned most often in the reviews is its ease of use for the novice listener. In moments you can listen to foreign broadcasts beamed to North America.

Soon, you will be scanning the airwaves to tune in exotic music programs and sports events from faraway locales. The YB-400PE even picks up shortwave amateur (ham radio) broadcasts and shortwave aviation/military frequencies (cockpit-to-tower communications). The possibilities for family fun, education, and enjoyment are boundless.

For travel or home use, Grundig adds a dual-time travel clock with snooze and sleep timer. The FM band is stereophonic with your headphones. The lighted LCD panel is easy to read in the



Yacht Boy 400PE

The Best in Value!



dark. Comes with a form-fitting pouch, integral telescoping antenna and advanced external antenna on a compact reel, carry-strap, ac-adapter, ear-phones and complete instructions.

Made by Germany's Grundig.

World leader in shortwave radios, the 400PE measures just 7-3/4"L x 4-1/4"H x 1-1/4"W; weighs only 20 oz. It slips easily into your carry-on for travel and fits on a nightstand, office credenza, or yacht cabin console. One-year warranty.

Grundig's Yacht Boy 400PE Named Editor's Choice.

Passport To World Band Radio is regarded as the leading authority of the shortwave industry. Here's what their testing expert wrote about the Grundig Yacht Boy 400PE:

"Best performance for price size category, and among the choicest portables of any size, at any price."

"The 400's FM performance is right up there with the very best among world band radios."

Please call our shortwave hotline and talk to the experts: 800-872-2228.

Grundig sets the standard for customer service.

Grundig supports the industry's only Toll-free Shortwave Hotline. Consumers and dealers can call 1-800-872-2228 in the United States or 1-800-637-1648 in Canada weekdays from 9am to 4pm Pacific Time. You can speak with a real live shortwave expert, not an automatic message machine. Grundig even answers questions for those who own other brands, for whom no such toll-free hotline service is available!

Grundig warranty service is the best.

Any problems? We fix them fast. Dealers know that customers will be taken care of! Dealer support service is first-rate, too. Remember, all we sell in North America are shortwave radios. We specialize! We do it best!

Watch this space for Grundig's biggest product announcement in years!

Shortwave enthusiasts and Grundig dealers will have an extra-special reason to celebrate the new millennium—the most important Grundig product announcement in years!

GRUNDIG
made for you



FREQUENCIES

1600-1700	Algeria, R Algiers Intl	6160af	11715af	15160me	1600-1700 sm	Russia, Voice of Russia WS	6005me		
1600-1700	Anguilla, Caribbean Beacon	11775am			1600-1630	S Africa, Channel Africa	6000af		
1600-1700 vl	Australia, ABC/Alice Spgs	2310do			1600-1700	South Korea, R Korea Intl	5975as	9515va	9870as
1600-1700 vl	Australia, ABC/Katherine	2485do			1600-1700	Swaziland, Trans World R	9500af		
1600-1700 vl	Australia, ABC/Tent Creek	2325do			1600-1615	Switzerland, Swiss R Intl	12010as	15185as	
1600-1700	Australia, Radio	5995pa	9500as	9580pa	11660as	Tanzania, Radio	5050af		
1600-1700 vl	Botswana, Radio	4820do	4830do	7255do	1600-1645	UAE, Radio Dubai	13630eu	13675eu	15395eu
1600-1700 vl	Canada, CBC N Quebec Svc	9625do			1600-1700	Uganda, Radio	4976do		
1600-1700	Canada, CFRX Toronto	6070do			1600-1700	UK, BBC World Service	3915as	5975as	5990as
1600-1700	Canada, CFVP Calgary	6030do					6195va	7160as	9410eu
1600-1700	Canada, CHNX Halifax	6130do					9740as	11750as	11940af
1600-1700	Canada, CKZN St John's	6160do					15310as	15400af	15485eu
1600-1700	Canada, CKZU Vancouver	6160do					17830af	17840am	21470af
1600-1659 s	Canada, R Canada Intl	9640am	13650am	17715am	1600-1700	UK, Merlin Network One	6185eu	21500af	
1600-1656	China, China Radio Intl	9565af			1600-1700	USA, KAJ Dallas TX	13815na		
1600-1700	Costa Rica, RF Peace Intl	6975am	21460am		1600-1700	USA, KTVN Salt Lk City UT	15590am		
1600-1700	Ethiopia, Radio	7165af			1600-1700	USA, KWHR Naalehu HI	9930as		
1600-1654	France, Radio France Intl	11615af	11700af	11995af	12015af	6035af	6110as	7125as	7215as
		15210af	15530af			9575me	9645as	9760as	11920af
1600-1650	Germany, Deutsche Welle	6170as	7120af	7225as	9585as	12040af	13600af	13710af	15205me
		9735af	11810af	13790as	15145af	15225af	15395as	15410af	15445af
		17800af				17895af			
1600-1700	Germany, Sunrise Radio	5850eu			1600-1700	USA, WEWN Birmingham AL	11875na	13615na	15745eu
1600-1630 s	Germany, Universal Life	11840af			1600-1700 mtwhfa	USA, WGTG McCaysville GA	9400am		
1600-1700 a	Germany, Good News World R	11840va			1600-1700	USA, WHRI Noblesville IN	13760am	15105am	
1600-1700	Germany, Overcomer Ministr	6010eu	13810me		1600-1700	USA, WJCR Upton KY	7490na	13595as	
1600-1700 vl	Ghana, Ghana BC Corp	4915do	6130do		1600-1700 irreg	USA, WMLK Bethel PA	9465am		
1600-1700	Guam, AWR/KSDA	11980as			1600-1700 s	USA, WRMI/R Miami Intl	9955ca		
1600-1630	Guam, TWR/KTWR	12015as			1600-1700	USA, WRNO New Orleans LA	15420am		
1600-1700	Guyana, GBC/Voice of	3290do	5950do		1600-1700 vl	USA, WSHB Cypress Crk SC	18910af		
1600-1630	Iran, VOIRI	9780as	11775as	13605as	1600-1700	USA, WWCR Nashville TN	9475na	12160na	13845na
1600-1700	Jordan, Radio	11690eu			1600-1700	USA, WYFR Okeechobee FL	11830na	15215na	15695eu
1600-1700	Kenya, Kenya BC Corp	4935do					17760ca	21525af	
1600-1700	Lebanon, Voice of Hope	9960me			1600-1610 a	Vatican State, Vatican R	11640as	13765as	
1600-1700 vl	Lesotho, Radio	4800do			1600-1625	Vietnam, Voice of	5940eu	7270eu	7400eu
1600-1700	Malaysia, Radio	7295do					15009eu		
1600-1630 smtwfa	Mexico, Radio Mexico Intl	9705na			1600-1700	Zambia, Christian Voice	3330af	4965af	
1600-1700 vl	Namibia, NBC	6060af	6175af		1600-1700	Zambia, Natl BC Corp	6165do	6265do	
1600-1625	Netherlands, Radio	12070as	12090as	15585as	1600-1630 vl	Zimbabwe, Zimbabwe BC	4828do	5012do	
1600-1650 occsnal	New Zealand, R NZ Intl	6105pa			1615-1700 as	UK, BBC World Service	9515na	11860af	
1600-1700 vl	Nigeria, Radio/Ibadan	6050do			1630-1700	Canada, R Canada Intl	6140as	7150as	
1600-1700 vl	Nigeria, Radio/Kaduna	4770do			1630-1700	Canada, R Canada Intl	6140as	7150as	
1600-1700 vl	Nigeria, Voice of	7255af	15120va		1630-1700 s	Canada, R Canada Intl	9640na	13650na	17715na
1600-1630	Pakistan, Radio	11570me	15170af	15325eu	1630-1700	Egypt, Radio Cairo	15255af		
		17720af		15465eu	1630-1700 mtwhf	Eq Guinea, Radio Africa	7190af	15186af	
1600-1700	Palau, KHBN/Voice of Hope	9955as	9965as		1630-1700 s	Seychelles, FEBA Radio	11665as		
1600-1700 vl	Papua New Guinea, NBC	4890do			1630-1700 vl	Zimbabwe, Zimbabwe BC	3306do	4828do	
1600-1700	Russia, Voice of Russia WS	4730me	4940me	4975me	1645-1700	Tajikistan, Radio	7245as		
		12065me		7210me	1650-1700 mtwhf	New Zealand, R NZ Intl	11675pa		

SELECTED PROGRAMS

Sundays

1600	Merlin Network One: Hard Country.	1605	USA, WHRI (Angel 2 1 Indiana): Bible Pathway. See S 1220.
1600	UK, BBC London (am/au): World News. See S 1200.	1610	USA, WHRI (Angel 1 Indiana): The Inside Pitch. See M 1135.
1600	USA, WHRI (Angel 1 Indiana): Walking in Power. Brother Pronk discusses Christian teaching from Florida.	1610	USA, WHRI (Angel 2 Indiana): The Voice of Salvation. See S 1225.
1600	USA, WHRI (Angel 2 Indiana): Message to Israel. A program originating in Brooklyn, NY for Jewish listeners.	1615	UK, BBC London (am/au): Megamix. A youth magazine series which covers new trends, entertainment, sport and other issues.
1615	UK, BBC London (am/au): Science Extra. See S 0030.	1615	USA, WHRI (Angel 1 Indiana): Life in the Word. See M 1345.
1615	USA, WHRI (Angel 2): The Bread of Life Broadcast. See S 0200.	1615	USA, WHRI (Angel 2 Indiana): Ever Increasing Faith. See M 1200.
1630	UK, BBC London (am/au): My Century. Moments from individuals' lives throughout the 20th century (5 or 30 mins).	1630	USA, WHRI (Angel 1 Indiana): Music. See S 0215.
1630	USA, WHRI (Angel 1 Indiana): Storming the Gates. See S 1100.	1630	USA, WHRI (Angel 2 Indiana): Power Today. See M 0230.
1630	USA, WHRI (Angel 2 Indiana): Sandra Davis Ministries. Sandra Davis evangelizes from Massachusetts.	1645	UK, BBC London (am/au): Insight. See S 0345.
		1645	USA, WHRI (Angel 2 Indiana): Music. See S 0215.

Mondays

1600	Merlin Network One: The Big Pair.
1600	UK, BBC London (am/au): World News. See S 1200.
1600	USA, WHRI (Angel 1&2 Indiana/Angel 3 Hawaii): USA Radio News. See S 0000.
1605	USA, KWHR (Angel 3 Hawaii): Music. See S 0215.
1605	USA, WHRI (Angel 1/2 Indiana): Bible Pathway. See S 1220.
1610	USA, WHRI (Angel 1 Indiana): The Inside Pitch. See M 1135.
1610	USA, WHRI (Angel 2 Indiana): The Voice of Salvation. See S 1225.
1615	UK, BBC London (am/au): Multitrack Hit-List. The UK Top 20.
1615	USA, WHRI (Angel 1 Indiana): Life in the Word. See M 1345.
1615	USA, WHRI (Angel 2 Indiana): Ever Increasing Faith. See M 1200.
1630	USA, WHRI (Angel 1 Indiana): Music. See S 0215.
1630	USA, WHRI (Angel 2 Indiana): Power Today. See M 0230.
1645	UK, BBC London (am/au): Insight. See S 0345.
1645	USA, WHRI (Angel 2 Indiana): Music. See S 0215.

Tuesdays

1600	Merlin Network One: From the UK.
1600	UK, BBC London (am/au): World News. See S 1200.
1600	USA, KWHR (Angel 1, 2, 3) USA Radio News. See S 0000.
1605	USA, KWHR (Angel 3 Hawaii): Music. See S 0215.

Wednesdays

1600	Merlin Network One: From the UK.
1600	UK, BBC London (am/au): World News. See S 1200.
1600	USA, KWHR (Angel 1, 2, 3): USA Radio News. See S 0000.
1605	USA, KWHR (Angel 3 Hawaii): Music. See S 0215.
1605	USA, WHRI (Angel 1/2 Indiana): Bible Pathway. See S 1220.
1610	USA, WHRI (Angel 1 Indiana): The Inside Pitch. See M 1135.
1610	USA, WHRI (Angel 2 Indiana): The Voice of Salvation. See S 1225.
1615	UK, BBC London (am/au): Multitrack X-Press. New pcp records, interviews, news and competitions.
1615	USA, WHRI (Angel 1 Indiana): Life in the Word. See M 1345.
1615	USA, WHRI (Angel 2 Indiana): Ever Increasing Faith. See M 1200.
1630	USA, WHRI (Angel 1 Indiana): Music. See S 0215.
1630	USA, WHRI (Angel 2 Indiana): Power Today. See M 0230.
1645	UK, BBC London (am/au): Insight. See S 0345.
1645	USA, WHRI (Angel 2 Indiana): Music. See S 0215.

Thursdays

1600	Merlin Network One: From the UK.
1600	UK, BBC London (am/au): World News. See S 1200.
1600	USA, KWHR (Angel 1&2 Indiana/Angel 3 Hawaii): USA Radio News. See S 0000.
1605	USA, KWHR (Angel 3 Hawaii): Music. See S 0215.
1605	USA, WHRI (Angel 1/2 Indiana): Bible Pathway. See S 1220.
1610	USA, WHRI (Angel 1 Indiana): The Inside Pitch. See M 1135.

1610	USA, WHRI (Angel 2 Indiana): The Voice of Salvation. See S 1225.
1615	UK, BBC London (am/au): Variable Feature. See S 0530.
1615	UK, BBC London (AS): The Music Studio. See T 1630.
1615	USA, WHRI (Angel 1 Indiana): Life in the Word. See M 1345.
1615	USA, WHRI (Angel 2 Indiana): Ever Increasing Faith. See M 1200.
1630	UK, BBC London (AE): The Music Studio. A new series for young people which provides a crash course in music making.
1630	UK, BBC London (am/au): Variable Feature. See S 0530.
1630	USA, WHRI (Angel 1/2 Indiana): Music. See S 0215.
1630	USA, WHRI (Angel 2 Indiana): Power Today. See M 0230.

Fridays

1600	Merlin Network One: From the UK.
1600	UK, BBC London (am/au): World News. See S 1200.
1600	USA, KWHR (Angel 1, 2, 3): USA Radio News. See S 0000.
1605	USA, KWHR (Angel 3 Hawaii): Music. See S 0215.
1605	USA, WHRI (Angel 1/2 Indiana): Bible Pathway. See S 1220.
1610	USA, WHRI (Angel 1 Indiana): The Inside Pitch. See M 1135.
1610	USA, WHRI (Angel 2 Indiana): The Voice of Salvation. See S 1225.
1615	UK, BBC London (am/au): Multitrack Alternative. Latest developments on the British music scene.
1615	USA, WHRI (Angel 1 Indiana): Life in the Word. See M 1345.
1615	USA, WHRI (Angel 2 Indiana): Ever Increasing Faith. See M 1200.
1630	USA, WHRI (Angel 1 Indiana): Music. See S 0215.
1630	USA, WHRI (Angel 2 Indiana): Power Today. See M 0230.
1645	UK, BBC London (am/au): Insight. See S 0345.
1645	USA, WHRI (Angel 2 Indiana): Music. See S 0215.

Saturdays

1600	Merlin Network One: The Media Zoo (reprise).
1600	UK, BBC London (am/au): World News. See S 1200.
1600	USA, KWHR (Angel 1, 2, 3): USA Radio News. See S 0000.
1600	USA, WHRI (Angel 2 Indiana): The Message of Love and Victory. Jan Graybill of Tulsa, Oklahoma with music and a Bible lesson.
1604	USA, KWHR (Angel 3 Hawaii): Turn Your Radio On. See S 0005.
1605	UK, BBC London (am/au): SportsWorld. See A 1405.
1633	USA, WHRI (Angel 2 Indiana): Adventures in Odyssey. See S 1330.

FREQUENCIES

2100-2200	Anguilla, Caribbean Beacon	11775am			
2100-2130 vl	Australia, ABC/Alice Spgs	2310do			
2100-2130 vl	Australia, ABC/Katherine	2485do			
2100-2200 vl	Australia, ABC/Katherine	5025do			
2100-2130 vl	Australia, ABC/Tent Creek	2325do			
2100-2200	Australia, Radio	7240as	9500pa	9660pa	11880pa
		12080as	17715pa	21740pa	
		3365do	4820do		
2100-2200 vl	Botswana, Radio	9625do			
2100-2200 vl	Canada, CBC N Quebec Svc	6070do			
2100-2200	Canada, CFRX Toronto	6030do			
2100-2200	Canada, CFVP Calgary	6130do			
2100-2200	Canada, CHNX Halifax	6160do			
2100-2200	Canada, CKZN St John's	6160do			
2100-2200	Canada, CKZU Vancouver	5995af	7235af	9770af	9805af
2100-2159	Canada, R Canada Intl	11945af	13650af	13690af	15150af
		17820af			
2100-2130	China, China Radio Intl	5220eu	6950eu	9920eu	11975eu
		15500af			
2100-2200	Costa Rica, RF Peace Intl	15050am	21460am		
2100-2130	Cuba, Radio Havana	13720eu	13750eu		
2100-2127	Czech Rep, R Prague Intl	5930eu	7345va		
2100-2200	Ecuador, HCJB	15115eu	21455am		
2100-2200	Egypt, Radio Cairo	15375af			
2100-2200 mtwhf	Eq Guinea, Radio Africa	7190af	15186af		
2100-2150	Germany, Deutsche Welle	9615af	9670as	9690af	9765as
		11785af	11865af	15275af	
		12040as			
2100-2200	Germany, Overcomer Minist	3366do	4915do		
2100-2200 vl	Ghana, Ghana BC Corp	3290do	5950do		
2100-2200	Guyana, GBC/Voice of	7410eu	9650eu	9910au	9950eu
2100-2200	India, All India Radio	11620va	11715au		
		11785va			
2100-2200 irreg	Iraq, Radio Iraq Intl	3985va			
2100-2200 vl	Italy, IRRS	3985va			
2100-2200	Japan, Radio/NHK	6035pa	9725eu	11850pa	13630na
2100-2130	Kenya, Kenya BC Corp	4885do	4935do		
2100-2200 vl	Lesotho, Radio	4800do			
2100-2115	Liberia, LCN/R Liberia Int	5100do			
2100-2200	Malaysia, Radio	7295do			
2100-2130 smthf	Mexico, Radio Mexico Intl	9705na			
2100-2200 vl	Namibia, NBC	3270af	3289af		
2100-2200	New Zealand, R NZ Intl	17675pa			
2100-2200 vl	Nigeria, Radio/Ibadan	6050do			
2100-2200 vl	Nigeria, Radio/Kaduna	4770do			
2100-2200	Nigeria, Radio/Lagos	3326do			
2100-2200	North Korea, R Pyongyang	4405as	6575eu	9335eu	11710am
		13760am			
2100-2200 vl	Papua New Guinea, NBC	9675do			
2100-2125	Poland, Polish R Warsaw	6035eu	6095eu	7285eu	9525eu
2100-2200	Romania, R Romania Intl	7105eu	9550eu	9690eu	
2100-2200	Russia, Voice of Russia WS	7340eu	7360eu	9820eu	9890eu
		12020eu	12070eu		
2100-2200 vl	Solomon Islands, SIBC	5020do			
2100-2130	South Korea, R Korea Intl	3970eu	6480eu		
2100-2200	South Korea, R Korea Intl	15575eu			
2100-2200	Syria, Radio Damascus	12085na	13605na		
2100-2200	UK, BBC World Service	3255af	3915as	3955eu	5965as
		5975va	6110as	6180eu	
		6190af	6195va	7325eu	9410eu
		9740pa	11835af	12095sa	15400af
2100-2200	USA, KAIJ Dallas TX	13815va			
2100-2200	USA, KTBN Salt Lk City UT	15590am			
2100-2200	USA, KWHR Naalehu HI	15405as			
2100-2200	USA, Voice of America	6035af	6040me	6095me	7415af
		11870pa	11975af	13710af	15185pa
		15410af	15580af	17725af	17735pa
2100-2200	USA, WBCQ Monticello ME	7415na			
2100-2200	USA, WEWN Birmingham AL	9385eu	11875na	13615na	
2100-2200 mtwhfa	USA, WGTG McCaysville GA	9400am			
2100-2200	USA, WHRA Greenbush ME	15460af			
2100-2200	USA, WHRI Noblesville IN	5755am	9495am		
2100-2200	USA, WINB Red Lion PA	13790am			
2100-2200	USA, WJCR Upton KY	7490na	13595as		
2100-2200 as	USA, WRMI/R Miami Intl	9955sa			
2100-2200	USA, WRNO New Orleans LA	15420am			
2100-2200 vl	USA, WSHB Cypress Crk SC	13770eu	15665af		
2100-2200	USA, WWCR Nashville TN	9475na	12160na	13845na	15685na
2100-2200	USA, WYFR Okeechobee FL	7355eu	11580af	15565va	
2100-2200 vl	Vanuatu, Radio	4960do			
2100-2110	Vatican State, Vatican R	4005eu	5880eu	7250eu	
2100-2200	Zambia, Christian Voice	3330af	4965af		
2100-2200	Zambia, Natl BC Corp	6165do	6265do		
2100-2200 vl	Zimbabwe, Zimlabwe BC	3306do	4828do		
2115-2145 mtwhfa	Armenia, Voice of	4810va	9965va		
2115-2200	Egypt, Radio Cairo	9900eu			
2115-2130 mtwhf	UK, BBC Caribbean Report	5975ca	15390ca	17715ca	
2130-2200 vl	Australia, ABC/Tent Creek	4910do			
2130-2200 th	Belarus, R Belarus Intl	7105eu	7210eu		
2130-2200	Guam, AWR/KSDA	15610as			

2130-2200	Iran, VOIRI	6165au	9725as		
2130-2135 mtwhf	Latvia, Radio Latvia Intl	5935eu			
2130-2155	Moldova, R Moldova Intl	7520eu			
2130-2200	Turkey, Voice of	9525va			
2130-2145 t f	UK, BBC Calling Falklands	11680sa			

2200 UTC					
2200-2300	Anguilla, Caribbean Beacon	6090am			
2200-2300 vl	Australia, ABC/Katherine	5025do			
2200-2300 vl	Australia, ABC/Tent Creek	4910do			
2200-2300	Australia, Radio	17715pa	17795pa	21740pa	
2200-2300	Bulgaria, Radio	7535eu	7545eu		
2200-2300	Canada, CBC N Quebec Svc	9625do			
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			
2200-2229	Canada, R Canada Intl	5995va	7235va	9770va	9805va
		11705as	11945va	13690va	15150va
2200-2256	China, China Radio Intl	7170eu			
2200-2300	Costa Rica, RF Peace Intl	15050am	21460am		
2200-2245	Egypt, Radio Cairo	9900eu			
2200-2300 mtwhf	Eq Guinea, Radio Africa	7190af	15186af		
2200-2300	Germany, Overcomer Minist	12040as			
2200-2300 vl	Ghana, Ghana BC Corp	3366do	4915do		
2200-2300	Guyana, GBC/Voice of	3290do	5950do		
2200-2230	Hungary, Radio Budapest	3975eu	7250eu		
2200-2230	India, All India Radio	7410eu	9650eu	9910au	9950eu
		11620va	11715au		
		6165au	9725as		
2200-2230	Iran, VOIRI	3985va			
2200-2300 vl	Italy, IRRS	5990as	9675as	11900as	
2200-2225	Italy, RAI Intl	5100do			
2200-2215	Liberia, LCN/R Liberia Int	12080pa			
2200-2300	Malaysia, Radio	7295do			
2200-2225	Moldova, R Moldova Intl	7520eu			
2200-2300 vl	Namibia, NBC	3270af	3289af		
2200-2300	New Zealand, R NZ Intl	17675pa			
2200-2300 vl	Nigeria, Radio/Ibadan	6050do			
2200-2300 vl	Nigeria, Radio/Kaduna	4770do			
2200-2300	Nigeria, Radio/Lagos	3326do			
2200-2300 vl	Papua New Guinea, NBC	9675do			
2200-2230	Serbia, Radio Yugoslavia	6100eu	6185eu		
2200-2300 vl	Solomon Islands, SIBC	5020do			
2200-2300 as	Spain, R Exterior Espana	9595af	9680eu		
2200-2205	Syria, Radio Damascus	12085eu	13605na		
2200-2300	Taiwan, Radio Taipei Intl	5810eu	9985eu		
2200-2230	Turkey, Voice of	9525va			
2200-2300	UK, BBC World Service	3955eu	5965as	5975am	6175na
		6195va	7110as	7385as	9590na
		9660as	9915sa	11835af	11955as
		12080pa	12095sa	15400af	
2200-2300	UK, Merlin Network One	7120eu	7170eu	9835na	
2200-2300	Ukraine, R Ukraine Intl	4820eu	5905eu	6020eu	6080eu
		7150na	7205eu	7380eu	7420eu
		9560eu	9610na		
2200-2300	USA, KAIJ Dallas TX	13815na			
2200-2300	USA, KTBN Salt Lk City UT	15590am			
2200-2300	USA, KWHR Naalehu HI	17510as			
2200-2300	USA, Voice of America	7215as	9770as	9890as	11760as
		15185as	15290as	15305as	17735pa
		17820as			
2200-2230 mtwhf	USA, Voice of America	6035af	7415af	11975af	12080af
		13710af			
2200-2300	USA, WBCQ Monticello ME	7415na			
2200-2300	USA, WEWN Birmingham AL	5825na	5850eu	13615na	
2200-2300 mtwhfa	USA, WGTG McCaysville GA	6890na	9400am		
2200-2300	USA, WHRA Greenbush ME	13760af			
2200-2300	USA, WHRI Noblesville IN	5755am	9495am		
2200-2300	USA, WINB Red Lion PA	13790am			
2200-2300	USA, WJCR Upton KY	7490na	13595as		
2200-2300 as	USA, WRMI/R Miami Intl	9955sa			
2200-2300	USA, WRNO New Orleans LA	15420am			
2200-2300 vl	USA, WSHB Cypress Crk SC	13770eu	15285sa		
2200-2300	USA, WWCR Nashville TN	5070na	7435na	9475na	13845na
2200-2245	USA, WYFR Okeechobee FL	11580af	11740na	15565af	
2200-2300 vl	Vanuatu, Radio	4960do			
2200-2210	Zambia, Natl BC Corp	6165do	6265do		
2230-2300	Albania, R Tirana Intl	7160eu			
2230-2300	Austria, R Austria Intl	5945eu	6155eu	13730af	
2230-2300	Belgium, R Vlaanderen Int	13670na			
2230-2300	Cuba, Radio Havana	9550am			
2230-2257	Czech Rep, R Prague Intl	7345na	9435na		
2230-2300	Sweden, Radio	6065va	7325va		
2240-2250	Greece, Voice of	7475au	9425au		
2245-2300	India, All India Radio	7410as	9705as	9950as	11620as
2245-2300	USA, WYFR Okeechobee FL	11740na			
2245-2300	Vatican State, Vatican R	7305au	9600au	11830au	

FREQUENCIES

2300-0000	Anguilla, Caribbean Beacon	6090am				2300-0000 vi	Solomon Islands, SIBC	5020do							
2300-0000 vi	Australia, ABC/Katherine	5025do				2300-0000	Turkey, Voice of	7280eu	9655va						
2300-0000 vi	Australia, ABC/Tent Creek	4910do				2300-0000	UK, BBC World Service	3955eu	5965am	5975am	6035as				
2300-0000	Australia, Radio	9660pa	12080as	17715pa	17795pa			6175na	6195va	7110as	9590na				
		21740pa						9915sa	11945as	11955as	12095sa				
		9625do						15280as							
2300-0000	Canada, CBC N Quebec Svc	6070do				2300-0000	UK, Merlin Network One	3985eu	7170eu	9835na					
2300-0000	Canada, CFRX Toronto	6070do				2300-0000	USA, KAIJ Dallas TX	13815na							
2300-0000	Canada, CFVP Calgary	6030do				2300-0000	USA, KLTN Salt Lk City UT	15590am							
2300-0000	Canada, CHNX Halifax	6130do				2300-0000	USA, KWHR Naalehu HI	17510as							
2300-0000	Canada, CKZN St John's	6160do				2300-0000	USA, Voice of America	7215as	9770as	9890as	11760as				
2300-0000	Canada, CKZU Vancouver	6160do						15185as	15290as	15305as	17735pa				
2300-2329	Canada, R Canada Intl	5960am	6040am	9535am	9755am			17820as							
		11865am						7415na							
2300-0000	Costa Rica, RF Peace Intl	15050am	21460am			2300-0000	USA, WBCQ Monticello ME	5825na	5850eu	13615na					
2300-2330	Cuba, Radio Havana	9550am				2300-0000	USA, WEWN Birmingham AL	5085am	6890am						
2300-0000	Egypt, Radio Cairo	9900am				2300-0000 mtwhfa	USA, WGTG McCaysville GA	13760af							
2300-2350	Germany, Deutsche Welle	5990as	6045as	6130as	7235as	2300-0000	USA, WHRA Greenbush ME	5755am	9495am						
		15360as				2300-0000	USA, WHRI Noblesville IN	13790am							
2300-0000 s	Germany, Good News World R	9405sa				2300-0000	USA, WINB Red Lion PA	7490na	13595as						
2300-0000	Germany, Overcomer Ministr	12040as				2300-0000	USA, WJCR Upton KY	9955sa							
2300-0000 vi	Ghana, Ghana BC Corp	3366do	4915do			2300-0000	USA, WRMI/R Miami Intl	7355am							
2300-2330 as	Guam, AWR/KSDA	11775as				2300-0000	USA, WRNO New Orleans LA	7510eu	15285sa						
2300-0000	Guyana, GBC/Voice of	3290do	5950do			2300-0000 vi	USA, WSHB Cypress Crk SC	5070na	7435na	9475na	13845na				
2300-0000	India, All India Radio	7410as	9705as	9950as	11620as	2300-0000	USA, WWCR Nashville TN	11740na							
2300-2315	Liberia, LCN/R Liberia Int	5100do				2300-2345	USA, WYFR Okeechobee FL	4960do							
2300-0000	Malaysia, Radio	7295do				2300-0000 vi	Vanuatu, Radio	15235va	15415va	15435va					
2300-2325	Moldova, R Moldova Intl	7520eu				2315-0000 vi	Libya, Voice of Africa	6040am	9535am	11865am					
2300-0000 vi	Namibia, NBC	3270af	3289af			2330-2359 as	Canada, R Canada Intl	5960na	9755na						
2300-0000	New Zealand, R NZ Intl	17675pa				2330-2359	Canada, R Canada Intl	3300do							
2300-2330 vi	Nigeria, Radio/Ibadan	6050do				2330-0000 vi	Guatemala, Radio Cultural	7160do							
2300-2330 vi	Nigeria, Radio/Kaduna	4770do				2330-0000	Malaysia, RTM Sarawak	6165na	9845na						
2300-2330	Nigeria, Radio/Lagos	3326do				2330-0000	Netherlands, Radio	5940af	7400af	9839am					
2300-0000	North Korea, R Pyongyang	4405as	11335am	13760am	15130am	2330-2355	Vietnam, Voice of	12019am	15009af						
2300-0000 vi	Papua New Guinea, NBC	9675do						7450sa	9400sa	9400sa	11645sa				
2300-0000	Romania, R Romania Intl	6130eu	7195eu	9570na	11830na	2340-2350	Greece, Voice of								
2300-0000	Singapore, R Corp Singapore	6150do				2345-0000 mtwhf	UK, BBC World Service	3915as							
						930-1000	Italy, AWR Europe	7230eu							

SELECTED PROGRAMS

Sundays

- 2300 Merlin Network One: The Rock Radio Network.
- 2300 UK, BBC London (am/au): World News. See S 1200.
- 2300 USA, WHRA (Angel 5 Maine): The Call to Worship. See S 0430.
- 2300 USA, WHRI (Angel 1 Indiana): USA Radio News. See S 0000.
- 2300 USA, WHRI (Angel 2 Indiana): Standing Firm. Stan Wardlaw.
- 2305 USA, WHRI (Angel 1 Indiana): Music. See S 0215.
- 2330 UK, BBC London (am/au): Wright Round the World. Steve Wright's brand new show with listeners' requests and dedications.
- 2330 USA, WHRA (Angel 5 Maine): Music. See S 0215.

Mondays

- 2300 Merlin Network One: The Rock Radio Network.
- 2300 UK, BBC London (am/au): World News. See S 1200.
- 2300 USA, WHRA (Angel 2 Indiana/Angel 5 Maine): USA Radio News. See S 0000.
- 2300 USA, WHRI (Angel 1 Indiana): Lester Sumrall Teaching Series. See S 1400.
- 2305 UK, BBC London (am/au): Outlook. See M 1205.
- 2305 USA, WHRA (Angel 5 Maine): Music. See S 0215.
- 2305 USA, WHRI (Angel 2 Indiana): For the People (repeat). Chuck Harder is back with his old talk radio show.
- 2330 USA, KWHR (Angel 3 Hawaii): Lester Sumrall Teaching Series. See S 1400.
- 2345 UK, BBC London (am/au): Insight. See S 0345.

Tuesdays

- 2300 Merlin Network One: The Rock Radio Network.
- 2300 UK, BBC London (am/au): World News. See S 1200.
- 2300 USA, WHRA (Angel 2 Indiana/Angel 5 Maine): USA Radio News. See S 0000.
- 2300 USA, WHRI (Angel 1 Indiana): Lester Sumrall Teaching Series. See S 1400.
- 2305 UK, BBC London (am/au): Outlook. See M 1205.
- 2305 USA, WHRA (Angel 5 Maine): Music. See S 0215.
- 2305 USA, WHRI (Angel 2 Indiana): For the People (repeat). See M 2305.
- 2330 USA, KWHR (Angel 3 Hawaii): Lester Sumrall Teaching Series. See S 1400.
- 2345 UK, BBC London (am/au): Insight. See S 0345.

Wednesdays

- 2300 Merlin Network One: The 2-hour Album Zone.
- 2300 UK, BBC London (am/au): World News. See S 1200.
- 2300 USA, WHRA (Angel 5 Maine): USA Radio News. See S 0000.

- 2300 USA, WHRI (Angel 1 Indiana): Lester Sumrall Teaching Series. See S 1400.
- 2300 USA, WHRI (Angel 2 Indiana): USA Radio News. See S 0000.
- 2305 UK, BBC London (am/au): Outlook. See M 1205.
- 2305 UK, BBC London (am/au): Outlook. See M 1205.
- 2305 USA, WHRA (Angel 5 Maine): Music. See S 0215.
- 2305 USA, WHRI (Angel 2 Indiana): For the People (repeat). See M 2305.
- 2330 UK, BBC London (am/au): Multitrack X-Press. See W 1615.
- 2330 USA, KWHR (Angel 3 Hawaii): Lester Sumrall Teaching Series. See S 1400.

Thursdays

- 2300 Merlin Network One: The Rock Radio Network.
- 2300 UK, BBC London (am/au): World News. See S 1200.
- 2300 USA, WHRA (Angel 5 Maine): USA Radio News. See S 0000.
- 2300 USA, WHRI (Angel 1 Indiana): Lester Sumrall Teaching Series. See S 1400.
- 2300 USA, WHRI (Angel 2 Indiana): USA Radio News. See S 0000.
- 2305 UK, BBC London (am/au): Outlook. See M 1205.
- 2305 USA, WHRA (Angel 5 Maine): Music. See S 0215.
- 2305 USA, WHRI (Angel 2 Indiana): For the People (repeat). See M 2305.
- 2330 USA, KWHR (Angel 3 Hawaii): Lester Sumrall Teaching Series. See S 1400.
- 2345 UK, BBC London (am/au): Insight. See S 0345.

Fridays

- 2300 Merlin Network One: The Rock Radio Network.
- 2300 UK, BBC London (am/au): World News. See S 1200.
- 2300 USA, WHRA (Angel 5 Maine): USA Radio News. See S 0000.
- 2300 USA, WHRI (Angel 1 Indiana): Lester Sumrall Teaching Series. See S 1400.
- 2300 USA, WHRI (Angel 2 Indiana): USA Radio News. See S 0000.
- 2305 UK, BBC London (am/au): Outlook. See M 1205.
- 2305 USA, WHRA (Angel 5 Maine): Music. See S 0215.
- 2305 USA, WHRI (Angel 2 Indiana): For the People (repeat). See M 2305.
- 2330 USA, KWHR (Angel 3 Hawaii): Lester Sumrall Teaching Series. See S 1400.
- 2345 UK, BBC London (am/au): Insight. See S 0345.

Saturdays

- 2300 Merlin Network One: The Rock Radio Network.
- 2300 UK, BBC London (am/au): Play of the Week (from 2230). A different radio drama program each week.
- 2300 USA, WHRA (Angel 5 Maine): The Call to Worship. See S 0430.
- 2300 USA, WHRI (Angel 1 Indiana): USA Radio News. See S 0000.
- 2300 USA, WHRI (Angel 2 Indiana): DXing with Cumbre. See S 0400.
- 2305 USA, WHRI (Angel 1 Indiana): Irish Sports Report. See A 0505.

- 2330 UK, BBC London (AF): Warm World (6th, 13th, 20th). See T 0230.
- 2330 UK, BBC London (am/au): The Vintage Chart Show. See F 1530.
- 2330 USA, KWHR (Angel 3 Hawaii): A Temple of Jesus Christ. See A 0630.
- 2330 USA, WHRA (Angel 5 Maine): Music. See S 0215.
- 2330 USA, WHRI (Angel 1 Indiana): DXing with Cumbre. See S 0400.
- 2330 USA, WHRI (Angel 2 Indiana): Irish Sports Report. See A 0505.

HAUSER'S HIGHLIGHTS INDIA: ALL INDIA RADIO

via 250 kW Panaji, Goa, for B-98 switched from morning to evening schedule:

kHz	UTC	Lang
7265	1615-1730	Persian to ME
9700	1300-1500	Sinhala to Sri Lanka
9700	1530-1545	Home news in English
11695	1215-1330	Tibetan
11695	1330-1430	Nepali
11740	1530-1545	Home news in English
12040	1615-1730	Hindi to ME
15340	1115-1200	Thai
17595	1115-1215	Tamil to SE Asia
17595	1215-1245	Telugu to SE Asia

(Alok Dasgupta, India, DSWCI DX Window)

Causes and Effects of Ducting

What is ducting? (No, not duct tape!) What causes this phenomenon and how does it influence the propagation of radio waves?

What is ducting? Ducting is like a pipe or conduit that carries radio waves like in a pipe or duct, in the radio spectrum above VHF. The radio waves that become trapped in such a duct are bounced between the inside bottom and top of this "pipe" and can be carried very long distance without losing much of their energy.

What causes ducting? Ducting is a naturally occurring phenomenon caused by warmer air overrunning a colder surface. The elevated boundary between the warm air above and the colder air below, because of the different refraction index of the two layers, acts as a mirror bouncing the waves between this boundary and the colder surface that forms the bottom of this duct.

What influences does ducting have on radio propagation? The line of sight limit of VHF transmissions no longer exists under ducting conditions, and transmissions in the high frequency ranges start acting in a very peculiar fashion.

There is a unique situation that occurs along the U.S.-Canadian border around the Great Lakes region, in which the layers are reversed — the warmer water surface forming the bottom layer. When this surface ducting occurs, it becomes possible to trigger an amateur VHF repeater 2 to 300 miles away using a handheld transmitter with only 2 watts of output. In one case along the Canada/US border, a repeater in Rochester, NY, had the same input frequency as a repeater across Lake Ontario located in Kingston, ON. In the fall it becomes possible for an amateur in the Rochester to key up his handheld unit and get both repeaters activated! Lake Ontario, being a large body of water, remained warm in relation to the air for weeks after snow had started to fly. The only solution was for one of the repeaters to change frequency.

Another interesting case concerned a commercial VHF repeater system. The circuit was over 300 miles long, but was broken into four or five segments so that the same repeater input/output frequencies could be re-used along the line. In the fall again, two to three segments would enter into a self-perpetuating, locked-up stage because repeaters along the line would trigger each other and the carriers would remain on air. It was real chaos when the whole circuit got locked-up; no one could use the system. The only remedy to this situation was to send a technician up the mountain to pull the switch on one of the offending repeaters. This chaos was repeated for years before tone control was installed on the circuit!

OPTIMUM WORKING FREQUENCIES (MHz) For the Period 15 March to 14 April 1999 Flux=167 SSN=128 Predictions prepared using ASAPs for Windows®

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	28	28	27	23	21	18	17	17	16	15	14	14	14	16	22	26	27	28	29	30	31	31	31	29
WESTERN EUROPE	12	11	11	10	10	10	10	11	10	11					13	16	17	18	19	18	18	16	14	13
EASTERN EUROPE (P)		11	10	11	12	14	12								13	15	17	18	17	15				
MEDITERRANEAN	17	17	18	17	16	14	13	12							15	17	18	19	20	21	21	21	19	18
MIDDLE EAST (P)	13	13	14	18	17	15									12	14	17	18	17	15	14	14	14	14
CENTRAL AFRICA	25	24	23	19	17	15	14	13	13						18	20	22	22	24	24	24	24	25	25
SOUTH AFRICA	17	16	15	13	11	12	15	14	14					17	23	26	27	27	28	28	25	23	20	19
SOUTH EAST ASIA (P)	24	23	23	22	20	17	15				11	11	11	11	12	13	16	18	19	20	19	16	16	21
FAR EAST	24	23	23	22	20	18	15	13	12	11	11	11	11	11	13	14	14	14	14	14	16	21	23	23
AUSTRALIA	33	33	32	31	28	24	22	19	18	17	16	15	15	14	13	17	18	17	16	16	20	28	31	32
TO/FROM US MIDWEST																								
SOUTH AMERICA	25	24	22	19	18	16	16	15	15	14	12	13	14	19	24	25	26	27	27	28	28	28	28	27
WESTERN EUROPE	14	13	12	12	12	11	12	12	12	12	12	12	14	16	18	19	20	21	21	21	20	19	17	15
EASTERN EUROPE	10	10	10	10	12	12	12							14	15	17	18	19	18	16	14			
MEDITERRANEAN	18	17	18	16	15	14	13	12						17	18	19	20	21	22	22	22	21	19	18
MIDDLE EAST (P)	14	14	15	16	14	13								14	15	17	19	20	19	17	16	15	15	14
CENTRAL AFRICA	25	22	20	18	16	15	14	14	14					16	19	22	22	23	24	25	25	25	25	25
SOUTH AFRICA	17	16	15	13	11	12	15	15	15					18	24	26	27	27	28	29	28	25	24	21
SOUTH EAST ASIA (P)	21	21	20	18	16						11	11	12	14	15	18	19	20	20	19	17	16	20	
FAR EAST	23	22	22	20	17	15	13	12	11	11	11	11	11	12	13	15	15	15	14	14	17	21	22	23
AUSTRALIA	31	31	30	27	23	20	18	16	16	16	15	15	14	14	17	18	17	17	16	16	20	28	31	32
TO/FROM US EAST COAST																								
SOUTH AMERICA	21	19	17	16	15	15	14	14	12	12	11	13	19	22	24	24	24	24	25	26	25	25	25	23
WESTERN EUROPE	13	12	11	11	11	11	11	11	11	11	12	14	17	18	19	20	20	20	20	20	19	17	15	14
EASTERN EUROPE	10	10	10	10	11	12	11	11					13	15	16	18	19	19	19	18	16	14	12	11
MEDITERRANEAN	18	17	15	14	14	13	13	12					15	18	20	21	22	22	23	22	23	22	20	19
MIDDLE EAST (P)	15	14	15	14	13	13							15	17	18	19	20	21	21	19	18	16	16	15
CENTRAL AFRICA	24	21	19	18	17	17	16	15	15	15	17	22	26	28	29	29	30	29	29	27	26	27	27	26
SOUTH AFRICA	18	17	15	13	11	12	17	16	15	14	16	21	26	28	29	29	30	30	30	28	26	24	21	19
SOUTH EAST ASIA (P)	20	18	16	14								12	14	16	18	19	20	20	20	20	19	17	15	18
FAR EAST	21	20	18	16	14	13	12	12	12	12	11	12	13	15	15	14	15	15	14	15	16	19	21	21
AUSTRALIA	29	26	23	20	18	16	15	15	15	15	14	14	15	18	18	17	17	16	15	16	20	27	29	29

* Unfavorable conditions: Search around the last listed frequency for activity.
(P) denotes circuit across polar auroral zone; reception may be poor during ionospheric disturbances.

One of the most dramatic cases of ducting happened when two ships collided in fog with their radar fully operational. The radar antennas on these ships were located on top of the main mast 60 to 70 feet above the water. Yet, when the distress signal was transmitted, a small trawler, on its way to answer the distress call from about 10 miles away, could clearly see the echoes of the sinking ships on his very simple radar.

What was the difference? The small trawler had his radar antenna about 30 feet above the water line! The antennas located at 70 feet above the water were located above the inversion boundary, and the radar signals being transmitted were

being reflected by the topside of the duct. They could not penetrate this layer to see the other vessel that was located in the duct. The small trawler had its radar antenna located in the duct and could see all around with no impediment.

Ducting normally occurs where a body of water is present, but some cases have been reported over land. Fall is the season of choice for this phenomenon and it will also affect the transmission of FM and TV broadcasting/reception.

You have a few good months before the thunderstorms start and the lawn/garden needs all your attention, so good DX.

The Literate Listener

Those who love radio and those who love literature have much in common. Like good radio, good books are characterized by the skillful use of language. Both the broadcaster and the novelist use their expertise not merely to tell a story, but to create a context in the beholder's mind. Both radio and literature, at their best, "literally" grab the listener and reader and place them squarely in another environment, even as the latter remain physically in their own.

For the listener and reader, the capacity to concentrate and shun distractions, having a well-developed and active imagination and possessing an ability to relate one's own experiences to those being described complete the circle. This is the essence of the act of communicating.

Odd, then, isn't it, that much of what is passed off as "professional broadcasting" takes no notice of this relationship? So much of radio is less than what it could, and arguably should, be. Relaying facts, relaying ideas is one thing; but relaying experiences — now that's where the magic is!

Some of that magic is palpable when literature and the radio are married. Reading the words is one thing; but hearing them read is quite another! And the experience is only enhanced by adding voices and some sound effects.

■ Readings

Off the Shelf (on *BBC World Service T-A at 0445*) presents a nightly reading of classic and contemporary literature encapsulated and serialized in installments. Selections are not limited by genre or nationality. Recent readings have included works by Charles Dickens, Willa Cather, Raymond Chandler and Tom Bodett. This is a great and relaxing way to end one's day.

Between the Covers (on *CBC North Quebec T-A at 0345*) is the Canadian Broadcasting Corporation's version of "Off the Shelf." It, too, is an excellent program that features Canadian works exclusively. (For those in Canada or who live in the northern United States, the program also can be heard via medium wave at 10:45pm local time on CBC Radio One affiliates. For others unable to hear the broadcasts on radio, the program is also available via RealAudio on the Internet at <<http://www.radio.cbc.ca>>.)

Book Reading (on *Radio Australia, F at*

2305, and A, at 0305 and 1130), in turn, puts its emphasis on Australian literature — normally traditional fare that has its roots in the country's history or the "outback."

Audio Book Club (on *Voice of Russia S at 0632, M at 0432 and 1432, H at 2032 and A at 0332*) is a weekly half hour of readings from classic Russian literature which is nicely excerpted and well presented, marred only by the reception difficulties listeners have had of late.

Radio Reading Room (on *HCJB M and F at 0200 and 0500*) is a Voice of the Andes production that twice weekly reads from contemporary Christian literature. The latter is far more versatile than the uninitiated might first expect, ranging across the spectrum from fiction and mysteries to humor and anthology.

Short Story (on *BBC World Service S at 1730, T at 1045 and F at 0630*) is a series which alternates every six weeks or so with **Good Books** (which features discussions of great literature) and presents the literary works of listeners (like you and me) from around the world.

■ Drama

Play of the Week (on *BBC World Service A at 2230 and S at 0630 and 1830*) is the best and most ambitious of this genre. This series draws on virtually every theatrical concept to raise the radio play to an art form worthy of its own place in Western culture. Presentations range from the classics to specially commissioned works, even to those submitted by listeners as part of an annual contest in playwrighting. The listener needs some "staying power" as the program can run up to 90 minutes.

The Mystery Project (on *Radio Canada International A at 2330*) is a half-hour throwback to the old time radio mystery play. Besides actually presenting some 1940's radio dramas, this long-running CBC series features newly-produced works and series that offer a nod to this popular genre. Good fun, this one!

Sunday Showcase (on *CBC North Quebec and on CBC Radio One affiliates and the Internet [see above] M at 0305*) are hour-long productions more in the nature of those broadcast on the BBC's Play of the Week. Again, the CBC's efforts are oriented more toward new and Canadian productions, though on occasion British, American and Australian

productions turn up. Great theatre at a great time.

Westway (on *BBC World Service T and F at 0130, T and H at 1515 with a compilation edition M on 0430*) is a soap opera, a type not my personal favorite. But it is for many, and the BBC has put much effort in promoting it, so who am I to argue? It's set in a fictional West London medical centre.

Unshackled (on *HCJB W at 0230 and 0530 and on other religious stations*) is the oldest continuous drama on radio. Performed in melodramatic style, complete with organ accompaniment and narrator, the presentation is formulaic and centered around the theme of personal redemption through faith.

■ Literature in Arts Programs

Some programs focus on contemporary books and writers, discussing their works, styles and motivations. The best of these is **Meridian Books** on the *BBC World Service (H at 1430 and 2130 and A at 0130)* and **Talking Books** with Ian Brown during the third hour of **This Morning, the Sunday Edition** on *Radio Canada International (S at 1605)*.

In addition, smaller broadcasters without the resources to produce individual programs devoted solely to literature, often include reports and features on the subject within broader cultural or general magazine-style programs.

(The above listings are for services targeted to or generally audible in North America. Times and days are in UTC. Abbreviations are as they appear in *MT's* Shortwave Guide pages, which should be consulted for frequencies. Some of the times noted above may shift by one hour earlier UTC when Daylight Savings Time goes into effect at the end of the month.)

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Edited by John Figliozi

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SATELLITE RADIO GUIDE

AUDIO SUBCARRIERS

By Robert Smathers, roberts@nmia.com

Audio frequencies in MHz. All satellite/transponder coordinates are C-band unless otherwise noted.

DS=Discrete Stereo

Classical Music

SuperAudio-Classical Collections	G5, 21	6.30/6.48 (DS)
WCPE-FM (89.7) Raleigh/Durham/Chapel Hill, NC	G5, 7	5.58/6.12 (DS)
WFMT-FM (98.7) Chicago, IL-Fine Arts	G5, 7	6.30/6.48 (DS)
WQXR-FM (96.3) New York, NY	S4, 14	6.20/6.80 (DS)

Satellite Computer Services

Superguide	G5, 7	5.48
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Contemporary Music

Radio Desjardins 1	T5, 14	6.80
Radio Desjardins 2	T5, 14	6.20
SuperAudio-Light and Lively Rock	G5, 21	5.96, 6.12 (DS)
WBES-FM (94.5) "Charleston's Soft Rock B94.5" Charleston, WV	GE1, 12	5.90
WPHZ-FM (96.9) Bremen, IN (South Bend market)	G6, 15	6.48, 7.30 (DS)

Country Music

SuperAudio-American Country Favorites	G5, 21	5.04/7.74 (DS)
WSM-AM (650) Nashville, TN	C4, 24	7.38, 7.56

Easy Listening Music

FCC mandated safe-harbor program audio-easy listening music	G3R, 9	6.80
	G5, 2	6.80
SuperAudio-Soft Sounds	G5, 21	5.58/5.76 (DS)
United Video-easy listening music	C4, 8	5.895 (N)

Foreign Language Programming

Antenna Radio (Greek)	S4, 14	7.80
Arab Network of America radio network	GE2, 22	5.80
La Cadena CNN Radio Noticias (CNN Radio News in Spanish)	G5, 17	7.56
KAZN-AM (1300) Pasadena, CA-Radio Chinese (Chinese)	GE1, 22 (Ku-band)	5.80
Radio Tropical	GE1, 1	7.60
SRC AM Network	E2, 1	7.38
SRC FM Network	E2, 1	5.41/5.58 (DS)
Unidentified Los Angeles area ethnic radio station	GE-1, 22 (Ku-band)	7.78
WCRP-FM (88.1) Guyana, PR-religious (Spanish)	G6, 6	6.53

Jazz Music

KLON-FM (88.1) Long Beach, CA., ID-Jazz-88	G5, 2	5.58/5.76 (DS)
Superaudio-New Age of Jazz	G5, 21	7.38/7.56 (DS)

News and Information Programming

Broadcast News	E2, 1	5.78
Cable Radio Network	G5, 2	7.24 (N)
	G5, 2	8.30
	G7, 6	7.30
CNN Headline News	G5, 22	7.58
CNN Radio News	G5, 5	7.58
	G5, 5	6.30
	G5, 22	6.30
USA Radio Network-news, talk and information	GE3, 13	5.01, 5.20
WCBS-AM (880) New York, NY-news	G7, 19	7.38
WCCO-AM (830) Minneapolis, MN	GE3, 6	6.20

Religious Programming

Ambassador Inspirational Radio	GE3, 15	5.96, 6.48
Brother Staire Radio	G5, 6	6.48
KHCB-FM (105.7) Houston, TX	GE1, 9	7.28
LDS Radio Network	C1, 6	5.58

Salem Radio Network	GE3, 17	5.01, 5.20
Trinity Broadcasting radio service	G5, 3	5.58/5.78 (DS)
WHME-FM (103.1) South Bend, IN, ID-Harvest FM	G6, 15	5.58/5.78 (DS)
WROL-AM (950) Boston, MA (occasional Spanish)	GE3, 3 6.20	

Rock Music

KRLA-AM (1150) Los Angeles, CA - Oldies format	C1, 7	7.38
SuperAudio-Classic Hits-oldies	G5, 21	8.10/8.30 (DS)
SuperAudio-Prime Demo-mellow rock	G5, 21	5.22/5.40 (DS)
WOKI-FM (100.3) Oak Ridge-Knoxville, TN.	S3R, 7	6.20

Shortwave Broadcasters via Satellite

C-SPAN Audio 1: Various shortwave broadcasters	C3, 7	5.20
C-SPAN Audio 2: British Broadcasting Corporation (BBC)	C3, 7	5.41
Deutsche Welle	GE1, 22	7.38, 7.56, 7.74
RAI Satelradio Italy (Italian)	G7, 14	7.38
WEWN-Worldwide Catholic Radio, Vandiver, AL	G1R, 11	5.40 (English), 5.58 (Spanish)

WHRA Africa/Middle East-World Harvest Radio, South Bend, IN	G6, 15	7.82
WHRI Americas-World Harvest Radio, South Bend, IN	G6, 15	7.46
WHRI Europe-World Harvest Radio, South Bend, IN	G6, 15	7.55
KWHR Asia-World Harvest Radio, South Bend, IN	G6, 15	7.64
KWHR South Pacific-World Harvest Radio, South Bend, IN	G6, 15	7.73
World Radio Network: WRN1 North America	G5, 6	6.80
World Radio Network: WRN2 North America	G5, 6	6.20 (Multi-lingual)

Sports

KRLA-AM (1150) Los Angeles, CA/ L.A. Kings Hockey Radio Network	C1, 7	7.38
Madison Square Garden Network (MSG) Spanish Language S.A.P. (occ)	C4, 6	6.20

Specialty Formats

Aries In Touch Reading Service	C4, 10	7.87
Colorado Talking Book Network	C1, 3	5.60
SuperAudio-Big Bands (Sun 0200-0600 UTC)	G5, 21	5.58/5.76 (DS)
Weather Channel-background music	C3, 13	7.78
Wisdom Radio Network	GE1, 12	7.10
Yesterday USA-nostalgia radio	G5, 7	6.80

Talk Programming

American Freedom radio network	S4, 19	5.80
Amerinet Broadcasting	G1R, 17	5.58
Business Radio Network	C4, 10	8.06
For the People radio network	C1, 6	7.50
Friday Night Live (Fridays)	GE1, 12	5.70 (N)
	S4, 16	5.80
Orbit 7 Radio Network	C1, 14	7.48
Radio America Network	C1, 2	5.58
Republic Radio International	G7, 14	7.70
Talk America Radio Network #1-talk programs	GE3, 9	6.80
Talk America Radio Network #2-talk programs	GE3, 9	5.41
Talk Radio Network (TRN)	C1, 14	5.80
Truth Radio	S4, 19	7.56
TVRO.NET (featuring Keith Lamonica)	S4, 16	5.80
United Broadcasting Network	C1, 2	7.50
WOKIE Radio Network	GE1, 12	5.70 (N)
WWTN-FM (99.7) Manchester, TN-news and talk	G5, 18	7.38, 7.56

Variety Programming

CBM-AM (940) Montreal, PQ Canada-variety/fine arts	E2, 1	6.12
KBVA-FM (106.5) Bella Vista, AR., ID-Variety 106.5	G6, 6	5.58/5.76 (DS)
West Virginia Public Radio	GE1, 12	7.74
WNMX-FM (106.1) "Mix 106" Waxhaw, NC	G1R, 17	7.92
WUSF-FM (89.7) Tampa-St. Petersburg, FL (Public Radio)	C4, 10	8.26

SATELLITE RADIO GUIDE

AUDIO SUBCARRIERS / SCPC SERVICES

FM SQUARED (FM²) AUDIO GUIDE

GE-3 Transponder 13 (C-band)

Ambassador Inspirational Radio	1.41, 4.47 and 4.65 MHz
Blank audio carriers	1.05 and 3.57 MHz
Focus on the Family	1.23 MHz
Information Radio Network	3.39 MHz
International Broadcasting Network (IBN)	4.83 MHz
USA Radio Network	4.30, 5.01 and 5.20 MHz
Various Religious Programs (no common ministry)	.33 and 3.75 MHz
VCY/America (channel 1)	.51 MHz
VCY/America (channel 2)	.78 MHz

GE-3 Transponder 17 (C-band)

Blank audio carriers	1.28 and 3.57 MHz
Data Transmission	.80, 1.14, 1.21, and 2.06 MHz
Focus on the Family	1.05 and 1.40 MHz
In-Touch Ministries	4.47 MHz
Salem Satellite Network	4.65, 4.84, 5.01, and 5.20 MHz
SRN News	.33 MHz
USA Radio Network	1.77 MHz

Galaxy 3R Transponder 3 (Ku-band)

Blank Audio Carriers	2.06, and 3.25 MHz
Data transmissions	.06, 2.93, 3.07 and 3.17 MHz
AP Network News	3.53 MHz
In-Store audio network ads (various companies)	.71, .81, .91, .98, 1.05, 1.15, 1.26, 3.44, 3.62, 3.70, 3.80, 3.88, 3.97 and 4.20 MHz
Muzak Services	.15, .27, .39, .51, 1.36, 1.48, 1.60, 1.72, 1.84, 1.96, 2.19, 2.31, 2.44, 2.56, 2.68, 2.80, 3.34, 4.08, 4.34, and 4.45 MHz

Galaxy 3R Transponder 16 (Ku-band)

Data transmissions	.64, 1.95, 2.18, 2.40, 2.52, 2.73, 2.82, 2.92, 3.20, 3.24, 3.47, 3.73, 3.97, 4.14, and 4.24 MHz
In-Store audio networks	.15, .27, .39, .99, 1.11, 1.23, 1.35, 1.47, 1.59, 1.71, and 1.83 MHz

SBS 6 Transponder 13 (Ku-band)

Data Transmissions	.06, .15, .25, .30, .35, .47, .51, .57, .65, .71, .74, .76, .84, .89, .93, .96, 1.05, 1.12, 1.22 and 2.10 MHz
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Telstar 5 Transponder 28 (Ku-band)

Data Transmissions	.06, .15, .23, .30, .35, .38, .47, .57, .65, .71, .74, .76, .84, .89, .93, .96, 1.05, 1.12, and 1.22 MHz
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Single Channel Per Carrier (SCPC) Services

By Robert Smathers
roberts@nmia.com

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The frequency in the first column is the 1st IF (typical LNB frequency) and the second column frequency (in parentheses) is the 2nd IF (commercial receiver readout) for the SCPC listing. Both frequencies are in MHz.

GE-2 Transponder-Vertical 13 (C-band)

1178.70 (81.3) NASA space shuttle audio

GE-3 Transponder-Horizontal 13 (C-band)

1207.90 (52.1)	Wisconsin Voice of Christian Youth (VCY) America Radio Network—religious programming
1204.25 (55.75)	Wisconsin Voice of Christian Youth (VCY) America Radio Network—religious programming
1204.00 (56.0)	SRN (Salem Radio Network) News
1201.50 (58.5)	Wisconsin Voice of Christian Youth (VCY) America Radio Network—religious programming
1201.30 (58.7)	Wisconsin Voice of Christian Youth (VCY) America Radio Network—religious programming

Galaxy 6 Transponder 1-Horizontal (C-band)

1443.80 (56.2)	Voice of Free China (International Shortwave Broadcaster) Taipei, Taiwan
1443.60 (56.4)	KBLA-AM (1580) Santa Monica, CA—Radio Korea
1443.40 (56.6)	Voice of Free China (International Shortwave Broadcaster) Taipei, Taiwan
1438.30 (61.7)	WWRV-AM (1330) New York, NY—Spanish religious programming and music, ID—Radio Vision Christiana de Internacional
1436.50 (63.5)	West Virginia Metro News—network news feeds

Galaxy 6 Transponder 3-Horizontal (C-band)

1404.80 (55.2)	KOA-AM (850)/KTLK-AM (760) Denver, Colo—news and talk radio/Colorado college sports
1404.60 (55.4)	WGN-AM (720) Chicago, IL—news and talk radio/Northwestern college sports
1404.40 (55.6)	Illinois News Network—network news feeds/W MVP-AM (1000) Chicago, IL—talk/Chicago Blackhawks NHL radio network
1404.20 (55.8)	Tribune Radio Networks/Wisconsin Radio Network

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SATELLITE RADIO GUIDE



SINGLE CHANNEL PER CARRIER (SCPC) SERVICES

1402.70 (57.3)	WLAC-AM (1510) Nashville, TN—news and talk/ <i>Road Gang</i> trucker program (overnight)/Tennessee college sports	1382.00 (78.0)	sports Occasional audio/Westwood One college sports programming	1447.00 (53.0)	XEMZA-AM 560, Manzanillo, Mexico
1402.20 (57.8)	NorthWest Ag News Network - Agriculture info for the Pacific Northwest	1381.60 (78.4)	KEX-AM (1190) Portland, OR—news and talk radio	Anik E1 Transponder 21-Horizontal (C-band)	
1402.00 (58.0)	Occasional audio/Clemson college sports	1381.40 (78.6)	Occasional audio	1036.70 (63.3)	In-store music
1401.50 (58.5)	USA Radio Network	1381.20 (78.8)	KJR-AM (950) Seattle, WA— sports talk radio/Washington State college sports	1037.00 (63.0)	In-store music
1399.50 (60.5)	Occasional audio	1377.10 (82.9)	In-Touch—reading service	1037.50 (62.5)	In-store music
1399.20 (60.8)	Occasional audio	1376.00 (84.0)	Kansas Audio Reader Network—reading service	SBS5 Transponder 2-Horizontal (Ku-band)	
1399.00 (61.0)	Sports Byline USA/Sports Byline Weekend	1375.40 (84.6)	USA Radio Network/Agrinet Agriculture news service	1013.60 (80.4)	Wal-Mart in-store network
1398.80 (61.2)	Talk Radio Network (TRN) — talk radio format	Galaxy 6 Transponder 4-Vertical (C-band)		1013.20 (80.8)	Wal-Mart in-store network
1398.50 (61.5)	Occasional audio	1376.00 (64.0)	Data Transmissions	1012.80 (81.2)	Sam's Wholesale Club in-store network
1398.30 (61.7)	WSB-AM (750) Atlanta, GA— news/talk/Georgia college sports	Galaxy 6 Transponder 6-Vertical (C-band)		1004.50 (89.5)	Wal-Mart in-store network
1398.00 (62.0)	Occasional audio	1347.00 (53.0)	WCRP-FM (88.1) Guayama, PR— Spanish language religious programming	1004.00 (90.0)	Wal-Mart in-store network
1397.80 (62.2)	Occasional audio/Colorado Avalanche NHL radio network	Anik E2 Transponder 1-Horizontal (C-band)		1003.60 (90.4)	Sam's Wholesale Club in-store network
1397.50 (62.5)	Minnesota Talking Book Radio Network—reading service for the blind	1446.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio—North (Quebec) service	1003.20 (90.8)	Wal-Mart in-store network
1397.10 (62.9)	Wisconsin Radio Network/Wisconsin college sports	Anik E2 Transponder 7-Horizontal (C-band)		RCA C5 Transponder 3-Vertical (C-band)	
1396.90 (63.1)	Occasional audio	1326.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio—North (Eastern Arctic) service	1404.80 (55.2)	RFD Radio Service
1396.70 (63.3)	Radio America Network	Anik E2 Transponder 13-Horizontal (C-band)		1404.60 (55.4)	Wyoming News Network—network news feeds/Northern Sports Network/Wyoming college sports
1396.40 (63.4)	Georgia News Network (GNN)—network news feeds	1206.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio—North (MacKenzie) service	1400.60 (59.4)	Learfield Communications/Indiana college sports
1396.00 (64.0)	WHO-AM (1040) Des Moines, IA—talk radio/Iowa News Network—network news feeds/Iowa college sports	1205.00 (54.5)	Canadian Broadcasting Corporation (CBC) Radio—Occasional feeds/ events	1400.40 (59.6)	Learfield Communications/MissouriNet
1395.80 (64.2)	WTMJ-AM (620) Milwaukee, WI—talk radio/Wisconsin college sports	Anik E2 Transponder 17-Horizontal (C-band)		1400.20 (59.8)	Occasional audio/Data transmissions
1395.60 (64.4)	WGST-AM/FM (640/105.7) Atlanta, GA ID <i>Planet Radio</i> —news and talk radio	1126.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio—North (Western Arctic) service	1400.00 (60.0)	Learfield Communications/Purdue college sports
1395.40 (64.6)	Michigan News Network—network news feeds/Michigan college sports	1125.50 (54.5)	Canadian Broadcasting Corporation (CBC) Radio—North (Newfoundland and Labrador) service	1396.60 (63.4)	Kansas Information Network/Kansas Agnet—network news feeds/Southwest Missouri State college sports
1395.00 (65.0)	Occasional audio	Anik E2 Transponder 23-Horizontal (C-band)		1396.40 (63.6)	Liberty Works Radio Network — talk radio
1394.70 (65.3)	WJR-AM (760) Detroit, MI—news and talk radio/Michigan News Network	1006.00 (54.0)	Societe Radio-Canada (SRC) Radio-AM Network	1396.20 (63.8)	MissouriNet/Illinois college sports
1394.50 (65.5)	XEPRS-AM (1090) Tijuana, Mexico— Spanish language programming	1005.50 (54.5)	Canadian Broadcasting Corporation (CBC) Radio—North (Yukon) service	1396.10 (63.9)	Occasional audio/Illinois college sports
1394.30 (65.7)	Michigan News Network/Michigan State college sports	Solidaridad 1 Transponder 1-Vertical (C-band)		1395.90 (64.1)	Western Montana Radio Network/Red River Farm Network/Montana college sports
1385.40 (74.6)	WDUQ-FM (90.5) Pittsburgh, PA — Jazz format	1447.90 (52.1)	Antenna Radio Noticias	1395.70 (64.3)	MissouriNet/Kansas State college sports
1384.60 (75.4)	WDUQ-FM (90.5) Pittsburgh, PA — Jazz format	1447.60 (52.4)	Antenna Radio Noticias	1386.40 (73.6)	Learfield Communications
1384.40 (75.6)	KOA-AM (850)/KTLK-AM (760) Denver, CO—news and talk radio/Colorado college sports	1447.20 (52.8)	La Grande Cadena Raza	1386.20 (73.8)	Radio Iowa/Iowa college sports
1384.20 (75.8)	WSB-AM (750) Atlanta, GA — news/talk/Georgia college sports	Anik E2 Transponder 21-Horizontal (C-band)		1386.00 (74.0)	United broadcasting Network—talk radio
1383.70 (76.3)	Motor Racing Network (occasional audio) NASCAR racing	Anik E2 Transponder 7-Horizontal (C-band)		1384.60 (75.4)	Capitol Radio Network//North Carolina State college sports
1383.10 (76.9)	KIRO-AM (710) Seattle, WA—news and talk radio	1326.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio—North (Eastern Arctic) service	1384.00 (76.0)	Occasional audio/ABC Direction Network—network news feeds
1382.60 (77.4)	Soldiers Radio Satellite (SRS) network—U.S. Army information and entertainment radio/Army college	1325.50 (54.5)	Canadian Broadcasting Corporation (CBC) Radio—North (MacKenzie) service	1383.80 (76.2)	Occasional audio/Syracuse college sports
		1325.00 (54.5)	Canadian Broadcasting Corporation (CBC) Radio—Occasional feeds/ events	1383.40 (76.6)	Capitol Radio Network/North Carolina college sports
		1326.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio—North (Eastern Arctic) service	1382.90 (77.1)	MissouriNet/Missouri college sports
		1326.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio—North (Eastern Arctic) service	1382.50 (77.5)	Virginia News Network—network news feeds
		1326.00 (54.0)	Canadian Broadcasting Corporation (CBC) Radio—North (Eastern Arctic) service	1382.10 (77.9)	Learfield Communications/MissouriNet/Illinois college sports/Blues NHL radio network

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Putting It All Together

Response to this column from *MT* readers after the first couple of issues combining *Satellite Times* and *Monitoring Times* has been gratifying. There is certainly an air of excitement among *MT* readers anxious to start listening to shortwave and domestic broadcasters on satellite and others who are intrigued by the new digital modes which make niche programming access a reasonably inexpensive reality. Among the most asked questions are: where to find information on this technology; where to buy equipment and how to install it. And, that brings us to this month's topic: Putting It All Together.

■ You Can Do It

One thing the small dish revolution has accomplished is to show how easy it is for consumers to do their own installations. The only difference between doing a direct broadcast satellite (DSS) installation and a big C-band installation is size! With just a few basic tools you can install your own C-band, Ku-band, digital, or analog satellite TV system. While your neighbors are grumbling about high cable-TV rates and poor service, you'll be tuning into a range of video and audio entertainment they may never have access to!

If you're looking for cable-style entertainment and a worry-free installation and don't want a new hobby, I recommend getting any one of the three small dish systems (Primestar, DirecTV, or DISH). If you're adventurous, want to discover programming frontiers and don't mind a new hobby which will ask you to do a little tinkering and head scratching I say, "Welcome to the Clarke Belt!" The important thing is, don't think you don't have the money or the space to do it yourself. Believe it or not, money is no object and, as you'll soon read, neither is space.

Gone are the days when consumers had to rely on satellite dealers with soaring installation rates and huge product mark ups. With catalog retailers and Internet discounters, consumers now have a choice and prices for new

equipment have never been lower. Of course, if you don't want to do it yourself and price is no object, there are plenty of local dealers who will do an expert job of setting up your initial system. You may even find dealers who will do the installation of equipment you bought elsewhere.

■ Let's Shop

The most important thing to do when getting started in satellite TV is comparison shop. If you're thinking about getting a DBS system, there are huge price differences among sources. Even when you're looking for subscription packages, you can save a lot of money by taking a little time to compare prices.

With big dish systems there's even more money at stake. Off-the-shelf systems from local dealers can cost in excess of \$2,000 installed. With careful shopping, and by doing it yourself, you can cut that price in half! By getting used or factory serviced equipment, that figure can be additionally halved. In fact, you can get a complete C-band system from someone in your area who's jumping to DBS for as little as \$200. Make an offer!

The latest concept in satellite equipment retailing is found on the Internet where many local dealers are discovering the potential of reaching tens of thousands of new customers they'd ordinarily not have access to. This has provoked a price war on many satellite TV products such as dishes, receivers, and LNBs.

The customer is the beneficiary, but, before buying, find out what the warranty or product return policy is. The policies can differ from company to company.

If you're buying with a credit card it's still a good policy to do so with a live person on an 800 number. Doing so also helps protect you from an unsatisfactory product purchase or delivery problems.

■ Installation 101

Mention satellite TV installation and most people will think about a looming 10-ft. dish dominating their backyard. It doesn't have to be that way. And, anyway, many *MT* readers live in townhouse-style apartments or condos: Few people have all the room they want for dish installation. Don't let this discourage you!

Take a closer look at the pictures on this page. Photo #1 shows the outside of a typical reader's apartment or condo. Where are the dishes? A view from the inside shows they are definitely there. The third photo shows a homemade installation of a 4.5-foot dish on a 10-by-10-foot deck. I actually set that dish up inside the patio doors shown and had excellent results with the dish looking through the glass.

Of course, dish pointing is severely limited and you do have to explain the eccentric decorating scheme. But, the point is, you can do an installation even without any space! And, if you aim at one of satellites packed

with digital signals, you could actually be getting quite a bit of programming without having to move the dish.

Another thing to notice about the two installations is that one is a professionally made mount with an actuator motor attached to move the dish while the other is a homemade mount made of 1-by-6-inch pine and is not intended to move without a lot of effort. Again, it all depends on what you want from a satellite TV installation. Your installation can be as complicated and expensive or simple and cheap as you like.

Regardless of the installa-

PHOTO #1: Can you find the dishes?



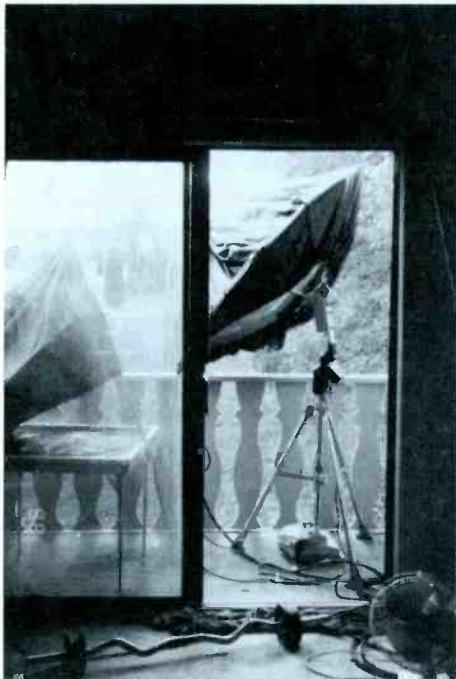


PHOTO #2: Inside view looking out: There they are!

tion, most dishes, mounts, feed horns, etc. are designed to be put together with only a socket wrench and maybe a screw driver or other hand tools. No need for a fancy toolbox crammed with esoteric tools. Buy your coax cables with connectors attached and you won't even need a crimping tool!

Before you go any further it really helps to do a "site survey." Do you have an unobstructed view of the south and west? (If you live in the west it would be south and east.) Will your installation be on top of a septic system or other utilities? (Bad idea.) Check to see if your view puts the dish in the front yard. Will that be a problem with your spouse or that neighbor you never got along with?

■ Four Steps to Success

I've simplified a big dish, permanent installation down to four easy steps. It just couldn't be easier!

1) Dig a hole. If you're doing a big dish (10-foot or larger) make the hole two feet in diameter and four feet deep. For a 6-foot dish make it 12 inches wide and three feet deep. Put gravel in the bottom of the hole and prop up the mounting pole which holds the dish up in the hole. Mix 4, 6 or 8 bags of Quikrete® or similar product depending on whether you're putting up a 6, 8 or 10-foot dish. Let it cure for 24 hours before mounting the dish. Use a level to make sure it's perpendicular and take readings all around the pole.

2) Dig a small trench and lay the all-

in-one cable from the place in your house where the receiver will be located out to the dish. Remember to leave plenty of extra cable to go up the pole and out to the feed horn. It will surprise you how much you'll need. Keep the overall run of cable to 100 feet or under. You don't want to add extra cable length as splicing and adding will reduce signal gain. You may put the cable in a PVC pipe three feet under ground and run it out to the dish with a down-turn pipe at the end to prevent rain from filling up the pipe, or, as I have done, just dig a trench 6 inches deep and lay in the cable.

3) On a garage floor, deck or some other smooth, flat surface, put the dish together as per manufacturer's instructions. Some installations want the mount on the dish to simply be slipped over the pole. Others may want the mount on the pole and the dish attached at that point. Follow directions.

4) Attach the low noise block downconverter (LNB) to the feed horn and mount it to the feed support. If you're using an low noise block downconverter feed (LNBF), the feed horn and LNB are already attached. Install according to instructions. Now, attach the ends of the cable as required. If you're doing a simple, no-actuator system with an LNBF you may only need one length of coax for the whole system (it switches polarity on the LNBF electronically and the voltage to do the switching is carried on coax to the LNB).

For a motorized, C/Ku-band, standard LNB feed horn installation you'll need two RG-6 cables for the two LNBs; three small hook-up wires for the polarotor; and three larger wires for the actuator motor. All-in-one cable has all this wiring conveniently bundled together. Now, go inside the house and hook up the other end of all those wires to the receiver. You're done!

■ Align the Dish

There are two types of mounts used today. One is called an azimuth/elevation (AZ/EL) mount, which means you have to adjust the



PHOTO #3: Dish on a deck: satellite TV for small places.

azimuth (where the dish is pointed east or west along the Clarke Belt) and elevation (how high or low against the horizon the dish is tilted) for each satellite you want to watch. The other type of mount, called a polar mount, is set up so that it tracks the Clarke Belt in one smooth line from horizon to horizon.

To initially set up the dish on the Clarke Belt, rotate the dish by the motor to the lowest point on the horizon east or west (depending on which side of the country you're located). Look for a transponder transmitting in the clear. C-SPAN, channel 7 on Satcom C3 (131° W) is perfect for East Coast viewers and NASA-TV, channel 9 on GE-2 (85° W) is great for West Coast viewers. Now loosen the bolts which secure the dish and mount to the pole. By rotating the whole dish and mount left or right and peaking the signal, you'll be aligning the dish to true north and south axis.

Now run the dish, via the motor, to the other satellite (GE-2 for East Coasters and C3 for West Coasters). Follow the directions for programming these two satellites in your receiver's memory. Most receivers have an automatic programming feature once you have two satellites programmed. Get into that set-up mode and sit back and let the receiver do the rest!

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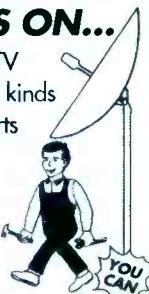
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Indoor Antennas and More

I have a radio hobbyist friend who, in the course of courting the woman who became his wife, discovered that she owned a house on the top of a hill with two large trees spaced about 130 feet apart. While I know that the basis for their relationship is much deeper than the location of these trees (just right for an 80 meter dipole), he remains the envy of many of his radio friends. Only recently did I have the opportunity to "one up" my friend by getting a house with a back lot large enough to string an 80 meter loop.

Although large lots with nice trees and (hopefully) understanding neighbors are worth seeking in the radio hobby, Old Uncle Skip is well aware that many folks, by either choice or circumstance, live in locations where large outdoor antennas are either not possible or are significantly discouraged. They live in apartment buildings, condominiums or gated communities. Most living arrangements that are not single family dwellings seem to be designed to inhibit the pursuit of radio pleasure. Whenever I speak to radio groups, I always encounter a large cross section of folks who have to contend with the evils of apartment listening and landlords who threaten bodily damage if they try to string an outside antenna.

All is not lost, my apartment-dwelling friends. Old Uncle Skip spent enough time condo crawling to come up with a few notions on how to get the most monitoring out of an otherwise bad situation. The rest of you stick around, too, because these ideas can also help you with monitoring out of motel rooms when you travel or even if you live in a hovel covered with that worst of all fates — aluminum siding.

■ Analyze the problem

First we should take a bit of a look at the problems that apartment or condo dwelling present. You can conduct a practical experiment to show these general effects. Take a self-contained portable radio and tune it to a powerful station. Now, take this radio and place it inside your kitchen oven. (Make sure the oven is *off*; burnt plastic smells terrible.)

Even with the door open you will probably notice that the signal drops off sharply. That is because the metal of the oven surrounding it is shielding the receiver on five sides. Now, close the door. The signal will drop off even



further because now the receiver is shielded on all six sides and the signal coming to it can only reach it through the observation window in the door.

Most commercial buildings are constructed with metal beams and girders. Also the walls are full of the plumbing and wiring harnesses for the multitude of residents. Add to this all of the other residents switching on and off various appliances and electrical devices (including color television sets that generate a generous amount of radio frequency [RF] noise), and you have a shielding situation akin to putting your receiver into the oven. Between the metal shielding and the human made electrical noise generated by your fellow tenants, it is a wonder that you can hear anything at all.

Further, any antenna system you develop will not follow the textbook design parameters because it will be forced to interact with the surrounding metal and electrical wires. If you have a portable receiver with a whip antenna on it you have probably noticed that it works better or worse depending on where you place it within your apartment. Usually it works best near a window, similar to our oven experiment.

■ Scope out the strong points

Go through your apartment and get a notion of your best possible antenna locations. Pay special attention to potential access to any crawl space or attic area. These areas can often allow you to string antennas almost as long as many practical outside antennas.

Try to figure out the longest straight line through your rooms. For example, you may find that you can eyeball a line from your kitchen, through your living room, through

your bedroom and into your bathroom with the line terminating near the bathroom window. In this case you can string a simple longwire antenna that would run the length.

Remembering our oven tests, now look at your apartment with an eye to locating antennas that run nearest to windows. Also note locations where you might run wire in an "L" shape along two walls.

Don't spend all of your time looking up at the ceiling. In a high-rise apartment you may find it is less hassle to string your antenna wires along your baseboard. Experimentation might even indicate that you get better results by using the floor.

■ Try, try again

Now that you have checked out locations for stringing wire, head off to your local hardware or electrical store and buy a big spool of ordinary stranded hookup wire. You can use a relatively light gauge such as No.20. For experimenting you can use almost any insulated wire you may have around. Once you have figured out your best antenna strategy, you can purchase wire that will be pleasing in size and color. If your receiver does not have screw type terminals for external antennas you will need to consult your owner's manual for proper connectors and purchase a few of the same.

A good place to start your experiments is with a wire cut to 24 feet in length. This works out to a quarter wavelength on the 31 meter shortwave broadcast band. Try this antenna in a few of the locations you have picked as possible listening posts. Conduct listening tests with the wire horizontal, vertical, "L" shaped, zig-zagged across a window, etc.

You can't really do anything wrong in this experiment. You are just trying to find a wire location and configuration that will yield the best results. Take notes on what works and what doesn't. Once you have exhausted the possibilities of the 24 foot wire you will probably have sufficient savvy to try a few longer or shorter wires to check for improvements in signal quality.

Remember, most of your battle is with strong local interference and not weak broadcast signals. Reduce the noise floor and the signals will pop up all over the bands.

You will probably discover that you will want to use several antennas of varying lengths.

Also, indoor antennas in excess of 48 feet (1/4 wave at 60 meters) will produce diminishing returns as you get right down among the kind of noise that you are fighting to hear over.

Another simple antenna can be constructed out of common aluminum foil hung with thumbtacks around two walls of your apartment. You connect the foil with an alligator clip (available at most hardware stores) and a short piece of wire. Not very pretty, but still, Old Uncle Skip logged over 100 countries in his grad school dorm with just such an antenna.

Don't forget that a good ground connection will help to battle noise and interference, so remember to follow your owner's manual for establishing a ground connection. You will most likely have to utilize the cold water pipe in your bathroom or kitchen.

■ Outdoor disguises

Even in an apartment or an antenna restricted zone, you may still be able to get something useful up on the outside. Many apartments have balconies attached to them. The balcony area will allow for all manner of outside antenna experiments, most of which will not give your landlady apoplexy.

One of the first things I always recommend to any apartment dweller with a balcony is *get patriotic!* Head out to the department store and buy a U.S. flag and pole kit. Using one of the pole sections as a guide, go to your neighborhood hardware store and buy the longest piece of similar diameter aluminum tubing you think you can get away with. Use this replacement pole as the staff by which Old Glory will hang. If you happen to run a length of feed line from it back into your receiver,



who is to be the wiser?

You can also conduct experiments similar to those for indoor antennas.

Remember that outdoor antennas should be disconnected from your receiver when not in use and during any electrical storm activity. Place the connector outside or in a glass jar when not in use and strongly consider a commercially produced surge suppressor. Also, do not run your outdoor antennas in such a way that they can come into contact with power lines. You can't enjoy this hobby if your nose lights up every time you try to turn your receiver on. Be careful around electricity!

If you are fairly high up in a high-rise apartment and you only do your listening after dark, you might try a more challenging antenna project. Using very light gauge wire such as No.24 or No.26, you can lower an antenna out of your window by placing a one or two ounce fishing weight on the end. The length of this antenna is only limited by how high up your window is.

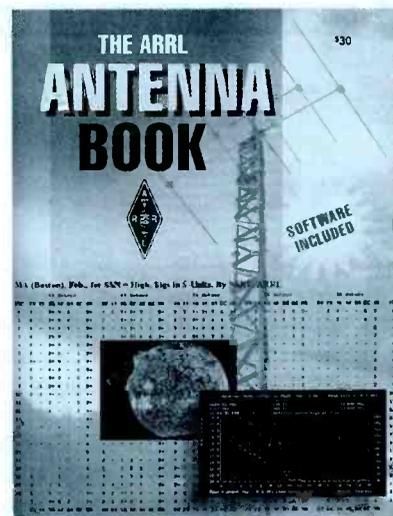
Be very careful that you don't lower this antenna onto your landlord's head or you may find yourself shopping for a new abode. Reeling this antenna in when not in use should keep people from being disturbed by your hobby. Again, watch out for power lines.

If you live on the topmost floor of your apartment building, you may want to consider asking if you may put up an antenna. Believe it or not, I get letters all the time from folks who have negotiated this privilege out of their apartment managers. Hey, it's worth a try, and your listening will improve enough to justify the asking. If you do work out an antenna arrangement, make sure you keep all your parts of the bargain so that the next radio person who moves into your apartment can enjoy the same privilege.

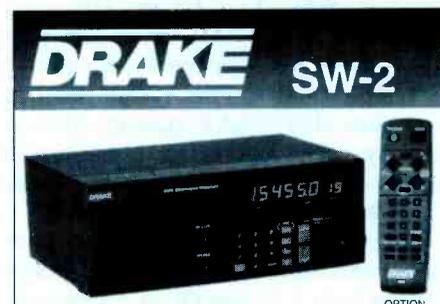
■ Resources for further reading

You can never know enough about antennas, especially if you live in an environment that is hostile to listening. To this end I strongly recommend *The ARRL Antenna Book*, R. Dean Straw N6BV Editor, \$30.00, published by the American Radio Relay League. Another exceptional antenna book that includes several discussions of limited space and apartment antennas is *Easy-up Antennas for Radio Listeners and Hams* by Edward M. Noll, originally published by Howard W. Sams & Company but recently re-released by MFJ Enterprises, Inc.. Both of these texts are available through many of the radio book dealers found in the pages of *MT*.

Setting up a listening post in an apartment or condominium can be frustrating at first.



But a little bit of experimentation and tenacity will yield results that may even put your single family dwelling friends to shame. Apartment antenna testing is inexpensive and fun once you get into it. And it doesn't hurt that you will learn a bit of antenna theory along the way.



The Drake SW-2 provide continuous coverage from 100 to 30000 kHz in AM, LSB and USB modes. Tuning is easy via manual knob, up-down buttons or 100 memories. The sideband selectable synchronous tuning stabilizes fading signals. Other refinements include: RF gain, tuning bar graphs, huge 100 Hz LED readout, keypad and dimmer. The optional remote (shown) lets you operate this radio from across the room (Order #1589 \$48.95). All Drake receivers are proudly made in Ohio, U.S.A. and feature a one year limited warranty.
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Watching Iraq

A few days before Christmas, the crisis concerning the renewed bombing of Iraq gave Europeans an unexpected reason for monitoring telemetry from the geostationary weather satellites that cover the region. Although resolution is lower than that available from suitably designed military reconnaissance satellites, for the serious amateur, they can provide images of areas of interest otherwise not available independently.

Yes, you can go on the Internet and download images from official European websites, but the ability to collect telemetry from your own antenna and decode it with your own setup, can be far more satisfying than merely collecting someone else's work.

The European METEOSAT-7 is stationed over longitude zero. In the early 1990s, following the Iraqi invasion of Kuwait, the Gulf region could be viewed by monitoring weather facsimile (WEFAX) or Primary Data transmissions from METEOSAT. A few years later, EUMETSAT commenced a policy of encrypting almost all Primary Data transmissions from METEOSAT (currently M-7), so that only synoptic (six-hourly) home-scanned images – including the mid-day transmission – are transmitted in the clear.

Fortunately an older METEOSAT (number 5) was brought into service in mid-1998 to help the Indoex (Indian Ocean Experiment) project. From its longitude at 63 east, visible-light and infra-red images are transmitted at regular intervals. METEOSAT-7 is re-transmitting unencrypted METEOSAT-5 lower resolution, whole-disc images at approximately hourly intervals – see figure 1.

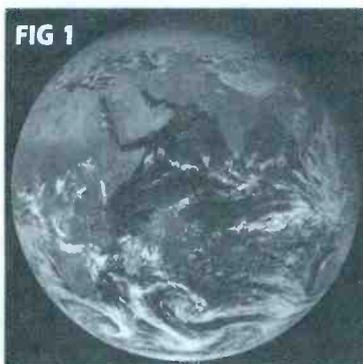


FIG 1
METEOSAT-5 (Indoex) December 21, 0920UTC visible-light images.

The image shows the Gulf region in sunshine, and a careful look at zoomed portions shows features that appear to be thin cloud. However, their shape is anything but random. One trail (or cloud) appears to start in Nafud, to the north of Saudi Arabia, crosses over Baghdad, and disperses over Afghanistan, completing a long, curved trail at variance with other local cloud formations.

METEOSAT-7 uses two channels – 1691.0 and 1694.5 MHz – for image transmissions; the former transmits standard WEFAX imagery, the latter transmits a mix of WEFAX and Primary Data User Station (PDUS) images. As with WEFAX transmissions from GOES-8 and GOES-10, METEOSAT-7's WEFAX comprises sets of sectored images originating from the original whole-disc scan.

Operational Weather Satellites

The Chinese Fengyun-2 geostationary weather satellite was brought back into operation just before Christmas. On Thursday December 17, a posting on the Internet WXSAT mailing list announced that Zhao Licheng, a scientist visiting CIRA from the Chinese National Satellite METEORological Center (NSMC), said that the FY-2 METEORological satellite, China's first geostationary METEORological satellite, had recommenced broadcasts of S-VISSR (stretched very high resolution infrared spin scan radiometer) to the international community. The data policy is that transmissions from FY-2 are open to all countries.

FY-2 IR F 18 DEC 98 05:01(UTC)



FIG 2
Fengyun-2 infra-red image December 18, 0501UTC

Shortly after the above message was received, I contacted the China Satellite METEORology Center and received a reply from Shi Jinming, the Director of the Computer Division at the Center. He kindly confirmed the continuation of operations, saying that the FY-2 satellite had restarted broadcasting S-VISSR with six transmissions every day: 03:00, 04:00, 05:00, 06:00, 07:00, 08:00 UTC. Raw data is being transmitted according to schedule.

The web site of the National Satellite METEORological Center of China is:

<http://nsmc.cma.gov.cn>

on which near real-time images can be viewed.

Information about the format of FY-2 S-VISSR data is also available at:

<http://www.cma.gov.cn>

via the National Satellite METEORological Center option.

I monitored the web site for some days and found that all three spectrum images (water vapor, infra-red and visible) were regularly available.

Scott Gennari confirms that image data is once more available at their NASA mirror site. The transmission schedule is limited to 6 broadcasts between 0300UTC and 0800UTC daily.

<http://rsd.gsfc.nasa.gov/goesg/earth/Weather/weather.html>

Polar Weather Satellite status

According to the Russian RESURS web site, the latest resources satellite in the series – RESURS-01-4 – was expected to resume transmissions by the end of January. This message came as a surprise to me because no one has reported any automatic picture transmissions (APT) from RESURS since last August. My own log book records an APT on August 11, at 1953UTC on 137.40 MHz. RESURS-01-4 uses 8192 MHz for high resolution image transmissions, but its APT was intermittent before terminating last August. Web address for news:

<http://www.ssc.se/sb/resurs/r4-news.html>

METEOR 3-5 continued transmissions during January, as reported by Dale Ireland and some southern hemisphere monitors. During most of the month the orbital plane of METEOR 3-5 slowly crossed the evening

terminator, where the satellite was moving north-bound. The effect of this orbital precession is that transmission cuts off before the satellite reaches more northerly latitudes. A satellite predictions program illustrates this, showing the rapidly reducing sunlight above 50 degrees N. By the end of January, we should hear METEOR 3-5 still transmitting during the afternoon part of its north-bound passes.

NOAAS-12, 14 and 15 remained in nominal operations – picture clarity subject only to the seasonally low level of illumination. I monitored a morning pass from NOAA-15, and, despite low sunlight, a considerable amount of detail was revealed after enhancing the visible-light portion of the image. Figure 3 shows the raw image as received on January 6th. The infrared channel on all NOAAS continues to provide excellent quality imagery.

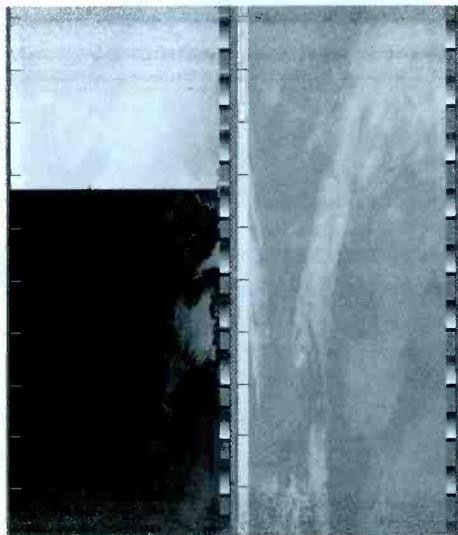


FIG 3: NOAA-15 image January 6 at 0830UTC – morning pass showing automatic channel changeover during south-bound travel.

■ SICH-1 and OKEAN-4

An occasional short transmission has been reported from the Russian oceanographic satellite SICH-1. I logged only one transmission during December, but others have reported greater success! The Russian OKEAN-4 was also heard once during January. Transmissions are invariably on 137.40 MHz and are mostly logged during passes over Russia. If any transmissions are heard on this frequency over America, I would expect that RESURS might be responsible.

■ GOES - Year 2000 tests

In Europe and the United States, satellite operators are preparing for the Y2K event. On

two occasions during 1998 the European satellite operator EUMETSAT conducted Y2K (year 2000) tests from METEOSAT-7. At the end of December, information was received from Steve Arnett of the Satellite Analysis Branch, NOAA/NESDIS/SSD, concerning a series of similar tests to be conducted from the GOES-7 satellite, positioned over longitude 105 west. Although the tests will have been completed by the time of publication, this summary provides background information.

The Office of Satellite Operations (OSO) arranged a second end-to-end test of its GOES system as it will operate in the year 2000. For the test, the time is set in the GOES ground system components to December 31, 1999, and run through the transition to January 1, 2000. Operations continue with the year 2000 time tag for the following 24 hours. Data flow consists of a GOES-8 GOES Variable Format (GVAR) data stream, time-tagged in the year 2000, and retransmitted via GOES-7.

This exercises the GVAR ingest systems to insure that all systems correctly process the data. A leap year test will also be performed. The National Weather Service and private users were invited to participate in the test that was scheduled for Monday, January 25, 1999, and due to end on Thursday, January 28, 1999.

Anyone requiring specific information should contact Gary McBrien, the Office of Satellite Operations year 2000 coordinator, at 457-5250.

■ GOES-L weather satellite ready for final testing

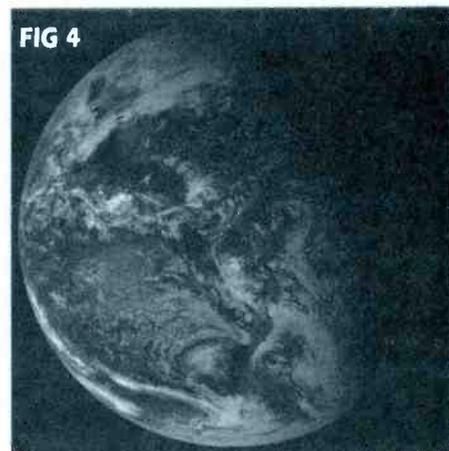
The GOES-L weather satellite arrived at Kennedy Space Center, ready to be launched aboard an Atlas II rocket in late March or early April. GOES-L is the fourth spacecraft to be launched in the new advanced series of geostationary weather satellites for the National Oceanic and Atmospheric Administration (NOAA).

The spacecraft is a three-axis, inertially stabilized weather satellite which has the dual capability of providing pictures while performing atmospheric sounding at the same time. Once in orbit the spacecraft is to be designated GOES-11 and should complete check-out before the start of the 1999 hurricane season.

■ Solstice images

While monitoring images from METEOSAT around the winter solstice, I collected a set from each available satellite; this included GOES-E, GOES-W, METEOSAT-5, METEOSAT-7 and GMS-5. I have slightly enhanced the GOES-E image

shown in figure 4 to show the terminator more clearly. On this 'shortest day' of the northern hemisphere year, the north and south poles can be seen to be in complete darkness and sunlight respectively.



GOES-E visible-light image December 21 at 2155 UTC

■ Correspondence

Telephone charges in Britain are relatively high, even at weekends, but an unexpected change in the regulations has given a new twist. Profits from such calls are now available to those companies that encourage more calls to be made; this has led to a new breed of Internet Service Provider. They do not charge for the service, but instead take a percentage of the profit made from each call.

Consequently, for correspondence, please note that I have changed my e-mail address and web site! Moving from an expensive provider to a truly free provider will have a significant impact. I hope to have updated my own site by the time this feature appears. Lawrence@itchycoo-park.freemove.co.uk <http://www.itchycoo-park.freemove.co.uk>

My thanks to Hank Brandli who has continued to send an occasional image from the Defense METEORological Satellite Program (DMSP) in which he previously worked. His images often feature unusual aspects.

FREQUENCIES

NOAA-14 transmits APT on 137.62 MHz
 NOAA-12 and -15 transmit APT on 137.50 MHz
 NOAAs transmit beacon data on 137.77 or 136.77 MHz
 METEOR 3-5 transmit APT on 137.85 MHz when in sunlight
 OKEAN-4 and SICH-1 sometimes transmit APT briefly on 137.40 MHz
 GOES-8 and GOES-9 use 1691 MHz for WEFAX

The 1999 Air Show Season Commences

The 1999 military flight demonstration team air show season starts this month. So in this month's Milcom column we will review some possible frequencies to monitor and the 1999 schedules (Table One) for each of the two major U.S. military flight demonstration groups.

The following frequencies were reported in use by the U.S. Navy Blue Angels during the 1998 season (channel number designators are tentative - not confirmed):

Freq MHz	Use	Chan (unconfirmed)
142.6250	Ground Support	
164.9000	Ground Support	Channel 6
168.9000	Ground Support	Channel 3
170.9000	Ground Support	Channel 1
236.4500	Usage Not Reported	Channel 17
238.1500	Diamond Air-to-Air	Channel 16
251.6000	Solo Air-to-Air	
263.3500	Fat Albert Demonstration	Channel 10
264.5500	Usage Not Reported	
273.3500	Diamond Air-to-Air	
275.3500	Diamond Air-to-Air	Channel 9
286.0000	Usage Not Reported	
307.7000	Air to Ground (Boss) [All six aircraft]	
345.9000	Solo Air-to-Air	Channel 8

The following frequencies were reported in use by the U.S. Air Force Thunderbirds during the 1998 season:

Freq	Use
140.4000	Support Aircraft: Cross Country Air-to-Air
141.4000	Four ship formation (Tentative)
141.8500	Four ship formation (Victor 1) Air-to-Air: linked to public address system
143.8500	Four ship formation (Victor 2) Air-to-Air: linked to public address system
235.2500	Thunderbird Control
322.9500	Solo aircraft
413.0250	Maintenance/Ground teams (146.2 PL tone)
413.1000	Maintenance/Ground teams

As always, if anyone confirms any new frequencies during the 1999 season, we want to hear from you. You can reach us via e-mail at larry@grove-ent.com or you can write to:



Milcom, P.O. Box 98, Brasstown, NC 28902. Stay tuned to this column during the show season for any possible updates that we receive.

U.S. Army MARS Frequencies

I have had a ton of requests over the last five years for a complete list of U.S. Army MARS (Military Affiliate Radio System). Thanks to an anonymous contribution (another one of those famous plain white envelopes that I get from time to time), Table Two is the latest list of Army MARS frequencies and designators.

Air-to-Air Frequencies

Finally, this month, an old friend from my *Utility World* column days (Paul Bunyan) checks in with a nice list of air-to-air frequencies recently monitored in the Midwest. These



TABLE ONE: BLUE ANGELS/THUNDERBIRDS 1999 PERFORMANCE

Mar 13	NAF El Centro, CA (Blues)	Jul 3-5	Battle Creek, MI (T-Birds)
Mar 20-21	Mesa, AZ (Blues)/Tyndall AFB, FL (T-Birds)	Jul 10	Pensacola Beach, FL (Blues)
Mar 27-28	NAS Corpus Christi, TX (Blues)/Eglin AFB, FL (T-Birds)	Jul 10-11	Niagara Falls, NY (T-Birds)
Apr 10-11	MCAS Cherry Point, NC (Blues)/March ARB, CA (T-Birds)	Jul 14	Madison, WI (T-Birds)
Apr 17-18	Millington, TN (Blues)/NAS Norfolk, VA (T-Birds)	Jul 17-18	Davenport, IA (Blues)/Bloomington, IL (T-Birds)
Apr 24-25	NAS Point Mugu, CA (Blues)/Patrick AFB, FL (T-Birds)	Jul 24-25	NAS Brunswick, ME (Blues)/Dayton, OH (T-Birds)
May 1-2	NAS Fallon, NV (Blues)/Fort Lauderdale, FL (T-Birds)	Jul 28	Cheyenne, WY (T-Birds)
May 8-9	MacDill AFB, FL (Blues)	Jul 30-31	MCAS Miramar, CA (Blues)
May 8	Nellis AFB, NV (T-Birds)	Jul 31	Avoca, PA (T-Birds)
May 9	Mountain Home AFB, ID (T-Birds)	Aug 1	MCAS Miramar, CA (Blues)/Avoca, PA (T-Birds)
May 15-16	Dover AFB, DE (Blues)/Andrews AFB, MD (T-Birds)	Aug 7-8	Seattle, WA (Blues)
May 17-28	European Tour (T-Birds)	Aug 14-15	Whiteman AFB, MO (T-Birds)
May 22	Randolph AFB, TX (Blues)	Aug 21-22	Otis ANG, MA (Blues)/Chicago, IL (T-Birds)
May 24	U.S. Naval Academy, Annapolis, MD (Blues)	Aug 28-29	Rochester, NY (Blues)/Westfield, MA (T-Birds)
May 26	U.S. Naval Academy Graduation Flyover (Blues)	Sep 4-6	Cleveland, OH (Blues)/Jackson, MS (T-Birds)
May 29	NAS Patuxent River, MD (Blues)/RAF Mildenhall (T-Birds)	Sep 11-12	Halifax, NS Canada (Blues)/Smyrna, TN (T-Birds)
Jun 2	U.S. Air Force Academy, Colorado Springs, CO (T-Birds)	Sep 18-19	NAS Oceana, VA (Blues)/Reno, NV (T-Birds)
Jun 5-6	Oklahoma City, OK (Blues)/Mankato, MN (T-Birds)	Sep 25	Maxwell AFB, AL (T-Birds)
Jun 12	Hill AFB, UT (T-Birds)	Sep 25-26	Wilmington, NC (Blues)
Jun 13	NAS Lemoore, CA (Blues)/Cannon AFB, NM (T-Birds)	Sep 26	Charleston AFB, SC (T-Birds)
Jun 16	McConnell AFB, KS (T-Birds)	Oct 2-3	Salinas, CA (Blues)/Great Bend, KS (T-Birds)
Jun 19-20	To be announced (Blues)/Hamilton, Ontario, Canada (T-Birds)	Oct 9-10	San Francisco, CA (Blues)/Edwards AFB, CA (T-Birds)
Jun 26	McChord AFB, WA (T-Birds)	Oct 16	Sheppard AFB, TX (T-Birds)
Jun 26-27	Willow Run, MI (Blues)	Oct 16-17	Kirtland, NM (Blues)
Jun 27	Travis AFB, CA (T-Birds)	Oct 17	Dyess AFB, TX (T-Birds)
Jul 3	Milwaukee, WI (Blues)	Oct 23-24	Little Rock AFB, AR (Blues)/Fort Huachuca, AZ (T-Birds)
		Oct 29-31	NAS/JRB New Orleans, LA (T-Birds)
		Oct 30-31	Moody AFB, GA (Blues)
		Nov 6-7	NAS Jacksonville, FL (Blues)/Fort Smith, AR (T-Birds)
		Nov 12-13	NAS Pensacola, FL (Blues)
		Nov 13	Luke AFB, AZ (T-Birds)

TABLE TWO: U.S. ARMY MARS AND DESIGNATORS

Freq (MHz)	Channel Designator						
2.0015	KAA	7.3095	KFA	14.4035	KMA	20.9750	KSK
2.2185	KAB	7.3125	KFB	14.4400	KMB	20.9780	KSL
2.2215	KAC	7.3135	KFJ	14.4855	KMC	20.9955	KSM
2.2565	KAD	7.3155	KFC	14.4885	KME	21.8255	KTA
2.2595	KAE	7.3165	KFK	14.4895	KMD	24.0125	KWA
2.3065	KAF	7.3585	KFD	14.5110	KMR	24.0500	KWB
2.3095	KAG	7.3615	KFE	14.5115	KMF	24.1975	KWC
2.3585	KAH	7.4050	KFF	14.5120	KMG	24.5600	KWD
2.8135	KAI	7.4100	KFN	14.5140	KMH	24.7615	KWE
3.2355	KBA	7.4225	KFO	14.5805	KMI	24.8600	KWF
3.2370	KBB	7.4330	KFL	14.6650	KMJ	27.5650	KZA
3.2385	KBC	7.5900	KFG	14.8475	KMK	27.7800	KZB
3.2435	KBM	7.7200	KFH	14.8555	KML	27.7900	KZC
3.2465	KBD	7.7545	KFP	14.8775	KMM	27.8100	KZD
3.2570	KBE	7.8495	KFI	14.9300	KMN	27.8200	KZE
3.2735	KBF	7.9545	KFM	14.9365	KMO	27.9925	KZF
3.2765	KBG	8.0385	KGB	14.9380	KMP	40.9500	MAA
3.2875	KBH	8.0660	KGC	14.9395	KMQ	142.325	MBA
3.2890	KBI	8.0675	KGA	15.7790	KNA	142.400	MBB
3.2905	KBJ	9.1820	KHA	15.7820	KNB	142.425	MBC
3.3470	KBK	9.2600	KHG	15.8720	KNC	143.000	MCA
4.0015	KCA	9.2615	KHH	16.0410	KOA	143.025	MCB
4.0040	KCB	9.3050	KHB	16.0495	KOC	143.350	MCC
4.0120	KCC	9.4190	KHC	16.0930	KOB	143.375	MCD
4.0125	KCL	9.4210	KHD	17.4445	KPB	143.400	MCE
4.0185	KCD	9.8100	KHE	17.4590	KPC	143.415	MCF
4.0215	KCE	9.9470	KHI	17.4975	KPA	143.975	MCG
4.0245	KCF	9.9485	KHJ	17.4985	KPD	143.9875	MCH
4.0275	KCG	9.9900	KHF	17.5015	KPE	143.990	MCI
4.0305	KCI	10.1515	KIA	17.5200	KPF	148.000	MDA
4.0315	KCH	10.1650	KIB	17.5465	KPG	148.010	MDB
4.0335	KCJ	10.1800	KIC	17.5940	KPH	148.0125	MDC
4.0365	KCK	10.5345	KIE	18.2125	KQA	148.025	MDD
4.4400	KCN	10.8150	KID	18.2945	KQB	148.075	MDE
4.4465	KCL	11.1050	KJC	18.6405	KQC	148.600	MDF
4.7910	KCP	11.1065	KJD	19.0024	KRE	148.625	MDG
4.9200	KCO	11.4555	KJB	19.0045	KRA	148.650	MDH
4.9300	KCQ	11.9900	KJA	19.0075	KRB	148.750	MDI
5.1135	KDA	12.0720	KKA	19.0105	KRC	148.800	MDJ
5.1165	KDB	12.0750	KKC	19.0135	KRD	149.750	MEA
5.2035	KDC	12.1470	KKD	19.0270	KRF	150.625	MFA
5.2065	KDD	12.1485	KKB	19.5305	KRJ	226.350	MGA
5.2185	KDE	12.1885	KKE	19.5310	KRG	226.400	MGB
5.3960	KDF	13.4795	KLB	19.5340	KRH	226.450	MGC
5.4010	KDG	13.5050	KLC	19.8400	KRI	229.400	MHA
5.7585	KDH	13.5080	KLD	20.0785	KSA	229.450	MHB
5.7615	KDI	13.5110	KLE	20.1055	KSB	229.650	MHC
6.8245	KEA	13.5140	KLF	20.2210	KSC	407.250	MIA
6.9050	KEG	13.7430	KLG	20.5200	KSD	407.525	MIB
6.9065	KEH	13.9120	KLA	20.5600	KSE	413.225	MJA
6.9085	KEB	13.9650	KLH	20.6505	KSF	413.250	MJB
6.9115	KEC	13.9945	KLI	20.6550	KSG	413.575	MJC
6.9880	KED	13.9965	KLL	20.8120	KSH	419.150	MKA
6.9975	KEE	13.9975	KLK	20.9215	KSI	903.600	MLA
				20.9415	KSJ	920.000	NMA

TABLE THREE: AIR-TO-AIR LOGGINGS

Freq (MHz)	Callsign	Aircraft Type	Unit	Home Base
140.150	Vandy ##	T-1A	71 FTW/32 FTS	Vance AFB, OK
142.600	Bat ##	F-16C	185 FW/174 FS	Sioux City, IA
148.525	Mint ##	F-16C	127 WG/107 FS	Selfridge ANGB, MI
149.525	Hammer ##	A-10A	442 FW/303 FS	Whiteman AFB, MO
250.800	Feud ##	Unknown	Unknown	Unknown
292.000	Mint ##	F-16C	127 WG/107 FS	Selfridge ANGB, MI
308.200	Zaper ##	EA-6B?	VAQ-130?	NAS Whidbey Island, WA?

frequencies can be active not only near a unit's home base of operations, but nationwide as well. Table Three is Paul's list (mode for all frequencies is AM).

Paul, my records indicate that 308.2 is a US Navy allocation and more than likely your

Zaper callsign, which has been frequently reported as belonging to VAQ-130, is based at NAS Whidbey Island.

Thanks again to Paul and all our contributors. We will see you in two months and good hunting.

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March Madness

Welcome aboard! Today we are going to have some fun: Fasten your seatbelts for a good belly laugh! The following stories are from Bob Bell's book *Laughter on the Wing*, a collection of funnies from *Australian Aviation's* "Airband" (Bob Bell's former column) and "Tales" columns. Consequently, many of these transmissions took place at Australian airports.

A little old lady traveling on her first A320 flight asked the flight attendant the way to the ladies room. The FA was busy with trays, so she pointed to the front of the aircraft, adding with a smile that she couldn't miss it. But the old dear followed directions too literally. She walked all the way to the front, opened the door to the cockpit, and looked in at the crew at the controls. The two pilots swung their heads around in surprise as the old lady quickly slammed the door shut. Confused, she returned to the galley and complained gently, "There are two men in the toilet and they're watching television!"

QANTAS 1: Sydney Clearance Delivery, this is QANTAS 1, stand 2, requesting clearance to Bangkok.

SYDNEY CD: QANTAS 1, good afternoon, clearance is a West 1 departure, Flight Level three-seven-zero, and squawk code 2731.

QANTAS 1: Roger, clearance West 1, Wollongong, Flight Level 370, Squawk 2731.

SYDNEY CD: And QANTAS 1, wind is zero two zero degrees at 15 knots. Do you want runway zero seven or three four for your departure?

QANTAS 1: (After a lengthy pause)... Well, we could take zero seven (short runway-2529 meters) but I forgot to put our rocket engines on!

The crew was immediately allocated RW34. Wonder why? Hi!

One day, a British Airways 747, callsign "Speedbird 9" is monitored inbound to Sydney very early in the morning. The Air Traffic Controller getting nervous about the aircraft landing before curfew finished at 5:00 a.m. local. The aircraft was for a Runway 34 arrival, approaching from out to sea.

APPROACH: Speedbird niner, you

have 30 miles to run, what is your expected landing time?

SPEEDBIRD 9: About two minutes to the hour, Sir.

APPROACH: Speedbird 9, your computer is worth more than mine!

SPEEDBIRD 9: Actually Sir, I was using my fingers!

APPROACH: In that case, Speedbird, we have the same computer!

In this story, set at a fairly large airport in the American midwest, an instructor and student are holding on the runway in their Cessna 172, waiting for departing traffic on the cross runway. Suddenly, a deer runs out of nearby bushland, stops in the middle of the runway and just stands there looking at them.

TOWER: Cessna Five four Golf, cleared for takeoff.

STUDENT: What'll I do Tower? There's a deer in front of us.

TOWER: What do you think you should do?

STUDENT: Maybe if I taxi up to him it'll scare him.

TOWER: Good idea!

The Cessna taxied up towards the deer, but the deer firmly holds his spot on the runway.

TOWER: I say again Cessna 1-8-5-4 Golf, clear for takeoff, sir, runway three-six! (Now starting to lose patience)

STUDENT: What should I do Tower?

TOWER: T-h-i-n-k!

STUDENT: I'm t-r-y-i-n-g to think.

Then for no particular reason, the "flying" deer bolts for the woods from the active runway. Two seconds later...

TOWER: Cessna Five Four Golf, cleared for departure runway three-six. Caution, wake turbulence, departing deer!

Some routine traffic between Melbourne Arrivals Control and an inbound United Airlines Boeing 747. The aircraft said something akin to... Maintaining 300 knots until touchdown.

MELBOURNE APPROACH: Ah... United, confirm you really meant maintain 300 knots until 20 miles from touchdown, sir?

UNITED 747: Yeah, yeah, I goofed...however I must say these things have carbon brakes, and they really are very good.

MELBOURNE APPROACH: Yes,

well it would have been real good to watch!

Top Eleven at O'Hare

The next set of funnies was obtained from the Internet by Richard A. Sklar (WA). He says, "I thought these were pretty good. Dialogue between controllers and pilots at Chicago O'Hare. Keep in mind that these conversations pop in during all the chatter on the radios, which when busy is almost continuous."

Top 11 comms actually heard from air traffic control at Chicago O'Hare:

- 11) **APPROACH:** American Two Twenty, eeny, meeny, miney, mo, how do you hear my radio?
- 10) **APPROACH:** The traffic at nine o'clock's gonna do a little Linda Ronstadt on you. **AIRLINER:** Linda Ronstadt: What's that? **APPROACH:** Well, sir, they're gonna "Blue Bayou!"
- 9) **AIRLINER:** I can see the country club down below, looks like a lot of controllers out there! **APPROACH:** Yes, sir, there are, and they're caddying for DC-10 drivers like you!
- 8) **AIRLINER:** Approach, what's our sequence? **APPROACH:** Calling for sequence I missed your callsign, but if I find out what it is, you're last!
- 7) **UAL 525:** Approach, United five two five, what's this aircraft doing at my altitude? **APPROACH:** What makes you think it's your altitude, captain?
- 6) **APPROACH:** Delta 176, say speed. **DELTA 176:** Approach, we slowed it down to two-twenty. **APPROACH:** Pick it back up to two-fifty. This ain't Atlanta and them ain't no grits on the ground.
- 5) **AIRLINER:** Request runway 27 Right. **APPROACH:** Unable. **AIRLINER:** Do you know the wind at 6000 is 270 at 50? **APPROACH:** Yeah, I do. If we could jack the airport up to 5500, you could have that runway. Expect 14 Right.
- 4) **AIRLINER:** The first officer says he has you in sight. **APPROACH:** Roger, the First Officer is cleared for a visual approach Runway 27 Right, you continue on that 180 heading and descend to 3000.
- 3) **INTERPHONE:** Hey O'Hare, you see the 7600 code flashing five northwest of Gary? **O'HARE:** Yeah, I do. You guys talkin' to him? (7600 code is transponder squawk for no-radio!)
- 2) **AIRLINER:** Approach, what's the Tower?

APPROACH: That's a big tall building with glass all around it, but that's not important right now. [One controller who watched *Airplane!* too many times?!]

The number one actual thing heard from an O'Hare Controller is: "Air Force four five, it appears your engine has...oh, disregard, I see you've already ejected!"

■ Air Traffic Control Separation Minima Standards

So you can't say we've frittered away the whole column, here is a topic of critical importance — the rules governing the separation between aircraft and other objects.

General

Aircraft are separated by the following minima.

- If less than 40 miles from the radar antenna - 3 miles.
- If 40 miles or more from the radar antenna - 5 miles.

Passing or Diverging

Vertical separation between passing or diverging aircraft may be discontinued when the following conditions are met:

- They have passed each other and their primary targets or secondary surveillance radar (SSR) control slashes do not touch.
- Their courses diverge by at least 15°.

Adjacent Airspace

If coordination between controllers in adjacent sectors has not been effected, radar-controlled aircraft are separated from the boundary of adjacent airspace in which radar separation also is being used, by the following minima.

- When less than 40 miles from the radar antenna - 1/2 miles.
- When 40 miles or more from the radar antenna - 2 1/2 miles.

Radar-controlled aircraft are separated from the boundary of airspace in which nonradar separation is being used by the following minima.

- If at a constant altitude when less than 40 miles from the radar antenna - 3 miles; when 40 miles or more from the radar antenna - 5 miles.
- If climbing or descending, regardless of distance from radar antenna - clear of boundary space.

Conflict Alert

The computer places each aircraft in the middle of an imaginary 2-1/2 mile diameter, 2000-foot-thick wafer of airspace. The minute the radar sees the edges of any two planes' wafers touch — whenever they come within 5 miles of each other laterally or within 2,000 feet of each other vertically — their data blocks begin to blink. The warning CONFLICT ALERT also begins to blink on the controller's radar display, listing beneath it the flight numbers of the planes in potential conflict. The warning gives the controller time to turn planes away from each other before they collide.

After the conflict is resolved, the controller and his supervisor go over the voice tapes (all transmissions to and from the control room are kept for 30 days) and procedures utilized by the controller and discuss what he could have done to avoid the potential problem. Too many of these can result in suspension and ultimately, dismissal.

Incidentally, the controllers have nicknamed the conflict alert warning as "The Snitch Gear," "Sally Snitch," "Squeal-a-Deal," as well as other names which are highly unprintable. A "deal" is controller talk for an accident.

Edge of Scope (PPI)

A radar-controlled aircraft climbing or descending through the altitude of an aircraft that has been tracked to the edge of the Plan Position Indicator (PPI) display is separated from the edge of the scope by the following minima until non-radar (procedural) separation has been established:

- When less than 40 miles from the radar antenna - 3 miles from the edge of the scope.
- When 40 miles or more from the radar antenna - 5 miles from edge of scope.

Obstructions:

- Within 40 miles of a radar antenna, aircraft are separated from prominent obstructions shown on the radarscope (displayed on the video map, described on the map overlay, or displayed as a permanent echo by a minimum of 3 miles.
- Vertical separation of an aircraft above a prominent obstruction, which is displayed as a permanent echo, may be discontinued after the aircraft has passed it.

Final Approach Course Interception

Arriving aircraft are vectored to intercept the final approach course to the end of the runway before reaching the approach gate and before intercepting the final approach glide slope. Radar vectors are applied in such a manner that interception of the final approach course does not exceed defined interception angles, depending on aircraft characteristics, and is within a prescribed minimum distance from end of runway.

Separation of Heavy Jets From Lighter Aircraft

Based on extensive tests to detect and measure the effects of wake turbulence, most countries categorize aircraft capable of takeoff weights greater than 300,000 pounds as "heavy jets" which can create dangerous vortices when airborne. Vortices are the culprits behind wake turbulence.

Heavy jets operating behind other heavy jets generally do not require any special separation because of wake turbulence. In the case of all other aircraft, however, wake turbulence separation minima are imposed by ATC. The basic rule: the lighter the aircraft following a heavy, the greater the separation will be.

Until next month, 73 and out.

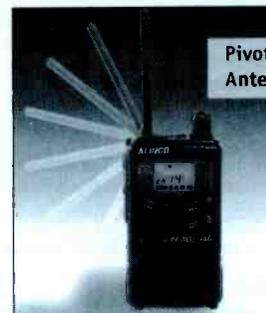
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*Cellular blocked. **Effective operating range varies due to terrain, channel use, batteries and other conditions

TLAs and other annoyances

All hobbies seem to have their own nomenclature. *Monitoring Times* tries to avoid using terms not familiar to most readers, but occasionally some will slip through. Members of the specialized DX clubs — or readers of Internet newsgroups and mailing lists — are quite likely to encounter a lot of terms geared to the club's particular interest. (Oh, by the way - TLA stands for "Three Letter Acronym"...)



As of Christmas 1998, the expanded AM band had 20 stations operating.

- AC: Adult Contemporary ("light rock") music (depending on context)
- bandscan: A list of stations normally received at a given location (not DX)
- barefoot: Unamplified.
- BCB: Broadcast Band. Sometimes refers to the 530-1710 kHz AM band, other times to all domestic broadcasting bands including FM and TV.
- CID: Call-letter identification with Morse code.
- CL: Call letters.
- CPC: Courtesy Program Committee (a group that arranges DX Tests)
- CRTC: Canadian Radio-Television Commission, the agency responsible for regulating radio north of the border ("Canadian FCC")
- CX,condx.: (propagation) Conditions.
- DA: Directional Antenna. Station radiates more power in some directions than in others.
- DAB: Digital Audio (radio) Broadcasting.
- Dead air: Station is on the air but broadcasting silence.
- DTV: Digital Television.
- DX: A radio station not normally heard at your location, with your equipment (regardless of distance)
- DXer: Someone interested in receiving radio stations not normally heard.
- DX Test: A special program put on to make it easier for distant-reception enthusiasts to hear a specific station.
- EE: English language.
- EZL: Easy listening music.
- FCC: Federal Communications Commission, the U.S. government agency responsible for regulating radio.
- FF: French language.
- GOS: Gospel (religious music)
- Graveyard: 1230, 1240, 1340, 1400, 1450, and 1490 kHz. These six frequencies have many more stations than other channels, and interference is much worse.
- HAR: Highway Advisory Radio. Essentially the same thing as a "TIS," see below.
- HDTV: High Definition (and usually digital) Television.
- HS: High School (in reference to sports broadcasts)
- ID: Station identification announcement.
- IRCA: International Radio Club of America.
- LSR: Local sunrise.
- LSS: Local sunset.
- LW: Longwave. 150-300 kHz broadcasting band used in Europe and Russia.
- MW: Mediumwave. European term for what's called "AM" in North America.

- NOS: Nostalgic music, mostly 1940s and 1950s.
- NRC: National Radio Club.
- Null: When referring to a station, the area where the station's directional antenna radiates relatively poorly. When referring to a receiving antenna, the area where that antenna receives relatively poorly.
- NWS, NX: News.
- OC: Open carrier. Same thing as "dead air" (see above).
- OLD: Oldies rock music.
- PSRA: Pre-sunrise authorization. Station is allowed to use a power greater than permitted at night, but less than permitted during the day, between 6am local time and sunrise.
- PSSA: Post-sunset authorization. Station is allowed to use a power greater than permitted at night, but less than permitted during the day, for up to two hours after sunset.
- QRM: Interference from other radio stations.
- QRN: Interference from natural sources (lightning, etc.) or from man-made sources other than radio stations (ignition noise, etc.)
- QSB: Fading.
- QSL: (Written) confirmation of reception. Used to be in the form of a special postcard printed specifically for distant-reception enthusiasts, but today it's usually a business letter on station stationery.
- QTH: Location.
- REL: Religious.
- RX, Rcvr.: Receiver.
- SID: Singing identification.
- Silent: Station is off the air.
- SPT: Sports.
- SRS: Sunrise skip (a period of enhanced reception between the time a station is allowed to go to daytime power, and the time the sun actually rises at the station's location).
- SS: Spanish language.
- SSB: U.S. National Anthem (Star-Spangled Banner)
- SSS: Sunset skip (a period of enhanced reception between the time the sun sets at the station's location, and the time the station is required to go to nighttime power.)
- TC: Time Check (station announces the current time.)
- TIS: Traveler's Information Station. A very

- low-power station operated by a local government to provide information for visitors and, on some occasions, emergency information for local residents.
- TL: Tower Location (where the station's transmitting tower is)
- TLK: Talk
- UC: Urban contemporary. Usually, music intended to appeal to African-Americans.
- UnID: Unidentified station.
- VHF: In Europe, sometimes this is used as a synonym for what's called FM radio in North America.
- VID: Spoken call-letter identification.
- WX: Weather.
- X-band: Expanded AM band, 1610-1700 kHz.

Bits and Pieces

While the CBC AM stations in Montreal are still operating as I write, the CRTC (see above!) is now preparing to hear applications for new services on their frequencies. Applications for 690 kHz are from CKVL-850 (which wants to change frequency to 690 and increase power); from Radio Nord, which wishes to build a French-language country music station; and from the CBC, which wants a French-language all-news station (which would give it three French-language stations in the city). Applicants for 940 are CIQC-600 (which wants to move to 940 and increase power); another application from Radio Nord for a country music station, this time in English; and again from the CBC, which wants 940 for its French-language all-news outlet if the CRTC gives 690 to someone else.

The CBC application indicates the new French all-news station, if granted, would be the "mother" station of a national network. I would be very surprised if a grant for such a station isn't followed closely by an application for a third English-language CBC station somewhere (probably Toronto) as well.

Martin Field of southern Michigan has been busy in the expanded band. He reports an unidentified station heard on 1650 between about midnight and 2a.m. on November 3 and 4 with all music. Other DXers in the East are also hearing this one. The consensus seems to be that it's WHKT Portsmouth, Virginia. Other expanded-band loggings at Martin's location include WPHG & WHLY on 1620, KCJJ 1630, WKSH 1640, WQSN & WBAH on 1660, WTDY & WNML on 1670, WBHG 1680, WMDM 1690, and KBGG and WCMQ on 1700. A reminder: the Spanish-language station on 1660 is indeed the former WJDM in New Jersey.

Pirate Radio at Winter SWL Fest

The annual Winter Shortwave Listener's Festival is scheduled for this month. Program Chairman Dr. Harold Cones indicates that this year's program will broadly cover topics of interest to shortwave DXers, including the annual forum on pirate radio broadcasting hosted by Andrew Yoder and your editor George Zeller. Hundreds of DXers, including many dozens of pirate radio listeners, will be attending this event on March 12-13 at the Kulpsville, PA, Holiday Inn, located at the Lansdale exit of the Pennsylvania Turnpike Northeast Extension.

Registration fees are \$40.00, while hotel rooms are \$69.00 per day. To register or to get more information, write to Winter SWL Festival, PO Box 591, Colmar, PA 18915. You can check out the event at <http://www.trsc.com/Radio/Events/Winterfest/winterfest.html> on the web. Tell them that *MT* sent you!

Radio Free Vermont vs. FCC

Micropirate **Radio Free Vermont** on 96.5 MHz in Rutland is defying an FCC Notice of Apparent Liability on two grounds: that the FCC has no jurisdiction for intrastate commerce, and that local ordinance prohibits FCC agents in Rutland! For the latest news here, <http://www.rovers.net/~rfv/> covers the station's unusual stance.

New South American Address

In last month's *MT* we noted that several South American pirate stations were using a postal maildrop in Buenos Aires, Argentina. Several of them report that because mail was being stolen from this post office box, they no longer use it. Some, like **Radio Cochiguaz** and **Andino Relay Service**, now use Casilla 159, Santiago 14, Chile. **Radio Blandengue** uses both Santiago and Merlin (see below). If you have unanswered reports outstanding, a follow-up to the new address is advised. The <http://www.geocities.com/Area51/Shadowlands/4401/index.html> web site remains a good place to check for recent updates on the situation.

Bust Update

Our readers' logs document that shortwave pirate activity has increased to its highest level since the Halloween FCC busts of four stations. There are new developments this month. As we see here, **Voice of the Pig's Ear** still

uses no maildrop, but it has been sending out QSLs for loggings printed in the *Free Radio Weekly* e-mail newsletter. The station still has no maildrop.

Additionally, multiple pirate community sources indicate that in addition to Pig's Ear and a **Rock-It Radio** relay, **Radio Halloween**, the third of four pirate stations busted, indicates that it has sold its transmitter. The fourth station continues to remain anonymous. At press time for *MT*, the FCC had still not taken additional action against any of the busted station operators.

Shortwave Pirate Activity

Greg Majewski, using data from *Free Radio Weekly*, notes that the top five shortwave pirates of 1998, based on number of broadcasts, were (in order) **Radio Metallica Worldwide** (80), **Mystery Radio** (59), **Radio Nonsense** (45), **Free Hope Experience** (45), and **Voice of the Pig's Ear** (40).

Pirate radio stations heard by our readers last month all used frequencies within 500 kHz of 6955 kHz, typically from two hours before sunset until at least 0500 UTC. Morning and afternoon broadcasts increase on the weekends. Programming formats and contact maildrops (when known) are listed here.

Anti-Claus- This parody ho-ho-ho appeared around the holidays. (None)

Atencion 69- A funny parody of numbers stations, using obscene words for the numbers. (None)

Blind Faith Radio- Dr. Napalm programs rock oldies. (Merlin)

East Coast Beer Drinker- Rock and promotion of beer consumption are the norm. (Blue Ridge Summit)

Happy Hannukah- Jewish history and holiday celebrations are heard here. (Merlin)

Jerry Rigged Radio- Their eclectic format varies with the season. (Providence)

Jimmy the Weasel- Rude remarks about "yo mama" and a capella singing is Jimmy's format. (Lula)

K-Mart Radio- They emphasize rock music and pirate commentary. (None; verifies logs in *The ACE* and *FRW*)

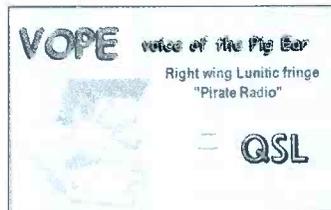
Radio Beaver- Bucky Beaver is back with Canadian rock and humor. (Merlin)

Radio Bingo- A pirate radio bingo game with sound effects comes from this new one. (None; takes e-mail reports via Radiobingo@check.com)

Radio Chad- This rocker announced that a December broadcast was its last show. (None)

Radio Eclipse- Steve Mann's rock recently featured a National Weather Service George Zeller Warning. (Providence)

Radio Free Speech- Bill O. Rights plugs individual freedoms and pirate radio. (Belfast)



Pig's Ear QSLs arrive in mailboxes

Radio Voice of Trailer Park Ministries- The mysterious Rev. R. F. Fields hosts gospel preaching and singing. (None)

RBCN- Radio Bob's Communications Network transmits hilarious original comedy. (Lula)

Take it Easy Radio- At Christmas they replayed an old Armed Forces Radio holiday show. (Belfast)

Voice of the Pig's Ear- No broadcasts here lately, but they are verifying now. (None; verifies logs in

The ACE and *FRW*)

WACK- Fast paced and well produced rock and comedy is their trademark. (None; announces toll free telephone number for reports)

WEED- This marijuana advocacy station has returned with slick productions. (Huntsville)

WKND- Radio Animal plays rock and promotes the pirate scene. (Blue Ridge Summit)

WMPR- Techno dance music is their norm, but they sometimes play holiday instrumental music. (still none)

Reception reports to pirate stations require three first class stamps for USA maildrops or \$2 US to foreign addresses. Send your letters to PO Box 1, Belfast, NY 14711; PO Box 28413, Providence, RI 02908; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 293, Merlin, Ontario N0P 1W0; PO Box 24, Lula, GA 30554; and PO Box 11522, Huntsville, AL 35814.

Thanks!

Your input is always welcome via PO Box 98, Brasstown, NC 28902, or via the e-mail address atop the column. We appreciate material sent in this month by Shawn Axelrod, Winnipeg, Manitoba; Ranier Brandt, Hoefler, Germany; Jerry Coatsworth, Merlin, Ontario; Ross Comeau, Andover, MA; Harold Cones, Newport News, VA; Howard Espravnik, Gallatin, TN; Joe Filipkowski, Providence, RI; Ullis Fleming, Glen Burnie, MD; Harold Frodge, Midland, MI; Paul Griffin, San Francisco, CA; William Hassig, Mt. Prospect, IL; Peter Lautzenheiser, Wooster, OH; Zacharias Liangas, Italy; Chris Lobdell, Stoneham, MA; Ben Loveless, Bloomfield Hills, MI; Greg Majewski, Oakdale, CT; Cachito Mamani, Santiago, Chile; Armando Mastrapa, Miami, FL; Bill McLintock, Minneapolis, MN; A. J. Michaels, Pittsburgh, PA; FL; Big Mike, Belfast, NY; Pat Murphy, Norfolk, VA; Dr. Napalm, Merlin, Ontario; Gary Neal, Sugar Land, TX; Pachakuti, Santiago, Chile; Dick Pearce, Brattleboro, VT; Mike Prindle, New Suffolk, NY; Al Quaglieri, Albany, NY; Steve Rogovich, Virginia Beach, VA; Robert Ross, London, Ontario; Martin Schoech, Merseburg, Germany; Lee Silvi, Mentor, OH; DJ Stevie, Basel, Switzerland; Robert Thomas, Bridgeport, CT; Maximo Tomas, Miami, FL; J. T. Ward, Jeff White, Miami, FL; Niel Wolfish, Toronto, Ontario; Mike Wolfson, Ashland, OH; and Dr. Zaius.

Voice Broadcasts on Low Frequencies

There was a time when longwave voice stations were quite common. The “experienced” among us will remember weather stations such as ELM, 375 kHz (Elmira, NY) and Federal Emergency Management Administration (FEMA) station WGU-20, 179 kHz (Chase, MD). Fifteen years ago, these and other powerful AM stations sprinkled the longwave dial.

Today, only a few Transcribed Aviation Weather Broadcast (TWEB) stations remain, and to my knowledge, most are located east of the Mississippi River. The good news is that a new type of voice station has taken to the air called AWOS—short for Automated Weather Observation Station. These low power (usually 25 watt) facilities are unmanned and broadcast the current weather conditions at their location using a computer-synthesized voice.

Table 1 lists the currently active voice stations (TWEB and AWOS) in the continental U.S. and Canada. The list is an excerpt from an international listing compiled by Bill Hepburn of the Longwave Club of America (LWCA). Bill’s list is published from time to time in the LWCA’s journal, the *Lowdown*, as well as on the World Wide Web at: <http://users.aol.com/radiosport/tweb.htm>

TABLE 1. LONGWAVE VOICE STATIONS

FREQ.	TYPE	ID	LOCATION
194	TWEB	TUK	Nantucket, MA
203	AWOS	MWM	Windom, MN
209	AWOS	HCD	Hutchinson, MN
212	AWOS	OKZ	Sandersville, GA
220	AWOS	AZC	Colorado City, AZ
221	AWOS	RBW	Wallerboro, SC
224	AWOS	FSE	Fosston, MN
227	AWOS	DXX	Madison, MN
230	AWOS	VYS	Peru, IL
233	AWOS	CQM	Cook, MN
236	TWEB	GNI	Grand Isle, LA
239	AWOS	BBB	Benson, MN
242	TWEB	GM	Milwaukee, WI
243	AWOS	TWM	Two Harbors, MN
245	AWOS	AVQ	Tucson, AZ
248	TWEB	WG	Winnipeg, MB
257	AWOS	SAZ	Staples, MN
259	AWOS	PBY	Kayenta, AZ
260	AWOS	JYG	St. James, MN
266	TWEB	MS	Minneapolis/St. Paul, MN
269	AWOS	CAD	Cadillac, MI
272	AWOS	ULM	New Ulm, MN
282	AWOS	ROS	Rush City, MN
284	AWOS	PQN	Pipestone, MN
285	AWOS	JZP	Jasper, GA
293	AWOS	UI	Quincy, IL
300	Marine	1L	Dutkewych Pt., ON
303	AWOS	MRT	Marysville, OH
308	AWOS	EVZ	Cartersville, GA
321	AWOS	FT	Denver, CO

326	AWOS	ETH	Wheaton, MN
327	AWOS	JMR	Mora, MN
329	AWOS	AAA	Lincoln, IL
329	AWOS	BQP	Bastrop, LA
332	AWOS	VVV	Ortonville, MN
334	AWOS	BNR	Findlay, OH
335	AWOS	COQ	Cloquet, MN
340	AWOS	JES	Jesup, GA
341	AWOS	ORB	Orr, MN
344	TWEB	LNT	Millinocket, ME
345	AWOS	FOZ	Bigfork, MN
346	AWOS	GHW	Glenwood, MN
347	AWOS	AJR	Cornelia, GA
350	AWOS	BEP	Perry, GA
350	AWOS	BFW	Silver Bay, MN
350	AWOS	CBG	Cambridge, MN
350	TWEB	ME	Chicago, IL
353	AWOS	CDI	Cedar Hill, TX
353	TWEB	DV	Davenport, IA
353	TWEB	IN	Int'l Falls, MN
353	AWOS	MJQ	Jackson, MN
356	AWOS	AQP	Appleton, MN
358	AWOS	CKC	Grand Marais, MN
359	AWOS	LXL	Little Falls, MN
359	AWOS	LYZ	Bainbridge, GA
360	AWOS	SW	Warroad, MN
362	AWOS	MZH	Moose Lake, MN
364	AWOS	HII	Lk. Havasu City, AZ
368	TWEB	PNM	Princeton, MN
369	AWOS	CXU	Camilla, GA
370	AWOS	VOF	Covington, GA
371	AWOS	FNA	Slidell, LA
371	AWOS	PUR	Marshall, MO
374	AWOS	BOD	Bowman, ND
376	AWOS	BHC	Baxley, GA
379	TWEB	DL	Duluth, MN
379	AWOS	SF	San Francisco, CA
380	AWOS	ML	Milledgeville, GA
382	AWOS	IQK	Louisa, VA
382	TWEB	LQ	Boston, MA
385	AWOS	SCG	Crane Lake, MN
392	AWOS	JNM	Monroe, GA
394	AWOS	RGK	Red Wing, MN
395	AWOS	CWV	Claxton, GA
395	AWOS	TAZ	Taylorville, IL
397	AWOS	AIT	Aitkin, MN
397	AWOS	EJK	Greensboro, GA
400	AWOS	CKN	Crookston, MN
400	AWOS	PPI	South St Paul, MN
407	AWOS	CHD	Chandler, AZ
407	AWOS	GYL	Glencoe, MN
407	AWOS	IE	Natchitoches, LA
415	AWOS	DJD	Canton, GA

DX Camp Results

During a mid-December DX camp in Ontario, Jacques d'Avignon (VE3VIA) reported “fantastic” LF conditions which enabled him to add several new catches to his log. Many European broadcasters were heard with amazing clarity—no headphones required! Table 2 lists selected loggings from Jacques’ extensive list.

LF loggings from readers are always welcome. Send your favorite picks to me at: *Below 500 kHz*, P.O. Box 98, Brasstown, NC 28902. You might see them in a future issue of *MT*.

TABLE 2. LONGWAVE LOGGINGS

FREQ	ID	LOCATION
162	BCST	France
171	BCST	Morocco
176	KRY*	Chardon, OH
177	BCST	Germany
180	BCST	Turkey?
183	BCST	Germany
189	BCST	Iceland (Loud!)
194	TUK	Nantucket, MA
198	BCST	England
207	FD	Brantford, ON
209	GDW	Gladwyn, MI
216	CLB	Wilmington, NC
216	BCST	France
223	YYW	Armstrong, ON
223	DM	Detroit, MI
226	EZE	Cleveland, OH
246	DFI	Defiance, OH
252	BCST	Algeria
253	YTF	Alma, QC
257	GTB	Fort Drum, NY
258	ORJ	Cory, PA
268	VKN	Montpellier, VT
278	MS	Massena, NY
279	OZ	Oneonta, NY
317	I	Montreal, QC
323	UWP	Argentia, NF
329	IA	Niagara Falls, NY
332	PH	Port Huron, MI
338	DE	Detroit, MI
343	GR	Beaumont, QC
344	LNT	Millinocket, ME
346	YXL	Sioux Lookout, ON
356	AY	St Anthony, NF
358	OG	Ogdensburg, NY
360	LYS	Olean, NY
360	PN	Port Menier, QC
362	SB	Sudbury, ON
372	CQD	Erie, PA
373	2Q	Mont Laurier, QC
375	JRV	Morrisville, VT
382	BT	Burlington, VT
382	LQ	Boston, MA
400	PTD	Potsdam, NY
404	Y	North Bay, ON
407	H	St. Hubert, QC
417	EK	Worcester, MA
523	JJH	Johnstown, NY

* 1-watt “lower” experimental station

End Notes

M. Midlo (TX) forwarded a interesting clipping from the *NY Times* dealing with natural radio. The article appeared in the “Arts & Leisure” section of the paper on October 4, 1998, and was titled *Beneath AM-FM, The Sounds of Silence*.

The article covered all the major types of natural signals that can be heard and stressed that these sounds existed long before humans inhabited the Earth. This type of coverage brings one of the most obscure parts of the radio hobby into the public light, and convinces me that we are indeed entering the “golden age” of natural radio.

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Restoring the Hallicrafters S-38

Readers feedback has been great regarding two of the hottest radio topics: survival communications and restoring boatanchor (BA) shortwave receivers. With this in mind, I have planned several restoration projects starting with a vintage Hallicrafters S-38 general coverage receiver.

The S-38 SW receiver is probably the most popular Hallicrafters receiver ever made. The green, dual half-moon dials are instantly recognizable even from a distance. Hallicrafters made thousands of these small SW sets starting in 1946 right after WW-II and on into the 1960s. Geared to the post-war "Nuclear Family," these sets cost about \$50 (in 1940-50 dollars) and performed quite well for the simple circuitry involved. Many young ham radio operators used some version of the S-38 (there were six in all) as a main station receiver in their Novice days.

The S-38 receiver we are going to work on is the "original" 1946 model with six tubes (35Z5 rectifier, 35L6 audio amplifier, 12SQ7 automatic noise limiter-ANL and beat frequency oscillator-BFO, 12SQ7 detector, automatic volume control-AVC and 1st audio frequency amplifier, 12SK7 intermediate frequency amplifier and 12SA7 first mixer and local oscillator-LO); four bands (540 - 1650 kilocycles, 1650 - 5.0 megacycles, 5.0 - 14.5 mc, and 13.5 - 30.0 mc); 455 kc IF, variable pitch BFO, ANL, electrical bandwidth, and internal speaker.

The S-38 had two production runs, with the first being the six-tube version with smooth black finish on the case and full metal bottom cover. Toward the end of 1946 the S-38s were changed electrically to only five tubes, using what was to become the S-38A chassis — a cardboard bottom cover and a black wrinkle finish on the case. These sets still said "S-38" on the front and had all the features, but they were built on the S-38A chassis. In addition, I have two S-38s that are six-tube models but have the black wrinkle finish on the cabinets.

Neither of these sets are considered "rare" and they make a great first restoration project, as the prices are not exorbitant (\$50-75) and the circuitry is simple. A good copy of the S-38 manual is a necessity (no, the manual or schematic for other S-38 models in the series will not work). Sources for manuals include Sams Photofacts, internet boatanchor reflectors, A.G. Tannenbaum¹ or W7FG Manuals².



The S-38 is the most prolific and easily recognized shortwave receiver in history. The model depicted here is the original six-tube version with adjustable BFO which was produced only in 1946 (the year I was born). Subsequent models were of five-tube design and featured a nonadjustable BFO.

Antique Electronic Supply³ offers a source of vacuum tubes and rebuilding supplies.

■ Lining up for inspection

We start our restoration with a thorough visual inspection of the S-38, looking specifically for burned or charred components, modifications/added controls, frayed power cord, etc. Give it a good physical inspection and you will save time and embarrassment before firing the unit up.

Special Note: there are four rubber grommets that isolate the S-38 chassis from the case. With age these grommets can become brittle and disintegrate, causing the "hot" chassis to come in contact with the metal case. In effect, this places 120 Vac on the metal case! Visually inspect these grommets and replace them, if necessary. Radio Shack sells a grommet assortment that will do the trick nicely.

If all is well above and below the chassis, then it is time to check the tubes. Pull the tubes and find someone with a tube tester (preferably a transconductance type) and check all the tubes. Replace any that don't measure up or won't light. The latter is definitely important, as the S-38 receivers have series-wired fila-

ments; if one tube has a blown filament none of the tubes will light.

With known good tubes and a variable ac voltage source (i.e., a Variac), start bringing up the line voltage gradually. Radio equipment that sit for long periods of time tend to have electrolytic capacitors that are leaky or can easily short if full ac input voltage is suddenly applied. It is best to err on the side of caution and bring the ac line voltage up gradually over a period of hours. On average most ac/dc sets like the S-38 will only draw a few hundred milliamps at most. There will be an initial current surge as the filaments come on line, but that should settle down quickly and only a very gradual increase in ac current should be noted as the ac line voltage is increased to the full operating potential.

With the proper ac input voltage, all the tube filaments should be glowing and, if the Receive/Standby switch is in the Receive position, and the Speaker/Phones switch is in the Speaker position, you should hear some kind of noise out of the receiver at this point. If not, cycle both the aforementioned switches several times to insure good electrical contact. A bit of contact cleaner spray (I prefer DeOxit[™]) would be a good addition to all the

slide switches, band switch and all the controls.

With noise from the speaker, it is time to try receiving something. Connect a 5-10 foot length of wire to the antenna terminal and you should hear stations on the AM broadcast band (Band "1") as you tune the receiver. Find a nice strong station and park there for a while. Listen intently to the quality of the audio coming from the receiver. Is it raspy? Does it have excessive ac hummmmmmm?

There will *always* be some hum in these sets; that's a fact of life. But ac hum that masks the received signal to the point of unintelligibility indicates a leaky filter capacitor that needs replacement before going any further. A raspy signal could indicate a bad coupling capacitor, a bias resistor that has changed value (don't laugh, it happens with great regularity) or even corroded pins on the tube.

If you have a nice clean signal, you can proceed to check out the remaining three bands and then align the receiver, following the instructions in the manual. If, on the other hand, you have problems, it is time to go into the troubleshooting mode.

■ Rudiments of troubleshooting

These simple AC/DC sets of the 40s, 50s, and 60s are not tough to troubleshoot. However, you have to remember a couple of things. First, there is no internal power transformer and that means that one side of the ac line is connected to the chassis of the radio! Secondly, these radios had no fuse protection. This translates into **SHOCK HAZARD!** Watch where you put your paws since 115-120 Vac can be deadly! Anytime you work on these sets use an isolation transformer to isolate the S-38 from the ac line.

Connect the negative lead of a dc voltmeter to the chassis and touch the positive lead to the pins of the large electrolytic capacitor. You are looking for high voltage readings in the neighborhood of 117 Vdc (+/- 10%). If you have the proper "B+" (high voltage) readings, then you need to do a stage by stage check of the receiver.

An easy "first test" is to identify the grid (pin # 5) of the 35L6 audio output tube and touch it with the blade of a small screwdriver. Next, touch your finger to the metal shaft of the screwdriver...there should be some hum in the speaker. There is no danger of shock by touching the grid of the 35L6, and your finger will act as a small antenna and cause the audio amp to hum a bit. This quick check basically says that the audio output stage is working properly.

Next we proceed from the audio output

stage back one stage to the 12SQ7 that functions as the detector, 1st audio amp, and AVC. Find the triode grid of that tube (pin #2) and repeat the screwdriver trick. If you hear a hum, the first AF amp is fine. Proceed to work backwards finding the grid of the preceding stage and inject a signal from a signal tracer or signal generator, to see if that stage is working. This is the way the "Old Timers" did it, and it is fast, accurate, and saves you valuable time.

Once you locate the defective stage, take some voltage readings, look for out of tolerance bias and plate load resistors, IF cans that have opened or shorted, or shorted bypass and coupling caps. Take your time and you will find the problem. Just use common sense and caution.

As for aligning the receiver, use the procedures outlined in the manual. The only thing I would add is a frequency counter to accurately set the radio frequency (RF) generator output. Normally these older receivers are not nearly as sensitive as the newer gear. If the MDS (minimum discernable signal) on your aligned S-38 approaches -90 dBm, consider this a bench mark. I have managed to get some of these simple SW rigs down below -100 dBm, but that does little good, since the overall selectivity of these receivers is so bad.

Cosmetic cleanup requires patience and lots of elbow grease. As discussed in my November column, don't use aggressive chemical cleaners on painted/silkscreened surfaces. Dish detergent is fine for most grime and grunge.

Once you have your S-38 cleaned and aligned it is ready to use. One thing that amazed me is the dial accuracy of these simple sets. Only Band #1 has a high and low end local oscillator adjustment. The other three bands only offer a LO adjustment for the high end of each band. Yet, these receivers maintain an amazingly accurate linearity across the entire frequency range of each band. This is a tribute to good design by the Hallicrafters engineers.

Plug in the S-38, attach a 25-foot antenna wire and enjoy the experience of using one of the classic SW receivers of the century. The sensations surrounding the S-38 — the warm glow of the tubes and dial light, coupled with the ambiance of listening to some exotic (or not so exotic) SW stations on a cold winter's night — are hard to beat.

The S-38 is one of those radios that grows on you. It's not very sensitive or selective, but the audio sounds great and the performance belies the simple circuitry beneath the chassis. The internet Hallicrafters reflector⁴ is a great source of information, tips and trivia on these sets. 'Till next time: have fun, be safe

and remember to **Keep It Simple.** 73 Rich K7SZ.

■ Footnotes:

- ¹ A.G. Tannenbaum: PO Box 386, Ambler, PA 19002 TEL: (215) 540-8327. Web URL: www.agtannbaum.com E-MAIL: k2bn@agtannbaum.com
- ² W7FG Vintage Manuals: 3300 Wayside Dr., Bartlesville, OK 74006 TEL: (800) 807-6146 FAX: (918) 774-9180 Web: <http://www.w7fg.com> E-Mail: w7fg@w7fg.com
- ³ Antique Electronic Supply: 6221 S Maple AVE, tempe, AZ 85238 TEL: (602) 820-5411 FAX: (602) 820-4643
- ⁴ Hallicrafter's internet reflector: hallicrafter@qth.net

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Soup Up Your Computer for Radio

The buzzword for those of us who remain committed to radio for the next few years is to get computerized and then soup up our computers to the hilt. High performance and multiple serial ports will be critical for success!

The bottom line for a "radioized" computer is now a Pentium 133. After all, today's entry-level computers are the low Pentium II and AMD K6-2 classes, and one should build or buy with an eye to the future. With complete systems (less monitor) in the low end of the PII class selling for under \$600, I'm not sure it's advantageous to roll your own low-end computer anymore, but high-end systems can be built cheaper. However, avoid "Celeron" CPUs. They're cheap but hog-tied, reminiscent of older 386SXs and 486SXs.

Also, 10-GB hard drives at \$200 are a sign of the times now. Go for the drive space — it's cheap!

Proper COMportment

One crucial part of a "radioized" computer is the ancient COMport or serial port. The coming Universal Serial Bus and the IEEE "Firewire" just haven't arrived yet, so the lowly COMport remains about the only way to marry radios and computers. Software and hardware still depend on the serial port to communicate with the radio. Save my Aug-98 column or get a reprint, where the important things about PC serial ports are discussed.

The more COMports in your PC, the better. The standard two mean a modem and a mouse will ease you out of the radio business unless you enjoy groping around the back of the computer every few minutes to swap cables. It's easy to add two more serial ports to any PC-286/up. Just install a cheap "add-on serial I/O card," in a spare 8 or 16-bit ISA slot.

Caution: shun the newer PCI-bus add-on serial cards. These may work with modems and mice, but they don't always work for radio applications, probably because the software developers still write for the old ISA bus and its conventional I/O ports.

A two-port ISA serial card with 16450 UARTs costs about \$10-\$20, but spend an extra few bucks for the faster 16550 UARTs. Most radio applications don't care about the UART, but modems do! To allow maximal serial port flexibility, ensure each has a 16550 UART. The two standard serial ports built into Pentium PCs/up come equipped with 16550's.

A new serial card should be initially configured for COM3/03E8/IRQ4 and COM4/02E8/IRQ3 and tested with a serial mouse taken from its normal port and inserted into another. After the new ports check out, the IRQ of one or both can be reassigned so more COMports can be used simultaneously (see ahead).

Resolving COMport Conflicts

Even if you have four COMports, you'll have to intervene in order to use more than two at a time. The standard (default) organization of the first four serial ports is given in Table 1.

COM1	03F8	IRQ4	COM2	02F8	IRQ3
COM3	03E8	IRQ4	COM4	02E8	IRQ3

Shared IRQs (Interrupt ReQuests) cause conflicts if COM1 and COM3 or COM2 and COM4 are used at the same time. Conversely, COM1 and COM2, or COM2 and COM3, COM3 and COM4, or COM4 and COM1 can be used at the same time since those combinations don't share the same IRQs. But you're still limited to two active COMports at a time.

A solution is to reassign the IRQ for one or two of the COMports. Most add-on serial I/O cards have jumper or software settings where the IRQs can be changed from the defaults. The easiest is if your computer doesn't use a printer or a sound card, in which case IRQ5 and IRQ7 can be reassigned to COM3 and COM4, respectively.

IRQs for older serial I/O cards are pretty much limited to 3, 4, 5, and 7. Newer I/O cards might also allow IRQ10 and 11, but radio software isn't all that avant-garde, and might not support "non-standard" IRQ assignments (IRQ9/up). You may need to shift IRQs around to optimize the serial ports for radio.

Analyzing IRQ Status

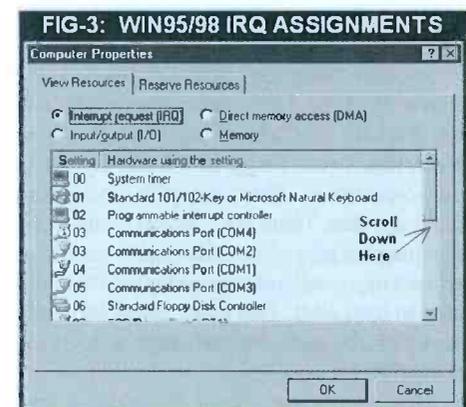
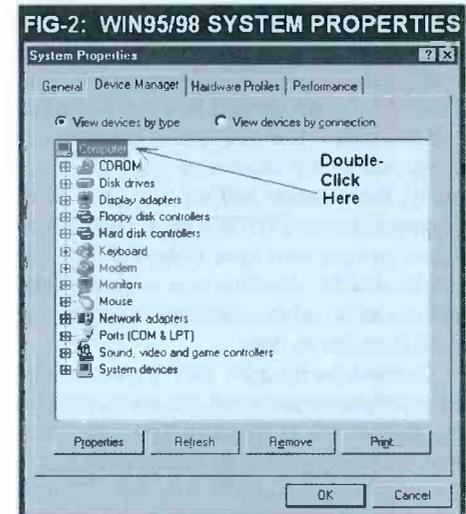
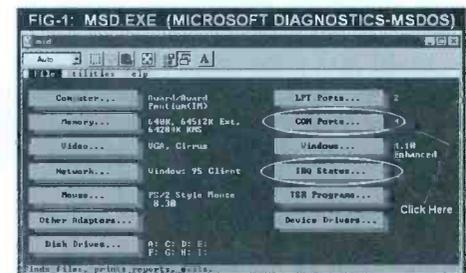
Unless you have extra computers, you'll have to make do with one. The problem is exacerbated when you need three or more active COMports. That means three or four different IRQs just for COMports.

You'll see that IRQs can be harder to come by than money. There are only 16 of them (0-15) of which most (0, 1, 2, 6, 8, 9, 13, 14, 15) are usually taken by the system. Optional peripherals, including printers, sound and video

cards, take up spare IRQs. It could be tough to find one or two more to reassign to the COMports.

The first step to freeing up an IRQ is to evaluate the status, which is easily done. If you use a later version of MS-DOS, including Windows 3.11 or earlier, run the DOS utility called MSD.EXE (See Fig-1). It shows important system information, including IRQ assignments.

For Windows 95/98, you can still use MSD.EXE if it's on your system; otherwise



click the Start button, drop down to Settings, and click Control Panel. When the Control Panel appears, scroll down to the System icon and double-click it. Then double-click the Computer icon at the top of the list that appears under System Properties (see Fig-2).

Figure 3 shows the IRQ resources window that appears under System Properties. Scroll this list to view the system IRQ status. It may be possible to free up one or more IRQs for the new COMports.

■ Freeing Up COMports

First, it's best to free up all the COMports that you can. The easiest way to get one free COMport is to trash the serial mouse and replace it with a PS/2 mouse.

Modern motherboards come with a PS/2 mouse header on-board, but the maker of your computer might not have used it. (Serial mice are cheaper and quicker to set up.) Nevertheless, read the docs for your motherboard and find the PS/2 header.

"Map" its pin arrangement and then buy a PS/2 mouse. You'll also need a PS/2 jack on a backplane strip that fits a spare slot hole on the rear of the computer. A cable and plug goes from the jack to the motherboard's PS/2 mouse header. Therefore you have to match the plug to the header. There are two or three different headers and pin arrangements, but it isn't difficult to match them up.

Windows 95/up recognizes a PS/2 mouse and automatically installs the correct drivers. You may have to first go into the BIOS/CMOS setups to enable the PS/2 port. MS-DOS and other systems may require special PS/2 drivers that come on the disk with the mouse. A PS/2 mouse demands IRQ12, so the only gain is a freed up COMport, but that may suffice for your needs.

You can sometimes free up a COMport by reconfiguring an internal modem to a nonexistent COM5. Review the docs and readme files on the modem's setup diskette for this possibility.

Another way to get multiple, usable COMports is with a "Digiboard," at 4-8 ports per board, controlled by a separate CPU for efficiency without IRQ conflicts. See <http://www.digiboard.com/> for more information on this alternative.

■ Freeing Up IRQs

This is the big one, and there are many tricks and kinks. Among the easiest, if you have a modern sound card that uses IRQ5, is to reassign it to IRQ10 or higher. This can be done from the BIOS/CMOS setup utility or sometimes from jumpers on the card or even the setup disk utility for the sound card. Then assign IRQ5 to a third COMport.

IRQ7 has possibilities. Windows 95/98 seems to not use it for printers, even though it may be assigned. In some cases, Win95/98 don't assign IRQ7 to the printer in the first place. In any event, IRQ7 might be assignable to a COMport! It's worth a try, and if there is a conflict, avoid printing during radio sessions.

Table 2 shows an ideal setup to allow all four ports to be used at the same time so long as nothing else conflicts (sound card, printer, etc.)

COM1 03F8 IRQ4	COM2 02F8 IRQ3
COM3 03E8 IRQ5	COM4 02E8 IRQ7

■ Horsepower Tricks

Windows95/98 are very conservative in their automated setups. In many cases, a needless control in the MSDOS.SYS file slows hard disk performance. Open the MSDOS.SYS file (in the C:\ root directory) with Notepad and scroll up and down the file looking for this line statement:

DoubleBuffer=1

Unless your hard disk is an SCSI type, there is a good chance this "throttle" isn't needed, so take it out. First, right-click on the MSDOS.SYS file in a My Computer or Explorer view; and choose Properties. Uncheck the "Read-Only" box. Then click Apply and OK.

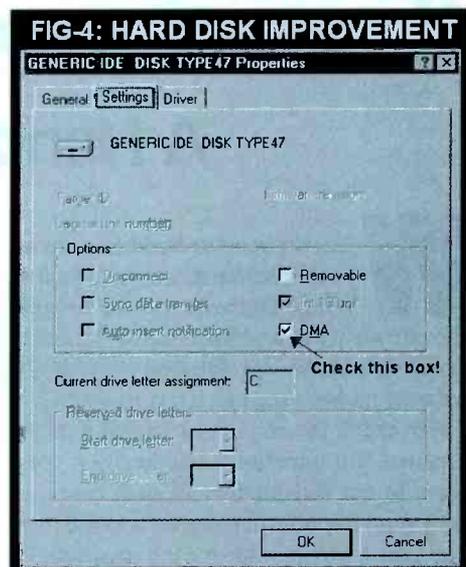
Now go back to Notepad where the MSDOS.SYS file is displayed and add a semicolon to the first space of the line to read:

;DoubleBuffer=1

Save the edited MSDOS.SYS file. Right-click on the MSDOS.SYS file in a My Computer or Explorer view; and choose Properties. Check the "Read-Only" box. Then click Apply and OK.

Close Windows and reboot. Hard disk performance will be improved. If problems arise, reboot and hit F8 immediately after Post (memory and disk drive checks) and before Windows starts to load. From the menu, choose Command Prompt Only and let the PC boot to DOS. Use the text editor called EDIT.COM in the C:\WINDOWS\COMMAND directory to remove that semicolon from the line in the MSDOS.SYS file, and all will be well. (You may first have to use the ATTRIB -r command to remove the read-only bit. After editing, use ATTRIB +r to reset the read-only bit. Use the ATTRIB /? command for a help display.)

A big improvement is possible if your PC has an Ultra-DMA hard disk and supporting controller on the motherboard. Refer to Fig-2 and the steps to get there, and double click the Disk Drives icon. Double click the first hard disk that appears; then click the Settings tab. Refer to Fig-4, where if the DMA box isn't checked, then check it. Click OK, accept the



warning, close Windows, and reboot.

If Windows accepts the change, you will note a marked improvement in hard disk performance. If the change isn't acceptable, Windows will automatically set it back to the unchecked condition. Repeat this procedure for all UDMA hard drives.

■ In Closing

Many hobbyists haven't married their radios to a computer yet because they can't, whether for lack of ports, drive space, or pizzazz. This article opens doors to new opportunities and possibilities. Save it: Even if you don't need it right now, you will ...

Support for this and all my columns is freely available by e-mail. If you're not computerized, please include an SASE with postal requests.

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ATTRIB	Attribute
BIOS	Basic Input/Output System
CMOS	Complementary Metal Oxide Semiconductor
DOS	Disk Operating System
GB	Gigabyte
IEEEER	Institute of Electrical and Electronics Engineers
I/O	Input/Output
IRQ	Interrupt Request
ISA	Industry Standard Architecture
PCI	Peripheral Component Interconnect/Interface
PII	Pentium II
PS/2	Programming System 2
SCSI	Small Computer Systems Interface
UART	Universal Asynchronous Receiver/Transmitter
Ultra-DMA	Ultra-Direct Memory Access (UDMA)

A Handy Tool for Antenna Work

When we want to build an antenna I suppose that most of us select an article that tells us how to build the one we want, and then follow the directions. When we are finished we put the antenna into service and, if it works satisfactorily, that's the end of our working on the antenna. But sometimes antennas don't perform to our satisfaction. In such cases we may want to perform some tests to see if we can find a way to improve the situation. Or our intellectual curiosity may lead us to check things out just to understand our antenna a bit better.

In the January and February 1998 "Antenna Topics" columns we looked at some ways to test antennas and feedlines. Since that time a couple of manufacturers have come out with improved models of their antenna-system test instruments. This month we'll take a look at one of them — the MFJ 259B SWR Analyzer.

■ The MFJ 259B SWR Analyzer

In case you haven't yet become acquainted with the term "SWR" it is the acronym for "standing wave ratio." Standing wave ratio, a measurement frequently used in radio communications work, is an indication of the degree to which energy (like the radio frequency [RF] signal coming down your feedline from your antenna) and given to a load (like your receiver's antenna input) is accepted by that load. Often much of the signal is rejected and reflected back into the transmission line. If the source of the signal and the load to which it is fed are what is called "matched" to each other then the transfer of signal to the load is optimized. That, of course, makes for good communications.

The 259B SWR Analyzer utilizes the information assessed in SWR analysis to perform a variety of useful measurements which can be quite helpful in optimizing matching where needed. It also provides other information helpful in getting maximum performance from radio communication systems.

The 259B's predecessor, the MFJ 259 SWR Analyzer, has been available for a few

years and has become very popular with people who work on antennas. In fact, *QST* magazine has published two different collections of ways to use the 259 for a wide variety of tests not initially claimed by MFJ. It is not too much to say that the 259, together with the antenna-system test instruments produced by AEA and Autek Research, have revolutionized our ability to quickly evaluate many important parameters of an antenna system.

Despite the success of the 259, MFJ decided to make a good thing even better. They did this by adding a number of valuable functions in the 259B (fig. 1) while retaining all the features of the older 259. A liquid crystal display (LCD) has been added for readout of many of the unit's added measurements. Other measurements are read from its two meters.

The 259B is surprisingly small (4 x 2 x 6 3/4 in) for a test instrument packed with so many features. Like the 259, the 259B is primarily designed for work with 50-ohm antenna and transmission line systems and operates over the range of 1.8 to 170 MHz. There is a useful frequency counter built-in which covers from 1 to 180 MHz. The unit can be powered either by internal batteries or an external power supply. Batteries may be dry cell or rechargeable, and a recharging mode is built into the unit.

■ What the 259B can do

Most of the quantities the 259B measures are familiar to those interested in antenna work. These include rapid assessment of RF devices for resonance, Q (a rating of effective bandwidth), complex RF impedance (resistance, capacitive reactance, and inductive reactance), and impedance value (Z). It also measures standing wave ratio (SWR), cable loss in dB, cable velocity factor, cable length, distance to cable faults (shorts or open cable). You can use it with antennas, transmission lines, filters,



FIG. 1. The MFJ 259B SWR Analyzer

traps, stubs, amplifiers, and antenna tuners. It also measures low-value capacitors (a few to a few thousand pf), and low-value inductors (.1 to 60 μ h).

Yes, that is a lot of measurement for one piece of gear, but then the 259B also makes advanced measurements such as return loss, reflection coefficient, and transmit efficiency. If you don't understand these advanced measurements (mostly they're a different look at the forward and reflected waves that determine

SWR) you may want to check the *ARRL Antenna Book* or other sources recommended in the 259B manual.

As a bonus, the 259B can even be used as a modest performance, low-level signal generator. In the instruction manual MFJ states that, "While the VFO is not stabilized, it is useful as a crude signal source." Crude or not, I have found this feature (also available on the older 259) to be of considerable use at times.

The manual is well written, and is frank in pointing out the limitations of the 259B as well as its virtues. It is always good to see a manufacturer interested in giving a fair and balanced view of their product.

■ The Practical Side

Receiving antennas for frequencies above about 20 to 30 MHz often offer improved reception when tuned to resonance. Transmitting antennas at any frequency generally give improved performance when resonant. Weak-signal work with mobile antennas in particular can benefit from antenna resonance. Antennas can be brought precisely to resonance with the help of the 259B. And, once you have the antenna resonant, the 259B can help you adjust the antenna-feedline match and feedline-receiver match for good signal transfer. You can also determine an antenna's bandwidth, which is the frequency range over which you can expect optimum performance.

If you prefer to make your own matching circuits rather than using someone else's design, the complex impedance values presented by the 259B will tell you the necessary inductive or capacitive reactance needed for the match. The 259B has so many features we could go on at length about such things as working with baluns, chokes, stubs, traps, the resonant frequency of tuned circuits and so on. But you get the idea: this little device is one handy piece of antenna test gear. In short, it is hard to imagine a more useful antenna tool for the price. If you do much work with antennas it is a smart buy. The MFJ 259B is available at \$249 plus S/H from MFJ Enterprises Inc., Box 494, Miss. State, MS, 39762: phone 601-323-5869.

RADIO RIDDLES

Last Month:

I mentioned "antenna modeling" and asked "What is it?"

Fortunately for us, for any particular antenna design, such variables as antenna ra-

diation and reception patterns, feedpoint impedance, and many other important aspects of performance remain the same regardless of the frequency for which the antenna is designed. Also fortunate is the fact that, at VHF and higher frequencies, antenna dimensions are quite small compared to the dimensions of the same design implemented at lower frequencies.

Why? Because it makes it possible to build a small model of an antenna at these higher frequencies, and, from the performance of the model, to reasonably predict the performance to be expected for this design at lower frequencies. It often allows a great savings in time and money to work out design problems with a small model antenna at a higher frequency before beginning construction of the much larger and more costly antenna planned for use at a lower frequency.

This Month:

One of the things that the 259B helps you check is "Q." What is this, and why do we care — or do we? If we don't, should we?

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, 73.

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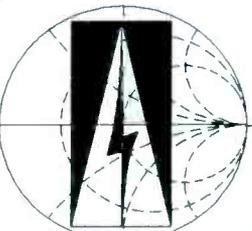
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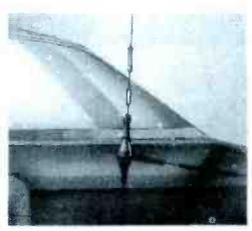


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Let's Talk about Ham Radio!

Yes, I know I talk about ham radio every month. But, there are some things I feel are very important for us to think about. In light of the many doomsayers and proposed changes in amateur radio regulations, a great deal of misinformation is being generated.

First of all, is ham radio doomed? If you mean will the hobby cease to exist, I doubt it very much. Will it change? Most surely it will. If you examine the history of our hobby, it is evident that every few years changes in technology or society affect our hobby dramatically. Back in the days of spark, many hams feared that CW would be the downfall of the hobby and refused to change to the new mode. Then as Phone and other modes were developed, a large portion of the fraternity went into hysterics about the crowding out of Morse code (CW). But as you see, the hobby just went on and on.

Today, technology is rushing ahead at a rate most of us cannot comprehend. As we absorb the ideas of some part of new technology, the mainstream has crashed ahead at lightning pace, and many of us feel overwhelmed. It is impossible for the average person to absorb all the new technology that's available. That does not mean we quit! Rather, most of us will fit into niches we carve out for ourselves — be it in an older technology such as CW or Phone, or one or more of the new ideas.

All through the history of our hobby there were the experimenters and builders,

and there were the operators who bought all or some part of their station. That has not and will not change.

Ham radio is about technology and people using it to communicate with others. As long as we can interest people in the hobby it will be there. Some of those who come into the hobby will be the leaders in technology. Many others, stimulated by the leaders, will make major contributions, and the balance will simply use the available technology for their own entertainment. That's the way it is!

■ The Internet

There is a lot of talk about the Internet taking the place of ham radio. I just do not see that happening. Ham radio is about challenge, experimenting and communicating. At the present time, most of us feel a satisfaction in saying I talk to so and so down in Argentina or wherever, on 40 or whatever band. It is a more personal experience and a feeling of kinship with the person on the other end. A special kind of satisfaction comes if we build some part of our own station, too. I am always amazed when I talk to another station using a rig or antenna I built myself. If you've done it, too, you know what I am talking about.

Understand, I am not knocking the Internet; it is a fantastic achievement and I do make an appearance on it at least once a week. The information available on the web

is super. I have joined several amateur radio groups on the web and love searching out web sites about ham radio.

In fact, I am presenting here a neat project that I found on KC6WDK's homebrew low power (QRP) pages at <http://www.brink.com/brink/QRP/>. It is a simple half watt transmitter, which when coupled with a receiver and antenna will allow the builder to work hams from everywhere. Cost of the little rig is next to nothing. The site has some neat receiver projects, too.

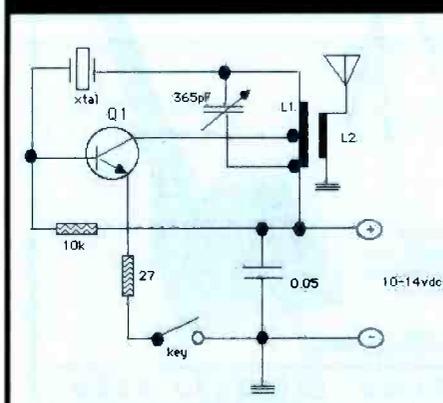
The "Mighty Mite" was mentioned by K4TWJ Dave Ingram in his column in *CQ* magazine, March 1992. First originated by W3FQJ Ed Knoll and expanded on by KY8I Tom Jurgens, this little rig will operate on any band from 160 to 30 meters. The transistor Q1 can be a 2N2222, 2N3053, SK3265 or similar NPN transistor. Use a heat sink on the transistor.

Use a ceramic trimmer cap 365pf and fundamental crystals. Use a 35mm plastic film container on which to wind the coil according to the table. Tune up with a 50 ohm, one watt carbon resistor, then connect to a dipole antenna and operate. Most of the parts can be cannibalized from an old transistor radio or from the local hamfest.

Questions? Contact me either via *MT* headquarters, to my home qth, or email to N3IK@zdial.com (use caps for my call) or n3ik@hotmail.com.

Take care and good DXing. 73 de N3IK, Ike

THE MICHIGAN MIGHTY MITE



Tank Coil:

Use a 1.25-inch diameter form (35 mm film canister, pill bottle, etc.) and #20-#22 AWG enameled ("magnet") wire. To make tap, wind L1 to the "tapped at" number of turns (see table below). Make a loop about 1 inch long, twist it a few times and finish winding. Sand the insulation off the end of the loop. This is your tap. After winding L1, wrap it with a thin layer of making tape and wind L2 on top of the tape in the same direction as L1. Secure L2 with more tape and finish by sanding insulation off.

L1:
(primary/collector windings)
160m--60 turns, tapped at 20
80m--45 turns, tapped at 15
40m--21 turns, tapped at 7
30m--15 turns, tapped at 6

L2:
(secondary/antenna windings)
160m-- 8 turns
80m--6 turns
40m--4 turns
30m--4 turns

Motorola's Hot New TalkAbout

It's obvious that the major players think there is serious money to be made in Family Radio Service transceivers. And it's not surprising: FRS has a lot to offer:

- small, conveniently-sized radios
- crystal clear FM communications in the 460 MHz band,
- no license, and
- none of the hassles that come with the long-range propagation that occur on 27 MHz Citizens Band radio.

As the man said, "What's not to like?" So long as you remember that FRS is limited to a maximum range of about two miles (and sometimes the range is considerably shorter), FRS offers a lot to like indeed.

Industry insiders tell me that Motorola has already captured a considerable share of the mushrooming FRS market by heavily promoting its excellent TalkAbout series of FRS radios. The TalkAbout+ that was reviewed in this column in September 1998 received high marks.

Recently, Motorola extended the TalkAbout line of FRS radios with the SLK series. These new TalkAbouts are about an inch shorter, roughly an inch narrower, and about 2-1/2 ounces lighter than the standard TalkAbout line. The top-of-the-line TA280 comes standard with rechargeable nickel metal hydride batteries (which offer about 12 hours of use) and a charger, as well as scan and call features.

To test the TA280, I used the optional battery pack which holds three AA alkalines and offers up to 30 hours of operation (90% standby, 10% talk), according to Motorola. The installation of the \$14.99 SLK alkaline battery kit requires sliding the NiMH battery door off the radio, replacing the NiMH battery back with the alkaline battery pack, and then sliding a new door — the alkaline battery door — onto the back of the radio. The reason for the new door is that the alkaline batteries are significantly thicker than the NiMH batteries they replace. As a result, the entire radio is about 3/8 inch thicker with the alkaline batteries.

The TA280 is certainly great looking with its silver main body and trim in any of four colors . . . very "new millennium." At the upper left is an orange power button. Below that, the Scan button. Press it, and the TA280 scans all 14 FRS channels, looking for activity. Curiously, the only sign that the radio is



The Motorola TalkAbout TA280 SLK offers cracking good performance in an easy-to-use package.

performing this function is a blinking Scan indicator that appears in the radio's liquid crystal display. For those of us accustomed to see numbers whirl by when a radio is scanning, this can be a bit disconcerting.

Below the scan button is the Call button, which will transmit any of five unique call tones when pressed. Still further below on the left side is the light and lock button. Press it briefly once, and the liquid crystal display (LCD) is illuminated for five seconds. Press and hold this button, a Lock indicator appears in the LCD, and key radios functions are locked so that they cannot be changed accidentally.

At the upper center of the radio's face the display shows channel number, interference code number (if any), battery condition, and indicators that show when special functions have been activated. Below the LCD is the push-to-talk switch, right in the dead center of the radio.

At the upper right are a pair of up and down scrolling buttons. In normal use, the first function of these buttons is to raise or lower the volume of the radio. To change channels, you must first press the Menu button. When the channel number flashes, you can use the scroll buttons to adjust the channel up or down. To activate to change CTCSS (Continuous Tone Coded Squelch System) tones — what Motorola calls "interference eliminator codes" — requires press the Menu button twice, then

using the scroll buttons to set the desired code number. As in the TalkAbout+, when a CTCSS code is applied to one channel on the TA280, it applies to all channels.

If you press the Menu button three times, you can program the TA280 to scan only certain channels. Press Menu four times, and you can set your choice of call tones. Press Menu five times to set the sensitivity of the radio for an optional voice-activated swivel boom microphone. In all, I liked operating scheme for the TA280.

The performance of the TA280 SLK is exemplary. Transmit audio is clear and crisp; ditto on receive. Even better, the range of the TA280 is fully equal to the best FRS radios I have tested. In short, the Motorola TalkAbout TA280 SLK offers cracking good performance in an easy-to-use package.

The suggested retail price of the TA280 is \$209.99. For retailer locations, call 1-800-353-2729 or visit www.motorola.com/talkabout.

Want to monitor FRS frequencies? Here they are.

Channel	MHz	Channel	MHz
1	462.5625	8	467.5625
2	462.5875	9	467.5875
3	462.6125	10	467.6125
4	462.6375	11	467.6375
5	462.6625	12	467.6625
6	462.6875	13	467.6875
7	462.7125	14	467.7125

More on the "Chirp"

In our January column, a reader asked what the occasional but prominent "chirp" is that he hears on some shortwave broadcasting signals. Veteran shortwave expert Larry Magne hit the nail on the head. Ionospheric "sounders," constant-carrier transmitters that sweep up and down the spectrum testing for propagation, cause that sound as they sweep through other signals. Thanks, Larry.

Q. How do I know if a signal is lower sideband (LSB) or upper sideband (USB)? The other night I was listening to a broadcasting signal and it sounded the same in LSB and USB.

A. A standard amplitude modulation (AM) signal, sent by medium wave and shortwave broadcasters, consists of three parts: The carrier wave (envelope), an upper sideband, and a lower sideband. Such signals are easy to receive because the audio is simplest to extract and hear; if you can understand the contents of the broadcast in the AM mode, it is not single sideband (SSB). But AM is spectrally inefficient because the the same audio energy is present in the upper sideband as the lower sideband of the carrier wave, an unnecessary redundancy.

Generally, you will use your 6 kHz bandwidth filter for AM (wider if there is no interference, or 4 kHz when there is interference), and 2-3 kHz for SSB.

AM also requires more electrical power to generate the carrier wave, and it is subject to distorted reception unless both sidebands are received identically. Because the sidebands are at two different frequencies (above and below the center carrier), and radio propagation can be frequency-selective, one sideband may be delivered at a different amplitude from the other, a well-established distortion known as "selective fade."

If, in the AM mode, all you hear is muffled audio, and it clarifies by turning on one of the two SSB modes (LSB or USB), then you are receiving single sideband. An SSB transmitter cancels the center carrier wave and one of the sidebands, leaving the remaining upper or lower sideband which you can then receive by choosing either USB or LSB respectively.

Q. Do you think that Radio Shack stopped selling their service manuals on certain models so that they could monopolize the service industry, or so they could reassure their cellular customers that they were doing something to guarantee better privacy? (Roger Morse, Binghamton, NY)

A. Radio Shack and Uniden both now withhold service manuals and schematic diagrams for those scanner models which could conceivably be modified to receive cellular telephone frequencies. This was done voluntarily to assist the Federal Communications Com-

mission (FCC) appease an unhappy Congressional committee who wanted more teeth put into the law to prevent people from listening in on cellular phone calls. Undoubtedly, the gesture generates good public relations with their cellular customers as well.

Q. Why is it that when my electric service fails, other utilities such as gas, phone, and water continue to operate? Aren't they all controlled by electricity, too? Mark Burns, Terre Haute, IN)

A. Absolutely, but they have fail-safe backup

Bob's Tip of the Month

■ 24 hour time on a 12 hour watch

If your digital watch has a stopwatch function, there's a good chance it runs out to 24 hours, then starts again. For local 24 hour time, simply start the stopwatch at midnight; for Universal Time, start it when it is 0000 hours UTC at your location. (Thanks, Nathan Bollinger, KB4CWR)

■ Scanner accessories savings

Since many Uniden scanners are private labeled for Radio Shack, next time you need a special battery, antenna, or CTCSS tone board, check both your Radio Shack and Uniden dealer for the equivalent part. (Thanks, Terry R. Davis, KC8DSE, Pullman, MI)

■ Unmute the SW portable

When tuning the Sangean ATS818 or 818CS (same as Radio Shack DX390 and 392) portable shortwave receivers, the sound is muted until the dialing is stopped. To keep the audio open during tuning, carefully remove the cover and locate the three

Hints by the Handful

7-wire ribbon cables. Select the ribbon on the bottom of the board, carefully disconnect it from its jack, bend over the center wire to keep it from connecting, and reconnect the cable. (Thanks again, Terry!)

■ Custom cataloging your favorite MT articles

Tired of pawing through dozens of old magazines looking for your favorite articles? Photocopy them and classify them by topic in a three-ring binder; using a notebook with pockets allows various sheets of reference materials, extra paper, and pens and pencils. (Thanks, Ken Reheman, N9MKU, Evansville, IN)

■ Dust your radios

Dust and heat are the two primary enemies of electronics. While you may carefully use the hose attachment for your vacuum cleaner to dust electronic equipment, it might be better to use something made for electronics: the computer vacuum, inexpensive and available from computer suppliers. (Thanks, Ruan McCarthy)

systems such as auxiliary generators and, in the case of phone systems, giant rechargeable battery banks to power the DC phone lines.

Q. What equipment do I need to receive Canadian C- and Ku-band satellite TV from here in Indiana? (Al Cernius, Beverly Shores, IN)

A. By U.S.-Canadian agreement, domestic satellite TV viewing is restricted to citizens within the borders of the respective countries. This is commonly done with decoders, and your address defines the accessibility to the code to enable reception. Contact a local satellite dealer to see if he has any better ideas, and whether your visual horizon contains the bird(s) of interest.

Q. Can I improve my scanner reception by combining two similar antennas and feeding them both to my scanner? (Numerous inquiries)

A. Yes, and you can also worsen it. If you combine the outputs of two identical antennas, regardless of what kind they are, the most improvement you can get is 3 dB (half an S unit) over one antenna alone.

But this gain comes from directivity and, just like the old adage, "What goes up must come down," where the gain went up in one direction, it will come down in another, often considerably.

The singular exception to this is combining the outputs from antennas of different frequency ranges so that they won't compete on the same frequencies.

Select the single, best antenna you can for general purpose reception, and save dual antennas (dueling antennas!) for radio direction finding purposes, or for patterning your reception to favor a particular direction at the expense of another.

Q. I notice that there are several frequencies in the 169-171 MHz range allotted to wireless microphones, but I've never seen any low-powered handie-talkies offered for that range. I would like to communicate with nearby relatives; can I use those frequencies? (George C. Albro, Buffalo, NY)

A. The Federal Communications Commission (FCC) regulates a wide variety of services, each with its own set of rules. For example, low power, license free, two-way communications devices are given different frequency assignments from low power, license free, one-way microphones.

The primary purpose is to minimize the likelihood of interference among services, but there would be no reason why you couldn't

transmit over a wireless microphone, have them transmit back, and each of you listen on a scanner or other VHF receiver.

Much easier, though, would be for you to get a pair of Family Radio Service (FRS) handie-talkies from Grove Enterprises or any other MT advertiser that offers them; they are low cost, virtually interference free, and work extremely well for such close-in communications.

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Radio Shack DX-397 Compact Portable

Radio Shack was a relatively new operation when I had a girlfriend living near where it all began. So, while I was visiting her in Connecticut I went by the Radio Shack store and made my first purchase — a simple two-bit toggle switch. Because of where it had to go, it was a pain to install. Nothing unusual with that, but the kicker was that the switch didn't work. A replacement switch worked, but only intermittently.

Back then if you bought, say, 100 Switchcraft switches, all 100 would work perfectly time and again. Dud switches were all but unheard of, until Radio Shack.

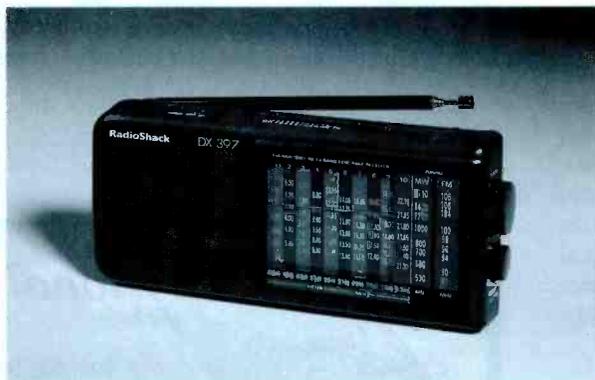
During another visit, I tried again at the same store by purchasing an RCA phono plug. Trouble is, when I soldered it, the disc insulator melted like beeswax, ruining the plug. Surely, I thought, an outfit like this would soon go belly up.

So much for my prognosticative skills, but there is a bright side to this story. As the years went by, Radio Shack evolved from its dismal beginnings as "Radio Schlock" into a marketer of some worthwhile equipment, a far cry from some of the stuff they peddled at the outset. Now, for example, all their digital world band radios are surprisingly good performers, and are especially worth considering when offered at reduced prices during special sales.

The most recent addition to the Radio Shack world band roster is the \$59.99 DX-397, a compact analog portable designed mainly for travelers who don't want to risk taking along a pricey receiver, such as the \$360 high-tech Sony ICF-SW100S, where it might disappear thanks to lost luggage or light-handed service personnel, or might get clogged with beach sand.

■ Exceptional frequency coverage for type

The '397, made in China, covers the usual FM band and AM from 529-1710 kHz, plus 10 world band segments: 4.5-5.1, 5.74-6.3, 7.1-8.0, 9.3-10.0, 11.45-12.16, 13.4-14.4, 15.1-15.9, 17.4-18.1, 18.75-19.2 and 21.3-22.1 MHz. For a simple bandspread analog portable, this is remarkably complete coverage, including even the new 15 meter (19 MHz) broadcasting band.



Tuning is smooth and free from backlash, and the indicator needle is stable and straight, with accurate factory alignment — one of several signs that the '397's quality control is better than that of most Chinese-manufactured world band radios. The frequency readout thus is readable to the nearest 30 kHz (six channels), but in most instances you can tell the frequency within ten or 15 kHz. This hardly puts it in the same league as a receiver with digital frequency readout, but it is adequate for casual listening on trips.

■ No frills

The '397, powered by three "AA" cells (not included) or an optional AC adaptor, is a bare-bones receiver with few features and no accessories whatsoever, not even a carrying strap. The only controls are for power, volume, tuning and band selection; a single LED is used as a signal indicator of sorts.

Thankfully, the power switch is designed such that it is unlikely to come on accidentally during transit. The telescopic antenna swivels, but does not rotate, making it less handy and robust than it otherwise might be. There is no elevation panel to tilt the radio to a handy operating angle when it is laid down flat.

■ Performance: few surprises

Aside from the superior frequency coverage, performance is predictable. Sensitivity to weak signals is fair, about what you would expect from a model of this price and size. Selectivity, or adjacent-channel rejection, is determined by a single and very wide bandwidth that is woefully inadequate for listening to stations hemmed in by interference. Yet, as with all wide bandwidths, it has the virtue of

providing superior fidelity when a powerhouse station is heard free from potential sideband interference.

Very strong signals sometimes "ghost" up and down the band in question because of cross-modulation or greatly limited deep-skirt selectivity. Image rejection from the receiver's single-conversion circuitry is dismal, allowing repeat signals from 900 kHz away to intrude upon the received signal with modulation sounds and varying-pitch whistles. Indeed, the 60 meter (5 MHz) band is so awash in spurious signals from the extended 49 meter (6 MHz) band that at times it can be difficult to find much in the way of "real" signals.

Yet, many of these findings are typical of what you encounter on any low-cost single-conversion analog portable — they are faults stemming largely from the receiver's dated, bare-bones design concept, rather than its design implementation. However, the '397's audio quality does rise a bit above the norm, being a notch better than most comparable models. Indeed, strong signals "out in the clear" can sound downright pleasant, although as a DX receiver the '397 falls flatter than last night's soufflé.

Bottom line is that the Radio Shack DX-397 is a predictable performer in its class, standing out from the herd of generic Chinese models because of its excellent frequency coverage and slightly above-average audio quality, as well as seemingly superior quality control. It serves its function of keeping road warriors and other travelers in touch with the world, and if you don't like it Radio Shack will take it back — no questions asked, no restocking fee — within 30 days of purchase.

■ Best bet: look during sales

Still, \$60 is a lot to ask for a radio that is only a little better than some "Brand X" Chinese models that retail for around \$30. The '397 should be selling for \$40, \$50 max, so if you're looking for a low-cost travel portable, check it out when Radio Shack is offering it during a reduced-price sale.

Better yet, check out Radio Shack's digital-readout models when they are marked down on sale. When these have their prices slashed, they offer some of the best values among world band radios anywhere.

■ Grundig Satellit 900 by July?

In the *mañana* products department, there are few that can quite equal Microsoft's NT 5.0 (recently re-christened Windows 2000 shortly before MS announced yet another six-month delay) or the Grundig Satellit 900. Year after year, we hear that these intriguing offerings will soon appear, and be nothing short of fantastic. And year after year, they get put off with nearly predictable regularity, like Lucy pulling away the ball from Charlie Brown at the start of every football season.

We can probably take heart that the Satellit 900 hasn't yet been renamed the Satellit 2000, but the latest scuttlebutt suggests that it may

materialize by early summer — June or July, say. And, yes, it does look like it may be an interesting radio along the lines of the Sony ICF-SW77.

We shall see. At least July is some months before the beginning of the football season.

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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.

A Mobile Monitoring Post

By Joe Glath, Jr.

I live with one wife and seven cats, which leaves little room for a permanent listening post. Sitting quietly in this house with earphones on is not the safest thing to do. Now granted, it could be worse. The numbers could be reversed — seven wives and one cat! Yikes!

Here's what I came up with. Enclosed are two photos which show how one can have his wife/cats and still enjoy listening to shortwave. It's all put into a camera bag. Yes, that's right, a camera bag. (When I really want to get away from the wife and cats I do a little photography, so I have a number of camera bags lying around.) The bag in the picture can hold the following:

- Main Compartment
 - Sony 7600G w/case
 - Bearcat BC60 XLT-1 scanner
 - Sony AN-LP1 antenna w/controller
 - Copy of *Passport to World Band Radio*
 - Instruction books (never leave these behind)
 - Small pair headphones

- Small Left Side Compartment
 - Batteries, AAs
 - AC adaptor for scanner
- Small Right Side Compartment
 - Sony AC adaptor for 7600G
- Front Compartment
 - Small tablet, pens/pencils, photos of wife/cats (no, not really!)

The radio scanner and antenna controller all use the same size batteries, AAs. These batteries are all small and easy to carry, and available anywhere.

A copy of *Monitoring Times* should also be carried — perhaps rolled and stuffed into a back pants pocket. A small 24-hour clock could also be included.

Not only is this arrangement great for portable listening in the house, but when the warmer weather comes, the bag can be taken out to the back yard, porch, etc. It is also easy to take on trips. Everything is in one place.

P.S. This arrangement will also come in handy if the wife/cats should see this letter in print. All I'll have to do is grab the bag and run, taking my whole listening post with me!



Photo by: Joe Glath, Jr.



Photo by: Joe Glath, Jr.

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ICOM RS-8500 Software

We reviewed the ICOM IC-R8500 wide coverage receiver in January 1997 *MT*. This month, we describe the ICOM RS-8500 Version 1.0 software that permits an IBM compatible PC to control the IC-R8500 receiver. The RS-8500 package consists of two floppy disks, a cable fitted with DB-25 and DB-9 connectors, and a single page installation sheet.

Overview

The RS-8500 software lets you control most of the IC-R8500's features using your computer. In addition, the software provides a Band Scope that portrays spectrum activity akin to a panoramic adapter. You can read memory channel and search limit data from the radio into the program and vice versa.

Data can be stored in disk files, though the format is proprietary and no mechanism is provided to convert ICOM's files to ASCII files or exchange them with other programs.

The user interface consists of a Main window and several specialized windows.

Easy Installation

Our computer is a Gateway 266 MHz Pentium II, equipped with 64 MB of RAM and a 9 GB SCSI hard drive. The computer is equipped with two serial communications ports, COM1 and COM2.

We found the RS-8500 installation under Microsoft Windows 95 easy and glitch-free. The main window is a color replica of the IC-R8500 front panel (Fig. 1). After initial installation, we used the Options, then Settings menu to change the port setting to COM2 and verify that the CI-V address and signaling rate were correct. RS-8500 permits a user to choose the appropriate COM port in contrast to the SONY SC1PC software that mandates installation on COM1. We chose COM2 because COM1 on our computer is connected to an external modem.

Main Window

The Main window resembles the IC-R8500 radio front panel. You can position the mouse over a virtual pushbutton and activate it by pressing a mouse button. The rotary tuning, volume, squelch, and IF shift controls can be "rotated" by using the left and right mouse buttons.

Setting the IC-R8500 to a specific frequency



FIG 1 - Main screen displays replica of IC-8500 front panel. You can use mouse buttons to activate radio controls.

couldn't be simpler — merely type the frequency digits on your computer keyboard, followed by the Enter key.

Five pulldown menus are arranged along the top of the Main window.

Memory Channel and Program Scan List Windows

The Memory Channel List window (Fig. 2) looks like a spreadsheet, termed a "grid," and allows you edit and view the IC-R8500's memory channel contents. The IC-R8500 permits you to change the number of channels in a bank, but the R-8500 software does not.

The Program Scan List window (not shown) is a grid that looks very much like the Memory Channel List window. It is used for entering the 10 pairs of scan limits, their labels, reception mode, attenuator setting, and step size.

CH	NAME	Frequency	Mode	ATT	TS	SEL	SKIP
0							
1	KINCOM P1	400 57500 FM		12 SA			
2	KINCOM P1	400 57500 FM		12 SA			
3	KINCOM P2	400 37500 FM	20dB	12 SA			
4	KINCOM P2	402 37500 FM		12 SA			
5	ISPF M1	155 47000 FM		SA		SEL	
6	ISPF M4	185 48000 FM		SA		SEL	
7		145 17000 FM		SA			

FIG 2 - Memory channel list screen permits viewing and editing memory channel data.

Radio Player Window

The Radio Player window (Fig. 3) is a compact version of the Main window. There are slider controls for adjusting volume and squelch, as well as an "auto squelch" facility reminiscent of early Electra/Bearcat base scanners.

Three types of S-meter are available: a bar graph display which resembles the S-meter in a Japan Radio NRD-535D, a text string (e.g., S4), and a sliding graph of signal strength vs. time.

You can select memory channels and banks. While changing channels through the Radio Player window, the actual frequency (in MHz)

FIG 3 - Radio player screen permits control of basic functions and requires little screen real estate.



is displayed in the S-meter area for a few seconds.

Scan Control Window

The Scan Control window (Fig. 4) permits easy control of both memory scan and limit searches. Unfortunately, the software does not override the receiver's limitations of scanning or searching only one bank at a time.

The scanning software lets you control the scan parameters the way you would via the radio front panel, though the online documentation implies otherwise. The documentation claims you can set the IC-R8500 to resume scanning immediately after a carrier drops, without delay. In use, there is actually a one or two second rescan delay. The other rescan delay settings ruthlessly resume scanning after a selectable delay, even if a signal is still present on frequency. By contrast, the documentation says the scanning won't resume until the carrier



FIG 4 - Scan control screen permits easy control of memory scanning and limit searches.

drops.

Band Scope Window

Like a panoramic adapter or spectrum analyzer, the Band Scope window (Fig. 5) is a graphical portrayal of activity above and below the current frequency. Receiver audio is muted as the band scope sweeps, though you can pause the band scope sweep at any time to hear the action.

You can position the mouse over any part of the band scope and the IC-R8500 tunes instantly to the corresponding frequency. Sweep width is selectable between 10 and 100 steps.

Simple, but Well Done

We found the RS-8500 software works reliably and installs quickly on our computer. It is very easy to use and the graphics are excellent.



FIG 5 - Band scope screen resembles a panoramic display.

Limitations include no way to export or import the memory channel data to third party programs and lack of a print option. Too, we wish the RS-8500 software overcame the IC-R8500's limitations by being able to scan more than one memory bank at a time and by providing adjustable and defeatable rescan delay on a per channel basis.

.....

PRO-34 Discriminator Output

Ron Leaman (ronleaman@worldnet.att.net) sent us the following information describing how he added a discriminator tap for baseband audio output from his Radio Shack PRO-34 portable scanner and says it applies to the PRO-37 model, too.

He looked at the service manual and found that the output goes directly to the squelch pot (potentiometer) on the top of the unit, which makes it easy to tap. The baseband signal output comes from IC101 pin #9 (TK-10420) and also goes to TP-103 on the first board, then

goes through the three-pin wired connector to the squelch pot. One of the pot's terminals is grounded, but the new jack is mounted to the metal chassis which also serves as a ground.

The unit does not appear to have a good location to add a connector, so Ron chose to use a subminiature 3/32 inch mono earphone type (Radio Shack #274-292) for its small size. He found a place between the antenna BNC connector and the squelch pot that had enough room to mount the new jack directly to the metal chassis. He carefully drilled a pilot hole through the plastic case between the BNC and the pot, but offset 1/4 inch from the BNC centerline towards the front of the case. He removed the case and finished the hole in the chassis with a 0.154 inch diameter drill. (Be sure to keep metal drill fillings out of unit.)

Ron soldered a 0.1 µF capacitor to the jack's center pin and mounted it to the metal chassis. (The capacitor blocks DC voltage while passing baseband audio signals.) He noted that you might have to temporarily remove the top board for clearance. Next, he soldered the other lead of the capacitor to the white wire on the Squelch pot.

Last but not least, Ron had to enlarge the hole in the plastic case to allow the mating plug to reach the new internal connector. The internal connector was too far in for the stock length

mating plug so he had to drill a larger hole in the case.

You may need to add a transistor buffer if you connect your PRO-34's new baseband audio jack to a sound card or tone reader which "loads down" the radio's circuitry and keeps the squelch open.

Ron suggested that the discriminator output on other Radio Shack scanners manufactured by GRE may be similar and you may be able to tap of the squelch pot in them, too. Check the service manual first.

AOR User Manuals

User manuals for most AOR receivers may now be downloaded from the AOR's United Kingdom web site: <http://www.demon.co.uk/aor>.

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Approach Avoidance and Aero Monitoring

Have you ever been fascinated by something, but at the same time be uncomfortable to really confront it? This is so common that it has a name in psychology: approach avoidance conflict. As we get closer to the problem we convince ourselves to veer away from it, thereby reducing our anxiety. However, after all our mental effort, the problem exists. So what does this have to do with the price of tea; or computers and radios? This month, a lot.

Many months ago, while surfing the Web for aviation sites, I came upon a very interesting program which promised to join three of my passions; monitoring, aviation and computers. The description of the program, AirNav, was very interesting. If you do any shortwave monitoring of commercial airliners you know that the pilots transmit regular reports to ground stations such as Shanwick, Ireland. These reports usually include position, speed, routing, selcal (a tone access code) and the aircraft's next reporting position and time.

This information has a number of purposes. In a heavily travelled route, such as the Atlantic route between the USA and Europe, spacing of aircraft for collision avoidance between them is a factor. Should an emergency occur, position information would prove critical to any attempted rescue effort or assistance.

Finally, weaving the incoming aircraft back into very crowded international airport's traffic patterns, preparation of gate requirements, and aircraft scheduling also benefit from air-to-ground communications. These communications networks are in operation 24 hours a day and cover the globe. If you tune your shortwave receiver to an active HF aeronautical frequency (for the Atlantic route try 3016, 5598, 8906, 13306 or 17946 kHz in SSB, single sideband) you'll hear many aircraft at various points along their intercontinental journeys.

Wouldn't it be nice to track each aircraft we hear on a radar-like map? You bet, and that's just what the author of AirNav was thinking when he created this very versatile program. See Figure 1.

I thought the program concept was simple and great, so I e-mailed them for a copy. AirNav's reply was swift. Within a few days I was delivered a large envelope containing AirNav Version 2.10 on four 3.5 inch HD

disks. Also in the envelope was a number of stapled-together pages. I skimmed over the pages and found them disjointed and confusing. They seemed daunting. Finally, lacking a printed manual, I put the program into my "to-do" procrastination file.

A few weeks went by and I found myself still thinking that the AirNav program concept was good, and should have been simple. So why did I have an envelope full of paper? This approach-avoidance cycle continued for a number of weeks until I decided to break one of my cardinal rules: Always beginning a review of a program by reading all the company's literature and following their instructions to the letter. But in AirNav's case following this rule was going nowhere.

Relative to other programs of similar operational complexity, AirNav discouraged me from proceeding. In spite of this, I decided to load the software on my 166 MMX running Win 95. AirNav's requirements are modest: 386 or higher, 4 Meg RAM, 15 Meg hard disk space and Windows 3.1/95/98. The installation was quite simple and fast; until I tried to register my copy via the assigned code and personal ID. (The company issues these to registered users. Without them you are allowed to use most features in a demo mode which is limited to 30 minutes.) After an hour of trying, I finally realized that in my assigned

ID Code, a space had been inserted in front of my ID. Starting a password with a space is usually not allowed for this very reason. But now I was now registered and had access to the full program.

AirNav has help and demo screens. Initially, I found them confusing while trying to learn to use the program. I decided to check out the Demo 1 and print its instructions. The resulting two plus pages, just for the Demo, was intimidating. But I stuck with it, and I'm glad I did.

What I found was that the program lacked a "first step" to start the new user up the stairs of basic use. So, what follows is my method of how to learn AirNav in a very basic, but useful manner. It may not cover all the options or operations of the program. However, it allows the first time user an easy and quick introduction into the basic use and some features of this very useful program.

■ Instructions According to John

To start using AirNav, begin by monitoring and noting the following basic flight data: Flight ID number, current position (map coordinates and altitude), heading, speed, time of next report and next report location. With this data in hand, it's time to turn our attention to AirNav. First load a map corresponding to the area where the aircraft is flying via the

FIGURE 1 - AirNav in action (Demo 1)

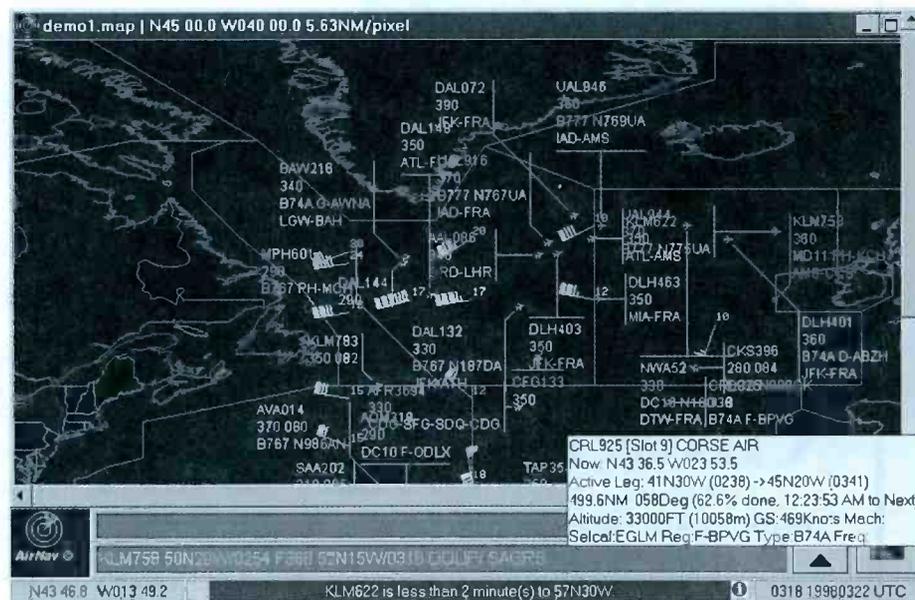




FIGURE 2 - Loading flight information obtained from shortwave monitoring

pull-down "Maps" menu. A number of maps are available, including a world map. However, the aircraft tracks and the map detail will be more accurate if you load a regional map. Now we are ready to enter the flight details we heard on shortwave.

By clicking on the box at the lower right of the screen, and then selecting "Flight Management," the screen shown in Figure 2 will be displayed.

Again, remember, our initial objective is just to get up and running with the minimum of hassle. This also means that we will not be utilizing all the capabilities of the program. But then, "The longest journey starts with the first step."

■ Getting on the "Radar" Screen

The Flight Management Mode screen is where it all happens initially. Begin by making sure that the slider bar, at the right of the large black flight identifier box, is set to Slot 1. The slot is actually the unique number of the aircraft we are about to map. Since this is the first aircraft we are entering, put it in Slot 1. Data for the next aircraft we monitor will be entered on this screen by first selecting Slot 2. In this manner we can add or edit aircraft data which is then dynamically displayed on the map with an airplane symbol.

Clearly, for identification purposes, the flight name, JFC123, is important. But in order for the display to move the aircraft along a track, waypoint and time for at least two points is required. If we don't enter this tracking data nothing happens. Frankly, that is the

key to the whole AirNav program. Of course, at least one of the waypoints has to occur in the future (relative to the current time) in order to see the aircraft move.

It's as easy as that! Why don't the instructions simply say this? Who knows? But I think it's a mistake and could put lots of people off before they have a chance to see AirNav's usefulness and many advanced features.

In Figure 2, we can see the location of flight JFC123 on the map to the right of the Flight Management box. Once we have entered the data the box is closed. The full map view, with its moving aircraft symbols, now fills the screen and we can watch our monitoring intercepts' progression.

■ The Full Deal

Figure 1 shows the Demo 1 screen which shows off lots of program features while tracking 53 aircraft! The entered flight details of any tracked flight will be displayed by placing the cursor near the flight. The large box at the lower right in Figure 1 displays the details of flight CRL925 — a Boeing 747 at 33,000 feet. We can update all flight information, as we monitor additional transmissions, by moving the cursor to the flight symbol and pressing the right mouse button. This command and control method is the other key, along with the Flight Management Mode, to using AirNav.

The bottom center of the screen displays messages from the program to the user. In this case it is warning that KLM622 is less than 2 minutes from its next waypoint. Other pro-

gram features include: estimation of times and waypoints, weather details, frequency list, screen zoom and the list goes on. Once a user becomes familiar with the program, AirNav adds a whole new dimension to aircraft monitoring.

■ Not a KISS off

We have just touched on the basic functions of the programs. It really does so much more. Audio alarms and color changes give the user additional flight information. A mode which strictly uses reported speeds to plot the position is also possible. I found the included databases of aircraft IDs and airport identifiers quite useful.

The latest program update can be downloaded via AirNav's website. Additional detailed regional maps have been added, as well as an updated aircraft database. All this and more is available to the experienced AirNav monitor. Had AirNav taken a KISS (Keep It Simple, Stupid) approach to their instructions, I would have been an enthusiastic user from the beginning, instead of a reluctant one.

I suggest that new users leave all the "instructions" and functional hype behind until they get a grasp on how the program works. Jump in and give the downloadable demo a try on your own, as we just did. Once you get a feel for the operational platform of the program, Help menus will become useful teaching aids.

Keep at it. The AirNav demo can be downloaded from their website at <http://fly.to/airnav>. The demo user can easily convert to a full version via a number of methods, including the use of a credit card and E-mail. The full version costs \$60; a bit high. But AirNav is worth it if you are really into HF aviation monitoring.

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The Bose vs. Zenith Challenge

By Ken Reitz



On the surface it would seem unfair to pit a stereo system against a table radio, but, a glance at the two pictures above demands it. These two products appear to have so much in common that it's surely a mistake that one costs five times more than the other. It's the vaunted Bose Wave and the Zenith look-alike challenger. How do they stack up individually and how do they compare against each other?

■ The Bose Weighs In

You would have to be Amish not to have been bombarded by TV and print ads trumpeting the extraordinary sound of the Bose Wave radio. It's depicted as transforming a room into a concert hall and rising up into a looming entertainment presence by simply turning it on. Can this diminutive radio, with its little 2.5-inch speakers actually deliver room-filling sound? The answer is: It had better, because at \$350 most buyers wouldn't tolerate anything less!

The Wave is another brainchild of famed MIT professor Amar G. Bose whose obsession with audio fidelity led him to research the "science of sound" and the formation of the multi-million dollar corporation which bears his name. Introduced in 1993, it astounded audiophiles and set a new standard for the nearly forgotten table radio.

The Wave utilizes patented Acoustic Wave speaker technology (a 34-inch tuned wave guide to channel the audio); presets for six AM and six FM radio stations; a credit card-sized, full function infrared remote control; adjustable sleep timer; and two typical clock radio features you've come to love — battery back-up and snooze control.

Realizing that most consumers don't

know what to do with typical stereo receiver functions such as equalization, tone control, and balance, Bose has dispensed with them entirely. Instead, automatic signal processing and active electronic equalization are performed by special circuitry in the radio while you thumb through the *Wall Street Journal*. The result: perfectly balanced audio for your untrained ears.

■ The Zenith Challenger

The Zenith Z213 so closely resembles the Bose Wave as to cause a lawyer to twitch excitedly. Its dimensions are virtually the same as the Bose; it has a nearly identical topside control keyboard and virtually identical functions and features. Without turning the radio on, the most obvious difference is the price. At about \$65 retail, the Zenith comes in at a savings of about \$285.

Among the convenient features shared by the two are: a CD/Aux input jack; adjustable 90 minute sleep timer; full function remote control; wake to music or alarm; ascending wake-up audio; easy-to-read front panel digital display; battery backup, and an alarm that works even if the power is off.

Despite the price tag, the Zenith actually has more features than the Bose. With 10 AM and 10 FM radio station presets, the Zenith also tunes the VHF-TV audio band (with 10 presets) and the seven NOAA Weather Radio frequencies that, throughout North America, tune into instant weather information from the National Weather Service.

■ Hearing the Difference

To test these radios I plugged a compact disc (CD) player into the auxiliary input of each and loaded it with classical, rock, jazz and pop CDs. I set the CD player to "spiral play" to rotate the music formats and, using

the remote controls, switched between the Bose and Zenith for a side-by-side comparison.

The Wave delivers a depth and clarity of audio unmatched in any product this small. It even successfully challenges stereos many times its size, weight and cost. Not that the Zenith sounded bad; on the contrary, it delivers such excellent audio that I could convince no one of its inexpensive price tag.

While the Bose delivered the lows, even at fairly minimal volume, that the Zenith simply couldn't, the Zenith did handle the mid-range and highs, even at nearly full volume. Only when pressed to fill a 20-by-20-foot room was there distortion from the Zenith's 3-inch speakers. The magical Bose went to the volume limit, filling the room to the pain threshold of my ears without distortion.

The Bose excelled in other areas as well. Equipped with a built-in "F" connector, it can be easily connected to an outside antenna, a must in rural areas. The Zenith uses a 29-inch wire antenna which is dangled behind the radio. Consumers are cautioned against attaching an external antenna (there's no provision to do so), but I found it necessary in my location to achieve decent reception of weak stations. I did this by taking 1/4-inch of insulation off the antenna lead and attaching a plastic-covered alligator clip which I could then insert into any 75 ohm coax antenna cable attaching the clip to the center conductor. Reception, as expected, was greatly improved.

■ Conclusions

Both radios work best in an urban or suburban environment where signals are strongest. The Zenith has the edge over the Bose with its extra tuning capabilities,

though to use the NOAA Weather Radio feature you'll need to be within 20 miles of the transmitter. The TV channel tuning feature is limited as well since it receives only channels 2-13. Popular UHF-TV stations in your area cannot be tuned in.

The Bose wins the reception event. While both tune in 100 kHz increments, the Bose is far more selective. Strong stations .1 MHz apart are easily separated. It's also considerably more sensitive. Stations receivable on the Zenith only with an external antenna are received without any antenna connection on the Bose.

The Bose Wave is the perfect table radio which lives up

to its own hype; it's essential listening for the financially endowed. The Zenith Z213 is a great table radio, which, combined with a cheap personal CD player is all a person would need for a portable sound system for a small apartment or dorm room.

Available in "pearl white or graphite gray" and made in the USA, the Wave radio is sold directly from Bose via a toll-free number (800) 919-BOSE, or on the web at www.bose.com. The Zenith Z213 is available in white or black, is made in China, and is sold in most major electronics retail stores in the US. For additional product information call (800) 677-0894, or, on the web at www.sdirect.com.

Sony Dynamo-Powered Emergency Radio

By Bob Grove

Sony's new ICF-B200 AM/FM analog radio is a busy little accessory. Power can be selected between AA alkaline cells (not included) or NiCd cells charged by a built-in, hand-cranked generator. The alkaline cells will provide approximately 40 hours of play time, while one minute of cranking will deliver enough charge for a half hour operating from the NiCd pack. An "Optimum Charge" LED signals the most efficient charging speed.

The brilliant, safety orange color of the case makes it easy to spot quickly, and a 75 dB,

pulsed-tone, acoustic beacon can quickly locate it or anyone near it. The analog dial may be lighted for station selection. A rubber-protected earphone jack invites private listening. The radio is splash-resistant for foul weather applications.

Signal sensitivity is in par with other pocket AM/FM analog radios; an LED signals proper center tuning for moderate and strong signals.

Designed for power outages, camping, and emergency dependability, the B200 is available for \$79.95 plus \$5 shipping from Grove Enterprises.

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Need emergency lighting? The B200 has a built-in emergency guide light, and its display is illuminated as well. A headphone jack allows private listening, or you can call for help with the audible alarm. The bright, safety-orange color quickly locates the radio under all conditions. Be ready for power outages—don't be caught without a source of emergency information! Call now to order your lifeline to the community!

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WHAT'S NEW?

TELL THEM YOU SAW IT IN MONITORING TIMES

OptoCom available from Grove

Last July "What's New" announced a ground-breaking product from Optoelectronics: The OptoCom computer-controlled scanner. It's finally here, and it is available for \$459.95 from Grove Enterprises (800-438-8155), as well as from Optoelectronics (800-327-5912). OptoCom comes packaged with TrakkStar software developed by ScanStar and Radio



Manager for Windows developed by Ben Saladino. To follow the GE/Ericsson EDACS system you will need to also pur-

chase the third-party, E-Trax software program for \$89.95.

First impressions are impressive: its outstanding feature is, of course, the ability to *simultaneously* scan multiple trunked systems (Motorola, Johnson's LTR, and Ericsson's EDACS) along with conventional frequencies. And it does this at a speed of 65 to 100 channels per second!

For more information about this exciting entry into computer-controlled scanning, contact either of the companies mentioned above, or watch for Bob Parnass' hands-on review in an up-coming MT.

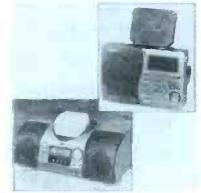
While you're at it, be sure to check out Grove's newly-designed on-line catalog at www.grove-ent.com; shopping with Grove was never easier.

WorldSpace Receivers Unveiled

An article in trade magazine *Radio World* has given us the first glimpse of production model receivers designed to pick up transmissions from the AfriStar satellite launched in October 1998. In December Hitachi, JVC, Panasonic (Matsushita), and Sanyo displayed receivers destined for sale in Johannesburg, South Africa; Nairobi, Kenya; Casablanca, Morocco; Cairo, Egypt; and other cities in Africa and the Middle East in 1999. The receivers will sell for between \$250 and \$350, depending upon manufacturer, model, and local import tariffs.

The JVC FR-DS 100 and Hitachi

KH-WS1 include FM, mediumwave, and shortwave reception along with L-band reception.



The Panasonic RW-WS10 and Sanyo DSB-WS1000 are WorldSpace-only L-band receivers.

Trudell Dish-Pod for Small Dish Antennas

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- By Number of hits per frequency in a "histograph".

• IF THAT ISN'T ENOUGH, try this... Multicolored, 3-D "Spatial/Landscape" (Depicted at left).

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For four decades, the Electronic Engineers Master Catalog ("EEM") has been the leading compendium of components and materials for the electronics manufacturing trade. More recently, the contents have been made available as well on CD-ROM.

The massive publication, as available in four printed volumes, contains 4300 pages of catalog data from more than 1000 manufacturers, with contact information for another 4000 manufacturers.

The CD database utilizes a fast search engine for data retrieval, listed by product and manufacturer. You can also see the data-



base on line by visiting <http://eemonline.com>.

The massive database is available for \$99.95, including shipping, in either printed or electronic format from the publisher, Hearst Business Communications/UTP Division, 645 Stewart Ave., Garden City, NY 11530; ph. (516) 227-1314, or fax (516) 227-1453.

IC Master Online

IC Master, a comprehensive source of IC product information which is also published by Hearst, used to appear in a gigantic three-part book form, then was offered on CD, and finally was available on the Internet (but only to those who owned the catalog or CD).



Now, engineers can search the internet database of more than 135,000 base part numbers for FREE.

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Guide to Federal Government Sales

No matter what the ads say, you won't find any \$50 Jeeps at government sales. Merchandise offered in federal government sales is usually sold at fair market price. Often, items will not be sold if the bid is below what is reasonable.

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Jim Handy CW Interface

Nervous about going on the air as a beginner in Morse code? MFJ Enterprises provides a nifty way to practice your CW with other local hams by turning your 2 meter or 440 MHz handheld into a CW transceiver.

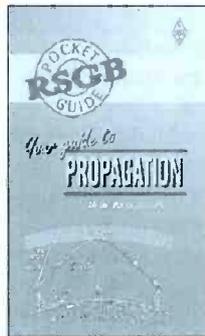
Simply plug the Jim Handy™ interface into your HT and plug in a straight key. CW is converted into audio tones sent to your mic jack. The Transmit/Receive switch automatically keys your push-to-talk on your HT as soon as you start sending. An adjustable T/R delay knob lets you send fast or slow CW. You'll be able to hear what you are sending from the built-in speaker so you can improve your technique.

MFJ-552 uses a 9 volt battery and includes an open-end patch cable to which you solder your HT connector. (Pre-wired interface to HT cables are available for \$14.95.) The Jim Handy interface is \$59.95 from MFJ or your favorite amateur radio dealer.

Call 800-647-1800 or visit www.mfjenterprises.com.

Your Guide to Propagation

The way in which radio signals propagate is a fascinating topic. A basic knowledge is invaluable to any shortwave listener,



radio amateur or professional engineer associated with radio technology. *Your Guide to Propagation* by British amateur Ian Poole G3YWX (author of last month's *MT* feature article) gives a clear introduction to the topic, covering the ways in which radio waves travel at frequencies from the medium wave broadcast band right up to the microwave region of the frequency spectrum.

The topics are explained in a clear and interesting fashion, covering the major elements of radio propagation and why they occur. *Ham Radio Today* says in its review, "It is amazing how much knowledge has been crammed into what is, in fact, quite a slim volume. Despite that, it's an easy read."

The book is published by the Radio Society of Great Britain and priced at £6.99 (Sterling). ISBN 1 872309 49 6. To order, contact The Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts, EN6 3JE, England, Tel: 01707 660888 (+44 1707 660888) 24 hrs Fax: 01707 645105 (+44 1707 645105), or e-mail to sales@rsgb.org.uk

Mahlon Loomis, Inventor of Radio

Confusion will always reign over who was the first experimenter to send signals by wireless communications. From Marconi to Tesla, and Loomis to Stubblefield, supporters draw their battle lines.

In 1965, the U.S. Senate issued a joint resolution memorializing Doctor Mahlon Loomis, a dentist, for his invention in 1864 and demonstration in 1866 of a form of wireless communications. The first patent for such a device

was issued to him in 1872.

In 1967 a book chronicling Loomis's life and work was written by Thomas Appleby, now deceased. Reprinted in 1993, these books are now out of print, but they are being offered in photocopy format under special royalty arrangement with the heirs.

Over 150 pages in length, the reprint includes illustrations of Loomis's experimental apparatus along with historic documentation of his claims, demonstrations, and frustrations. While Loomis readily demonstrated his wireless system by sending electrical pulses across many miles, as signaled by a galvanometer connected to his antenna, he was considered a crank by many who scoffed at his achievements.

In 1897, Guglielmo Marconi, after reviewing Loomis's papers in Washington, claimed he discovered the "kite aerial," even though it had been demonstrated by Loomis thirty years earlier. But Loomis could not defend his invention; he had died in despair in 1887, allegedly of a broken heart.

The reprint is available from \$25 plus \$5 shipping from Svanholm Research Laboratories, PO Box 81, Washington, DC 20044.

Changes at Marbian Productions

Ian McFarland, founder of Marbian Productions International, regrets to announce that he has discontinued the service of mailing a packet of shortwave program schedules on request. After putting in three years of effort, he received insufficient support from either broadcasters or recipients to keep the program going.

McFarland, himself a former program host from Radio Canada International, is still working to promote international broadcasting, however. His new project is as the Americas representative for the Association for International Broadcasting, a new trade organi-

zation started by two ex-BBC World Service staffers.

Besides serving as a clearinghouse, industry representative, conference organizer, etc. for the industry, AIB also publishes an industry magazine *The Channel*, and the twice-yearly *Global Radio Guide*. The *Guide* is a basic directory (no programming information) of English language transmissions for about 85 broadcasters.

Anyone interested in ordering the *Global Radio Guide* can now purchase it in North America for US\$5.75 from Marbian Productions, P.O. Box 41063MT, Port Coquitlam, BC, V3C 5Z9 Canada; phone/fax 604-941-5381. Persons interested in the AIB may learn more by visiting their website at www.aibcast.demon.co.uk

Home Video

Home theater is a rapidly growing sector of the consumer electronics market, and special considerations are required in the selection, maintenance, and repair of these expensive home entertainment centers, as well as supporting audio systems.

Andrew Yoder, already well known for his writings on shortwave listening, takes us on a literary tour of the history, sources, descriptions, selection, technologies, environments, accessories, and future, as well as the maintenance and repair of television receivers, video cameras, VCRs, and home satellite systems.

Home Video is \$39.95 in hard cover, \$29.95 paperback; published by McGraw Hill, 11 West 19th St., NY, NY 10011.

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 828-837-2216 or e-mailed to mtditor@grove-ent.com.

LETTERS TO THE EDITOR

NEWS AND VIEWS FROM OUR READERS

Rachel Baughn, Editor

Continued from page 5

a battery up from the floor. These batteries are heavy and not really made for lugging easily around in a DX camp or in a quiet site.

"I agree that they are made for repeated charge/discharge cycle by having a deeper sediment catch area at the bottom of the battery and thicker plates, but they are built essentially the same as a normal car battery. The deep cycle battery can be drained completely and not suffer from terminal death because of the way they are chemically and structurally built, but they are still lead acid batteries.

"You can charge/discharge a regular lead acid battery many times without ill effect. The main concern is not to fully discharge to 0 volt every time you use it. Normally a DX camp will last 2 to 3 days and if you are using really portable equipment you will not be discharging the small battery to extinction! I have used the setup described in the article to run a Sony 2010 and a professional tape recorder for 48 hours and the battery is not yet dead.

"This 'Battery in a Bucket' is not — repeat, *NOT* — to be used to boost a car on a cold winter morning; it was designed to supply 12 volts to run portable radio and tape recorder in an emergency or a DX camp environment.

b) "Next, the foam acid reaction problem. As far as I know the foam is inert once it has fully gelled. I really cannot comment on this, but let me say that not much acid could escape from the small vent hole after tipping the battery, so I do not consider this to be a real concern.

c) "Finally, the hydrogen concentration. The bucket is not fully airtight; some air can go in and out of it so the concentration would not reach dangerous levels if you charge it at a reasonable charging rate. Punching a small 1/4-inch hole in the top could alleviate the problem of a high concentration of hydrogen building up inside the bucket

"For the present setup, with a lawn mower battery, a reasonable charge would be about 2A/hr. Anything much higher than this will probably boil the battery dry and cause excessive gassing. I have assumed, probably wrongly, that user of this emergency/

DX camp setup would have some basic knowledge of lead acid battery care and maintenance, (especially if you are a ham and have operated in the field). Normally you do NOT recharge a lead acid battery at a rate higher than one tenth of its manufacturer-rated capacity.

"In this case, the battery used in the system described has a 15 A/Hr nominal capacity, so it should not be recharged at a rate higher than 1.5 A. 2.0 A is close enough in this case as a 1.5 A charger is not readily available unless you want to build one yourself.

"I hope that these explanations will help assuage the concerns expressed."

And finally, Chris Gordon of Granby, Connecticut, weighed in with similar concerns:

"I looked at the January 1999 article in *Monitoring Times* and immediately thought of an incident that occurred in West Hartford, Connecticut, several years ago. The fire department I work for was testing a new electric extrication tool called a Power Hawk. This tool consisted of electric-motor-driven 'jaws' and, more to the point, a gel-cell battery in a Pelican brand plastic case. Through charging, the gelcell apparently off-gassed hydrogen. There were unprotected electronics in the same case for charging and distribution. The resulting explosion sent five firefighters to the hospital.

"The use of a battery in a sealed container may produce explosive hydrogen gas even from a 'sealed' battery. The presence of electronics that are not 'intrinsically safe' can be a dangerous combo."

Bob Grove sent this reply to Chris, "Your point is well taken. I have been in (experimental) hydrogen gas explosions, and they are quite sensational. Perhaps we should print a caveat, suggesting vent holes be placed in the lid of the container, that the lid not be too tightly shut, and that no switching components be included in the bucket!"

Duplicate Designs

What does a half square have in common



Karl Holt of Delhi, New York, sitting in his radio shack with his Kenwood R-1000, Drake SW1, Realistic DX-390, and Zenith 7H820 Tube Radio (not in photo Zenith 1000 Transoceanic Receiver).

with a bobtail? *Everything*, according to Richard Herndon of Austin, Texas.

"I think the January 1999 issue could have used a little editorial savvy. Anyone reading the completed issue would have noted the striking similarity of articles on pages 84 and 86. I'm sure the individual column editors had no idea of this problem. That's why there is an editor for the magazine...right? <grin>

"I *did* note that *neither* of the column editors has an email address."

What an eye! As Richard suspected, neither I nor my technical editor, looked at both articles at the same time — but even so, I doubt I would have suspected that two antennas with such different names were the same. But as he properly notes, they certainly are! What irony that the same antenna should have come to each author's attention through such different routes. Must be a darned good antenna!

Both authors do have e-mail, by the way. Clem Small's was listed with the others on page 2 but not in his column header; sorry. Ike Kerschner just got on line last month.

Preserve your radio history

Last year we were asked to find a good home for two well-organized boxes of QSLs and log sheets. Interest in the collection came from a youth club, shortwave club, school teacher, library, and a shortwave manufacturer — *after* the collection had

Letters, continued on page 102

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FOR SALE: SONY ICF-2010, like new! AC adaptor, instructions, strap included. \$200. Money Order. Cathy, 717-486-3443.

FOR SALE: MAGAZINES, Monitoring Times, January 94 thru December 98. RCMA, January 95 thru June 96. 78 mint magazines for \$90. I will pay shipping. MOTOROLA HT600s. 1 pair, extra batteries, lapel mics, chargers, and manuals. Excellent working condition. \$400 firm. Joseph Miller, 2138 Maple, Downers Grove, IL 60515. 630-241-4231

WANTED: Realistic Patrolman CB-9. Larry, 409-299-1897.

Continued from page 101

already been given to a person who intends to digitize the collection for potential posting on the Internet.

If you are wondering what to do with your log books and other memorabilia, it appears there are groups which would put them to good use. Although we don't intend to become a clearing house for clearing your houses, we will be happy to provide space to advertise your collection free of charge, so long as you only charge postage costs to the recipient.

If your collection is of QSLs only, we

encourage you to contact the Committee for the Preservation of Radio Verifications (CPRV). This Association of North American Radio Club (ANARC) committee's goal is to preserve QSLs belonging to hobbyists who are no longer active. Please contact Jerry Berg, 38 Eastern Ave., Lexington, MA 02173 for an information pamphlet about the committee.

Your Letters to the Editor are always welcome at P.O. Box 98, Brasstown, NC 28902 or via email to mteditor@grove-ent.com. Watch for our antenna issue in April!

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CLOSING COMMENTS



By Bob Grove,
Publisher

Great Wailing and Gnashing of Teeth

■ The Right to Listen

I am frequently called by press reporters who are writing stories on scanner monitoring and, as a journalist, I am always happy to give them time. A common thread which runs through the interview is, "Do citizens have a right to listen in on private communications?"

Naturally, the knee-jerk reaction from scanner hobbyists is, "Sure, if the message is in clear voice where anyone can hear it, then I shouldn't be prevented from listening." But this only answers the question, "May I listen in?" not "Do I have the *right* to listen in...?"

The U.S. Constitution is the primary vehicle which outlines the rights of U.S. citizens: the remaining body of law elaborates on those basic rights by defining what is *unlawful*. There is a difference between an activity which is a right to which we are entitled, and an activity which, because it is not prohibited, is considered a privilege.

The fact is, we've never had the *right* to listen in; it was simply accepted as unavoidable. When the Federal Communications Commission (FCC) was created in 1934 and the first communications laws were passed, there were only caveats against the use or divulgence of overheard information. Specifically *allowed* were those radio communications intended for the general public; or relating to ships, aircraft, vehicles, or persons in distress; or the amateur radio and (later) citizens band services.

Implicit in the 1934 law was that it was expected that people could logically overhear radio transmissions since they are broadcast over wide areas. It didn't guarantee their right to listen, it only prohibited them from abusing the privilege to listen. It was not until 1986 that it was specifically made illegal to listen to cellular and other mobile phone communications (later extended to include cordless phones) and paging services.

We still have that privilege—not a right—in the vast majority of scanner and shortwave monitoring activities. In fact, the 1986 rewrite specified that it was *not unlawful* (i.e., was allowed) to intercept not only the communications allowed in 1934, but also those of "any governmental, law enforcement, civil defense, private land mobile, or public safety system, including police and fire, readily accessible to the general public, ... and by any marine or aeronautical communications system."

As increasing numbers of municipalities are electing to scramble their communications in order to discourage eavesdropping, scanner enthusiasts recoil and ask, "How do these elected officials have the nerve to make their communications private?" (Federal security and defense agencies have been doing this for decades.)

The law seems to us to be remarkably equitable in this regard: it implies that public safety and federal and governmental agencies have no more *right* to privacy in their communications than the public has a *right* to listen in. However, once a communication is scrambled or encrypted for the purpose of privacy, then the law will protect the privacy of that communication. Otherwise, scanner owners, listen to your hearts' content!

■ A New Ham Test?

The FCC has announced sweeping changes in amateur radio licensing. Needless to say, great wailing is heard from certain quarters to preserve the Morse code test. Proficiency in Morse is somehow perceived as a guarantee of ham character, in spite of the fact that the list of license suspensions and revocations reveals a strong presence of Morse-qualified licensees.

Some wags, aware that memorization of answers has little to do with on-air behavior, have proposed that the Morse and theory exams should be supplanted by a mental examination.

With tongue firmly implanted in cheek, I propose the following questions be added to the new license examination pool:

1. The primary reason that proficiency in Morse code must be maintained is:
 - (a) I had to learn it and, by golly, so will you;
 - (b) If you are shipwrecked on a desert island, and your mike is wet or you are hoarse, you can still send SOS by rubbing two wires together;
 - (c) It's the most efficient use of air time, especially for sending long words;
 - (d) To boost the amateur radio market by subsidizing manufacturers of keys;
 - (e) Because everyone prefers hearing "Beep-beep-beeeeeep" rather than the human voice;
 - (f) Out of respect for our founders who didn't have microphones.
2. Because of its worldwide propagation, the 20 meter phone band is best used for:
 - (a) Venting racial slurs, sexual epithets, political biases, and religious bigotry;
 - (b) Transmitting high power to cover up conversations or individuals you don't like;
 - (c) Utilizing catcalls, silly voices, bathroom sounds, and noisemakers to interrupt communications;
 - (d) Tuning up for long periods at maximum power on rare DX stations;
 - (e) Causing deliberate interference on emergency frequencies to prove you're in control;
 - (f) Contriving long, boring broadcasts to massage your ego.

Just as scanner hobbyists are having to adjust to the rapid evolution of communications and the growing concern for privacy, amateur radio must be willing to conform as well to the extinction of obsolete modes of communication — or be left behind.

Thankfully, it's not an all-or-none choice: Even though privacy-concerned agencies are scrambling their correspondence, there will remain an enormous pool of clear voice communications for the scannist to tune in. And even though Morse code has fallen from use in virtually all serious applications, anyone wishing to participate in its rich history may elect to do so on the amateur bands.

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