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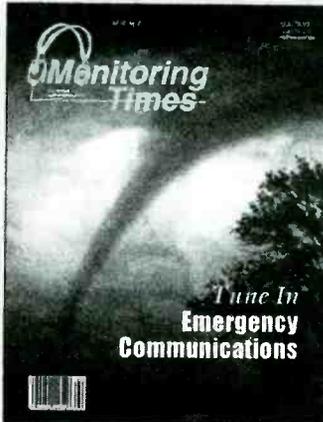
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Cover Story

Monitoring FEMA

By Larry Van Horn

A major reason for the existence of federal government is for the protection and defense of its citizens — and that includes defense from the natural disasters as well as against enemy nations. The Federal Emergency Management Agency is the lead agency that coordinates response and recovery efforts following any catastrophic disaster on U.S. soil, and that includes restoring communications for the area hard hit.

The first half of 1998 has already seen ice, floods, fire, and killer tornadoes such as pictured on our cover. The picture is a composite by John Bailey of a storm cloud under a weather watch (courtesy of Richard Barnett) and an actual funnel cloud, caught by noted photographer Warren Faidley (WeatherStock).

To learn about FEMA's role in a crisis, and to tune in their frequencies, turn to page 8.

C O N T E N T S

Close Encounter with a Twister 14



Photo credit: Warren Faidley, WeatherStock

By Steve Douglass

“I have lived in West Texas nearly 30 years and have seen more than my share of storms. I’ve held in my hands hail the size of grapefruit and felt winds so wild they could tie a knot in a wind sock, but I never really experienced the pure humbling power, the amazing atmospheric essence of a deadly tornado until last spring.” Here is the story and a frequency

list for storm spotting in the Texas Panhandle.

Mother, Jugs, and Speed? 18

By Les Butler

The modern, urban ambulance system is no longer your “mom and pop” shoestring operation. The American Medical Response company serves four counties in Michigan — including the city of Detroit — and must interface with hospital and public safety agency communications in all four counties.



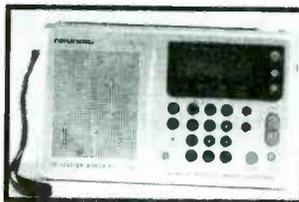
Antennas for Emergency Operations 22

By Joseph Carr



When the power is out over an entire region, you are often dependent on mobile or handheld radios to pull in news reports from outside your local region. The effectiveness of your antenna may make all the difference between hearing the news and hearing nothing. These tricks of the hobby can be applied in all kinds of circumstances — why wait for an emergency?

REVIEWS:



The Cherokee single sideband CB is a pound of punch in a pint-sized package: see p. 71. If intermod's your reception problem, PAR intermod filters provide a high quality solution (p.86).

In an *MT* news scoop, Larry Magne previews a new edition of the popular Grundig Yacht Boy 400 — The Professional Edition is a lot of fun at a very reasonable price (p.88). For reception when neither power nor batteries are available, the BayGen radios come through in a pinch (see p.85).





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By Fred Maia, W5YI
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The FCC - Who they are and what they do

The Federal Communications Commission (FCC) is now the primary agency impacting the economy, funding and future of the United States. Over the past century, our nation has been transformed from an agricultural to an industrial and now, to the information age. And it is the Federal Communications Commission that is managing this transformation, as it regulates electrical and electro-magnetic communications...the transfer of information from one place to another.

In the early 20th century, jurisdiction over wire and radio communications was handled by various agencies, including the post office. ("Radio" includes any wireless use of the radio spectrum; "wire" includes telephone and cable TV.) It soon became apparent that technological developments and interference necessitated coordination by a single federal agency. The Communications Act, signed June 19, 1934, created the Federal Communications Commission as an independent agency. It was created by Congress, and as such, reports directly to Congress. The Communications Act applies to the 50 states, Guam, Puerto Rico, the Virgin Islands and other island U.S. possessions.

The major function of the Commission is the allocation of radio frequencies to non-government communications services, licensing stations and operators, and regulating interstate and foreign wireline and radio communications. Radio operations of the Federal Government and the military are not regulated by the FCC, however.

All allocations of radio frequencies must be within the framework of international agreements established by the International Telecommunication Union (ITU) for the various radio services. The ITU, now nearly 200 countries strong, is a specialized agency of the United Nations.

There are five FCC Commissioners (previously seven) appointed by the President which must be confirmed by the Senate. Their five-year terms are staggered. No more than three Commissioners can be members of the same political party. The current FCC Commissioners are Chairman William E. Kennard, Susan Ness, Harold Furchtgott-Roth, Michael Powell and Gloria Tristani. The Commissioners supervise all FCC activities, delegating responsibilities to staff units and bureaus.

After a major reorganization of the FCC in 1995, the agency now has six bureaus and several offices. The six operating bureaus reflect six broad divisions of Commission responsibility.

The **Mass Media Bureau** is the part of the FCC that deals with broadcasting (television and AM/FM radio), as well as Multipoint Distribution Service and Instructional Television Fixed Service. The Bureau assigns frequencies and call

letters, issues broadcast licenses, performs policy and rulemaking functions, and administers the enforcement program for all mass media services.

Most recently, the Mass Media Bureau formally laid the groundwork for the transition to digital, high definition television by adopting a digital broadcast television (DTV) standard, service policies and rules for DTV, and by awarding a second channel to each of the 1,700 U.S. television broadcasters.

The **Common Carrier Bureau** has responsibility for FCC policies concerning tariffed wire and radio-based telephone companies that provide interstate telecommunications services to the public. These companies, called common carriers, provide voice, data, and other transmission services. As the industry evolves from an integrated monopoly to an intensely competitive industry, the FCC and the Common Carrier Bureau strive to adapt the Communications Act to a rapidly changing industry.

The **Wireless Telecommunications Bureau** (WTB) oversees the use of radio spectrum to fulfill the communications needs of businesses, local and state governments, public safety service providers, aircraft and ship operators, and individuals. In addition to licensing commercial providers of wireless services, WTB monitors the more than two and a half million licensees that use private wireless radio. WTB is responsible for all domestic wireless telecommunications programs, except those involving satellite communications.

The principal functions of WTB include evaluating new technologies (with the Office of Engineering and Technology), assessing utilization levels of the spectrum and the competitiveness of markets, identifying and allocating spectrum appropriate for licensing, developing through rulemaking the operating rules for radio-based services, assigning licenses through competitive bidding (auctions), developing methodologies for conducting complex auctions of radio spectrum, maintaining an antenna structure registration program, licensing personal, amateur and commercial radio operators, and enforcing the Commission's rules. The spectrum auctions run by WTB have already raised more than \$20 billion for the U.S. treasury.

Recent WTB rulemaking includes the authorization of a new Digital Audio Radio Service (DARS). And WTB now permits domestic operation of recreational ship and aircraft radio stations without individual licenses.

The **Compliance and Information Bureau** (CIB) assures compliance with communications law and is the FCC's primary point of contact with the public. CIB, through its headquarters

staff and various field offices, informs and educates licensees of important or new regulations. It advises consumers about measures they can take to combat fraud and other illegal practices in the provision of communication services. Its new Emergency Alert System (EAS) recently replaced the old emergency broadcast system (EBS).

The Compliance Division investigates unlicensed or unauthorized operation of radio stations, resolves interference problems where appropriate and provides communications assistance to public safety and law enforcement agencies.

The Bureau carries out its programs to serve the public and the Commission through 16 district offices, nine resident agent facilities, a toll-free National Call Center (1-888-CALL-FCC), and 14 remotely controlled monitoring and radio direction-finding sites located throughout the United States.

Established in 1994, the **International Bureau** develops, recommends and administers policies, standards, procedures and programs for the authorization and regulation of international telecommunications facilities and services and the licensing of domestic and international satellite systems. The Bureau also represents the Commission in international conferences involving telecommunications matters.

The **Cable Services Bureau** was created in 1993 and has worked since that time on issues related to the cable television industry and other multi-channel video programming providers. Increasing competition in the markets for the delivery of multi-channel video programming continues to be a major objective of the Cable Services Bureau.

The **Office of Engineering and Technology** is responsible for managing the non-Government use of the spectrum. It is the FCC's technical advisor on engineering and scientific matters. OET makes recommendations to the Commission on how the radio spectrum should be allocated and establishes the technical standards to be followed by users. OET recently issued guidelines for exposure by the public to radiofrequency radiation.

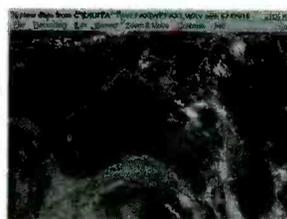
The FCC currently has approximately 1,750 employees, 1,450 of whom work at the Commission's downtown Washington, DC, headquarters. About 100 people work at the FCC's licensing facility in Gettysburg, Pennsylvania, and 200 are at various field offices. The FCC's budget is expected to exceed \$200 million in fiscal year 1999! Today, most FCC funding is paid back to the U.S. treasury in the way of regulatory fees.

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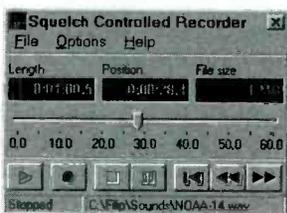
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A Hard Lesson — More to Come?

Seems to me Aesop had something to say about putting all your eggs in one basket ... or all your communications systems on one repeater?

When the PanAmSat Galaxy 4 (G4) geostationary communication satellite failed on May 19 it caused a huge communication nightmare. The public soon learned what a wide variety of domestic communications services were served by Galaxy 4.

The satellite initially experienced an anomaly within its on-board spacecraft control processor (SCP), the primary system responsible for pointing the spacecraft at earth. But when the automatic switch to a backup unit failed as well, the satellite began to rotate, losing its fixed orientation. Since customers could no longer access it, the communication package was shut down.

The National Weather Service lost its ability to send certain products (included radar mosaic and satellite imagery) to their four major storm laboratories. Even more critical, all Air Route Traffic Control Centers lost their weather service net and had to revert to

a landline system.

The list of communication services that suffered service disruptions was extensive. Some of the TV services affected include: CBS Radio and Television, CNN Airport Network, the Chinese TV network, Telemundo/Telenoticias, UPN and Warner Brothers TV networks, and World Harvest TV/Radio.

A large number of radio networks suffered outages and required relocation including the Georgia, Illinois, Iowa, Michigan, Tennessee, West Virginia, Wisconsin News Networks; the In-Touch, Kansas, and Minnesota reading networks for the blind; Agrinet; the AP Radio Network, Muzak Audio Services; NASCAR's Motor Racing Network; numerous grocery/department/specialty in-store radio networks; Sports Byline USA; Talk America Radio Network; Tribune Radio Network; United Broadcasting and the USA Radio Networks.

Major league baseball radio networks which had to relocate included the Atlanta Braves, California Angels, Chicago Cubs and White Sox, Colorado Rockies, Detroit Tigers, Milwaukee Brewers, Seattle Mariners, and Texas Rangers.

Other major service providers using Galaxy 4 that required relocation included Accuweather, most of the nationwide pager companies (40-45 million pager owners lost service), several satellite internet service providers, UPI and Reuters news agencies, and a number of credit and debit card verification networks affecting businesses such as Wal-Mart, Chevron Corp, automatic teller machines and fast pay at the gas pump.

Even public safety agencies suffered communications outages. We were surprised to discover the Los Angeles Fire Department, New Hampshire State Police, and San Francisco Police and Fire Departments communications were affected when Galaxy 4 spun out of control.

At presstime most communications circuits are being rerouted to other satellite systems. Galaxy 4's owner, PanAmSat, is in the process of moving a spare satellite into Galaxy 4's orbital slot. Final word on the future of Galaxy 4 had not been released as we went to press.

The failure is made even more troubling by the fact our galaxy of satellites has yet to run the minefield of the Leonid meteor shower this fall and bombardment by lethal solar

BULLETIN BOARD

July 4: Dillsburg, PA

Firecracker Hamfest sponsored by Harrisburg Radio Amateur Club at Monaghan Fire Hall, 245 W. Siddonsburgh Rd, Dillsburg. Talk-in 146.16/76 MHz. 8a.m., \$4 general admission. VE testing, indoor airconditioned tables, tailgating. Contact 717-232-6087 or fabinfo@fabral.com or n3njb@juno.com.

July 11: Oak Creek, WI

South Milwaukee ARC 29th Annual Swapfest at the American Legion Post #434 at 9327 S. Shepard Ave. Contact Robert Kastelic WB9TIK, SMARC, P.O. Box 102, South Milwaukee, WI 53172-0102. Talk-in 146.52 simplex. Free parking, free overnight camping, free beer and soda. 7a.m. - 2p.m.; admission \$5.

July 12: Northland (near Pittsburgh), PA

"A real old-fashioned hamfest!" by North Hills ARC at the Northland Public Library, 300 Cumberland Road (10 mi. north of Pittsburgh). Contact Bob Ferrey, Jr, N3DOK, 871 Rosalind Rd, Pittsburgh, PA 15237, (412) 367-2393, n3dok@pgh.net; <http://>

nharc.pgh.pa.us. 8a.m.-3p.m.; Free admission and parking.

July 19: Special Event Station W2ZZJ

Stratford, NY - The Fulton County Dr. Mahlon Loomis Committee commemorates the 172nd anniversary of the birth of Dr. Loomis. 1300-2000 UTC on General Class phone portion of 75, 40, and 20 meters, and on the Novice 10 meter phone band. Also on 2-meter FM repeaters. For certificate and literature, send QSL, contact #, and a #10 SASE (55 cents) to: George Sadlon W2ZZJ, 5738 St Hwy 29A, Stratford, NY 13470.

July 26: Timonium, MD

Baltimore Radio Amateur and TV Society (BRATS) ham and computer fest at Timonium Fairgrounds, York Rd off I-695, I-83. Free VE exams; call 410-467-4634 to preregister. Talk-in 147.03+, 224.96, 448.325. Tailgating 6a.m., indoors 8a.m.; admission \$5. Contact BRATS, PO Box 5915, Baltimore, MD 21282; 410-467-4634 voice or fax, www.smart.net/~brats or brats@smart.net

July 31 - Aug 2: Special Event Station W9ZL

The Fox Cities ARC (Appleton, WI) special event station from the EAA (Experimental Aircraft Association) Fly-In at Oshkosh, WI. SSB-HF operation in the General portions of the phone bands (8am to 4pm daily). RTTY operation mostly on 7085 and 14085. Certificate offered for contacts with proper QSLs to Wayne Pennings, WD9FLJ, 913 N. Mason, Appleton, WI 54914.

July 31-Aug 2: Rock City, NY

Worldwide TV-FM DX Association (WTFDA) convention. For details email dxfmv@buffnet.net or write host Dave Nieman at 12284 Nice Rd, Akron, NY 14001-9408. WTFDA's new club address is: P.O. Box 501, Somersville, CT 06072.

Aug 14-16: Missoula, MT

International Radio Club of America (IRCA) convention. Location 4B's Inn South. \$25 registration deadline Aug 3 to Larry Godwin, 2390 Clydes Dale Lane, Missoula, MT 59804. Email lbg@selway.umt.edu or call 406-721-5131

storms as our sun enters a potentially record-breaking cycle of activity. (Courtesy of the *Satellite Times* staff)

Hello? This is your Emergency Alert System ...

The digital Emergency Alert System now automatically activates warnings of floods, tornadoes, etc. via television and radio stations in the affected area, but what if you aren't listening to radio or television, and don't possess a weather alert radio?

A group which calls itself the Cellular Emergency Alert System Association is lobbying for the EAS warning system to be extended to users of wireless phones as well. The association says the technology already exists to send text messages to every phone that is turned on or sitting in a charger.

Word to the Weatherman

Forecasters may be able to blame El Niño for occasional embarrassments, but weather prediction always has been a bit of a crap shoot. Experiments currently underway as part of NASA's New Millennium program could come to the weatherman's rescue in about five years.

Using the world's only laser telescope with a holographic optical element, David Guerra at Western Maryland College is bouncing reflected laser light into the atmosphere to detect wind speed and direction as well as cloud boundaries and concentrations of particles.

According to the telescope's inventor, NASA engineer Geary Schwemmer, atmospheric winds drive the weather. "If we had a better knowledge of winds, that would give us an improvement in weather forecasting." The ultimate goal is to mount the holographic telescope in space for better weather prediction and disaster preparation.

"The Asteroid that Stopped the Lottery"

Don't bet on this movie coming out! The Oregon Lottery Commission awarded a \$124,000 contract to a company charged with devising a plan to ensure immediate restoration of gambling games in the event of such a catastrophic event as an earthquake or asteroid collision. One might wonder who would be thinking about gambling at such a time, but the commission pointed out that gambling generates \$1 million per day for the state.

A "Black Box" for cars

Living in the mountains of North Carolina, I can't rid myself of the memory of several fatal accidents that might have been prevented — the college student on his way home whose car rolled down a mountainside and wasn't found until many days later; the driver whose car took a corner too fast at night and was found the next morning upside down in the river ... These are classic examples of lives that might have been saved, had they been found in time.

"Over half the fatal crashes are single vehicles and the majority of them occur in a rural environment," says Dr. Ricardo Martinez, head of the National Highway Traffic Safety Administration. The agency is working with the Calspan SVL Corporation and others to develop an automated collision notification system which is currently being tested in Erie County, New York.

According to the report, the electronic "black box," located under the back seat, is activated by a collision. Its signal is transmitted via the car's cellular phone to a satellite and contains information regarding the location of the car, the severity of the crash, and even whether the car was hit in the front, side, or rear, or rolled over. The satellite alerts the appropriate 911 center which is then able to establish a phone channel so the dispatcher can discover whether anyone was injured.

The system is anticipated to cost the consumer \$200-300 and the technology may be readily available in as little as five years. However, the national network is not, and many procedural questions are just emerging.

Shortwave on NPR

Beginning in August, many of you should be able to hear a number of international

broadcasters over your local public radio stations. For some time now the World Radio Network (WRN), which relays some 20 international broadcasters on satellite (see p.39), has been carried in the middle of the night on AM across Canada on CBC Overnight, and more recently there have been similar arrangements in South Africa and Israel. Now NPR is planning on launching a similar all-night service in cooperation with WRN.

Business Covets Amateur Band

The Land Mobile Communications Council (LMCC) petitioned the FCC for additional commercial spectrum by "immediate ... reallocation of 420-430 MHz, paired with 440-450 MHz, from Federal use to PMRS [Private Mobile Radio Service]." Petition RM-9267 was filed for public comment until June 1st.

The 440 band is currently used by radio amateurs on a secondary basis with repeater use in 440-450 MHz, and satellite links and amateur television in 430-440 MHz. The primary allocation is to the federal government which uses it for telemetry, long-range surveillance, early warning systems, satellite tracking, etc.

"Communications" is written by Rachel Baugh based on news stories gleaned by the following reporters: Anonymous, NY; David Alpert, NJ; George Appleton, NV; Robert Brossell, WI; Kelly Davis, NC; Ed Diamond, IN; David Doan, FL; Allan Henney, VA; Kevin Klein, WI; Newtons at Fruitlands; Ira Paul, MI; Doug Robertson, CA; Brian Rogers, MI; Steven Rogovich, VA; Ed Schwartz, IL; Walter Szczepaniak, PA; Richard Sklar, WA; Robert Thomas, CT; Larry Van Horn, NC; George Wood, *Satellite Times*; *CDT Policy Post* and *W5YI Report*. We welcome news from your world of radio at MT headquarters or emailed to mteditor@grove.net.

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Monitoring the Federal Government During Emergencies

The EOV, assigned to the FEMA Mobile Emergency Response Support (MERS) Detachment in Denton, Texas, is an 82 foot long tractor/trailer weighing 92,000 pounds. A section of the trailer sides expands to form a work area capable of housing a 20-25 person Federal Response Team. The remainder of the trailer houses the MERS operations and communications centers, a reception area, and a small kitchen and bathroom. The tractor has two built-in 40kW generators which provide self-contained power for the entire operation.



By Larry Van Horn, N5FPW

Disaster!

It can strike anytime, anywhere. It takes many forms—a hurricane, an earthquake, a tornado, a flood, a fire or a hazardous spill, an act of nature or an act of terrorism. It builds over days or weeks, or hits suddenly, without warning. Every year, millions of Americans face disaster and its terrifying consequences.

The lead government agency that handles disasters in this country is the Federal Emergency Management Agency (FEMA). It is an independent agency of the federal government, reporting directly to the President. Since its founding in 1979, FEMA's mission has been clear:

To reduce loss of life and property and

protect our nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery.

When disaster strikes, FEMA is the first agency to arrive on scene and you can monitor the action on HF, VHF and UHF communications frequencies.

■ Federal Emergency Support Capability (FESC)

The FESC is the system that provides emergency management; its task is to keep information flowing when a federal response is required in any disaster or emergency. The

FESC supports Federal, State, and local response efforts by providing communications of all kinds on the scene of a disaster, and is a link to the FEMA National Emergency Management System.

The FESC consists of the Mobile Emergency Response Support (MERS) detachments, the Mobile Air Transportable Telecommunications System (MATTS), the Information Display System (IDS), and the portable, private automatic branch exchange (PABX) systems from the National Network Operations Center (NWOC). These FESC resources may be deployed as a complete package or as stand-alone systems. We will only discuss the MERS and MATTS systems in this article.

■ FEMA Mobile Emergency Response Support

The MERS capability is the mobile extension of the fixed FEMA switched network (FSN) and is provided by five MERS detachments located at Bothell, Washington; Denton, Texas; Denver, Colorado; Thomasville, Georgia; and Maynard, Massachusetts. Each MERS detachment has a transportable disaster communications system composed of modular elements that can provide a Disaster Field Office (DFO) with voice, facsimile, message, and data communications over a variety of media in both secure and clear message networks; HF, VHF, UHF radios (See Table 1 for a complete listing); microwave line-of-sight transmission systems; Ku-band satellite communications systems; and self-contained power generation and distribution systems.

■ FEMA Mobile Air Transportable Telecommunications System

MATTS is an air mobile system designed to provide communications for any emergency requirement. MATTS communications capabilities include voice and data landline, HF/VHF/UHF radio, and a variety of satellite systems in the secure and clear modes.

An integral part of MATTS is the telephone switchboard which is capable of providing 48 trunks and a T-1 link to 88 subscribers. MATTS can also provide voice, data, and video communications when used in conjunction with its T-1 via a Ku-band satellite link. MATTS is self-contained, provides its own power source, and is air transportable on either C-130 or C-141 aircraft.

■ FEMA National Radio System (FNARS)

The FNARS is the nationwide HF radio network that links FEMA Headquarters, the regions, and State EOCs (Emergency Office of Communications). (See Table 1 for a complete listing.) The system, approximately 75 percent complete, consists of Harris 10-kilowatt transmitters at the network control stations (See Table 2) and FEMA regional facilities, and Harris 1-kilowatt transmitters at primary State Eocs. The FNARS is the primary HF network used to coordinate disaster response and recovery activities in the United States and other emergency management activities involving States and the Federal Government. This network also serves as a backup network for the FSN.

FEMA also sponsors State Eocs desiring to participate in the National Communications System (NCS) SHARES program (see the



MATTS communications capabilities include voice and data landline, HF/VHF/UHF radio, and a variety of satellite systems in the secure and clear modes.

March 1994 *Utility World* column). The FNARS net control stations maintain a 24-hour watch on the two nationwide calling channels (5211 and 10493 kHz). These net control stations also maintain a pool of contingency callsigns for distribution to other Federal agencies in support of their operations.

FEMA's HF radio modernization program has been ongoing and now includes the upgrading of many stations to add automatic link establishment (ALE) in compliance with Federal Standard 1045.

Tables 1 and 2 provide a complete profile of FEMA stations and their HF, VHF, and UHF frequencies.

SHARES

SHARED RESOURCES — Presidential Executive Order 12472 established national policy guidance in support of National Security and Emergency Preparedness (NS/EP) objectives. This guidance mandated that action be taken to "... ensure that a national telecommunications infrastructure is developed..."

Consistent with the Executive Order, functionally similar government telecommunications networks were designed to interchange traffic in support of national leadership requirements. The National Communications System (NCS) was responsible for the implementation of this Executive Order. A segment of this effort addressed the sharing of federally controlled HF radio resources to establish a robust national emergency HF communications infrastructure. This evolved into the SHARES HF radio program (see Table 3 for frequencies).

There are five objectives to the SHARES program:

- Provide participating agencies with extended high frequency coverage and en-

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Table 1 - Federal Emergency Management Agency (FEMA) Frequencies

FEMA NATIONAL RADIO SYSTEM (FNARS) HF FREQUENCIES

Foxtrot 1	2320.0	Foxtrot 25	10194.0	Foxtrot 50	15708.0
Foxtrot 2	2360.0	Foxtrot 26	10493.0	Foxtrot 49	15840.0
Foxtrot 3	2377.0	Foxtrot 27	10588.0	Foxtrot 51	16201.0
Foxtrot 4	2445.0	Foxtrot 31	10899.0	Foxtrot 52	16238.0
Foxtrot 5	2658.0	Foxtrot 32	11108.0	Foxtrot 53	17519.0
Foxtrot 6	3341.0	Foxtrot 35	11545.0	Foxtrot 54	18483.0
Foxtrot 7	3379.0	Foxtrot 28	11721.0	Foxtrot 55	18744.0
Foxtrot 8	3388.0	Foxtrot 29	11801.0	Foxtrot 57	19969.0
Foxtrot 9	4603.0	Foxtrot 30	11957.0	Foxtrot 58	20027.0
Foxtrot 10	4780.0	Foxtrot 33	12129.0	Foxtrot 59	20063.0
Foxtrot 11	5211.0	Foxtrot 34	12219.0	Foxtrot 56	20361.0
Foxtrot 12	5378.0	Foxtrot 36	13446.0	Foxtrot 60	21866.0
Foxtrot 13	5402.0	Foxtrot 39	13780.0	Foxtrot 61	21919.0
Foxtrot 14	5821.0	Foxtrot 38	13894.0	Foxtrot 62	22983.0
Foxtrot 15	5961.0	Foxtrot 37	13935.0	Foxtrot 63	23028.0
Foxtrot 16	6049.0	Foxtrot 48	13956.0	Foxtrot 64	23390.0
Foxtrot 17	6106.0	Foxtrot 41	14450.0	Foxtrot 65	23451.0
Foxtrot 18	6108.0	Foxtrot 40	14567.0	Foxtrot 66	23550.0
Foxtrot 19	6151.0	Foxtrot 42	14776.0	Foxtrot 67	23814.0
Foxtrot 20	6176.0	Foxtrot 43	14836.0	Foxtrot 68	24008.0
Foxtrot 21	6809.0	Foxtrot 47	14871.0	Foxtrot 69	24282.0
Foxtrot 22	7348.0	Foxtrot 44	14885.0	Foxtrot 70	24526.0
Foxtrot 23	7428.0	Foxtrot 45	14899.0	Foxtrot 71	24819.0
Foxtrot 24	9462.0	Foxtrot 46	14908.0		

OTHER FEMA HF ASSIGNMENTS

2220.0 2258.0 2280.0 2317.5 2652.0 3206.5 3224.0 3342.5 4018.5 4023.5 4031.5 4441.5 4598.5 4608.5 4883.5
 4886.5 5303.5 5379.5 5935.0 6804.5 6996.5 7361.5 8051.5 8161.5 9122.5 10871.5 11995.5 12250.5 13451.0
 16315.5 17461.5 17481.5 17501.5 20414.0 20444.5 20447.5 24060.0 24105.0 24135.0 24160.0 24191.0

VHF/UHF FEMA ASSIGNMENTS

138.225	Nationwide primary disaster response repeater (in 141.875)
138.575	Emergency Management Support Regions 5/8 repeater (in 141.950)
139.450	Emergency Management Support Region 4 repeater (in 142.425)
139.775	Emergency Management Support Region 4/6 repeater (in 143.475)
139.825	Emergency Management Support Region 2/9 repeater (in 143.000)
139.925	Emergency Management Support Region 2 repeater (in 143.000)
139.950	Emergency Management Support Region 6 repeater (in 142.975)
	Emergency Management Support Region 3/10 repeater (in 143.250)
140.025	Emergency Management Support Region 1/7 repeater (in 143.000)
140.900	Disaster Response Simplex Net Regions 1/7
140.925	Disaster Response Simplex Net Regions 5/8
141.725	Disaster Response Simplex Net Nationwide
141.850	Emergency Management Support Region 4/6 repeater (in 143.850)
141.875	Simplex/Repeater input to 138.225
141.950	Simplex/Repeater input to 138.575
142.350	Emergency Management Support repeater input to 142.975 (Region 9)/Simplex
142.375	Disaster Response Simplex Net Regions 9/10
142.400	Disaster Response Simplex Net Region 4
142.425	Simplex/Repeater input to 139.450
142.925	Disaster Response Simplex Net Regions 2 and 3
142.975	Simplex/Repeater input to 139.950
143.000	Simplex/Repeater input to 139.825, 139.925, and 140.025
143.050	Disaster Response Simplex Net Region 10
143.225	Mobiles
143.250	Simplex/Repeater input to 139.950
143.475	Simplex/Repeater input to 139.775
143.600	Disaster Response Simplex Net Region 1
143.625	Disaster Response Simplex Net Region 6
143.850	Simplex/Repeater input to 141.850
164.8625	National Radio System-Simplex (Channel 2)
	National Radio System-Repeater input for 165.6625 (Channel 1)
165.6625	National Radio System-Simplex and repeater output (in 164.8625)
173.7875	Nationwide low power simplex
408.400	Nationwide low power simplex
417.600	Nationwide low power simplex
417.700	Nationwide low power simplex
418.050	Nationwide low power simplex
418.075	Nationwide low power simplex
418.575	Nationwide low power simplex

hanced emergency HF radio communications at no added cost.

- Provide an enduring backup to vulnerable leased telecommunications.
- Provide the flagword SHARES to expedite identification and processing of emergency Federal government traffic.
- Standardize message preparation and procedures to simplify interagency handling of NS/EP traffic.
- Provide possible work-around to jamming by permitting interagency operation on allocated frequencies identified for SHARES use.

The last objective mentioned above is the key to the SHARES puzzle. There are no SHARES frequencies per se. Each agency submits frequencies to the SHARES pool on which they will permit SHARES operations.

You can recognize if a particular government HF frequency is being used for this purpose by the system flagword: SHARES. If you hear SHARES mentioned then you are dealing with a SHARES exercise or operation — not the normal day-to-day communications you might be used to hearing from that particular government agency on that frequency.

Based on over-the-air intercepts, it now appears that three SHARES operational readiness exercises are conducted during each calendar year. These have traditionally occurred in May, August and December. Other types of SHARES training exercises are believed to be conducted in January, May and September of each year. These exercises stretch over a two-day period and run continuously during the exercise period. Past exercises were only conducted during normal government working hours.

The following is a list of the member agencies for the SHARES communications system:

AT&T, Bellcore, Civil Air Patrol, Drug Enforcement Administration, Defense Logistics Agency, Defense Mapping Agency, Department of Energy, Department of Interior, Department of Justice, Director of Military Support, Environmental Protection Agency, Federal Aviation Administration, Federal Bureau of Investigation, Federal Communications Commission, Federal Emergency Management Agency, various state emergency operations centers (EOCS), American Red Cross, Federal Highway Administration, Immigration and Naturalization Service, Maritime Administration, MITRE Corp, U.S. Marine Corps/Mountain Warfare Training Center, National Aeronautics and Space Administration, various Army National Guard units, National Coord-

minating Center for Telecom, National Communications System, National Telecommunications and Information Administration, Office of Emergency Transportation, U.S. Air Force MARS, Air Force Reserve, U.S. Army — WAR46 (1111th Signal Battalion)/ 2nd U.S. Army (GA/SC), U.S. Army Material Command, U.S. Coast Guard, Customs Service, U.S. Department of Agriculture, U.S. Navy, U.S. Navy MARS, U.S. Transportation Command, Veterans Administration, 44th Med Brigade, Department of Health and Human Services, and the General Services Administration.

NECN

National Emergency Coordination Net — This exercise has similar participants to the SHARES exercises, but these exercises have only been monitored on FEMA's primary frequencies of 5211 and 10493 kHz using upper and lower sideband. Message traffic consists of relays of callsign, agency name, and local zip code.

Not much more is known about the NECN and any information that readers may wish to share is welcomed.

NTMS/NTCN

Two new acronyms that ute listeners may have not seen before are NTMS (National Telecommunications Management Structure) and NTCN (National Telecommunications Coordinating Network). The first of these acronyms describes an organization within the government and industry that is responsible for the country's telecommunications resources. The NTMS team provides a comprehensive, survivable, and enduring management capability for initiating, coordinating, restoring and reconstituting the telecommunications networks of the United States.

The National Telecommunications Coordinating Network (NTCN) is the primary telecommunications capability designed to support the operations and functions of the NTMS. The NTCN provides physical support for telecommunications management by ensuring at least the minimum connectivity for essential communications.

The NTCN relies on existing multimedia telecommunications systems and capabilities that can be readily accessed to support the NTMS mission. HF radios deployed by the NTMS program office serve in a contingency role as a means of communications if other systems or network segments are disrupted or inaccessible.

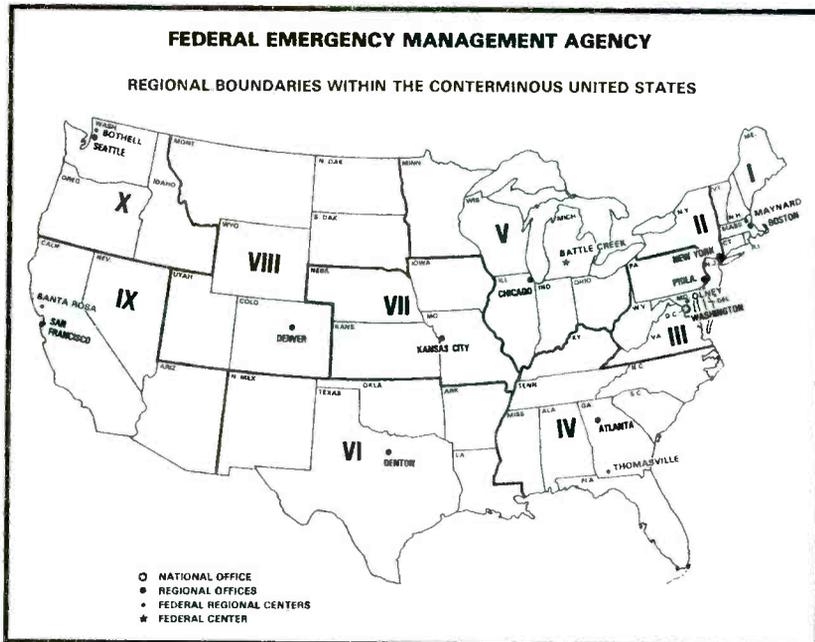


Table 2: FEMA Station Information

Stations WGY900-WGY919 are used by FEMA offices and regional headquarters. Stations WGY920-WGY998 are staffed by state-level and local offices.

Region Headquarters	Callsign WGY900	Location FEMA Operations/ECC, Warning and Support Division, FEMA Headquarters, 500 C St, N.W., Washington, D.C.	WGY975 District 6:	Lansing, MI. (MI EOC) Federal Regional Center, 800 N. Loop 2, Denton, TX 76201
			WGY906 WGY926 WGY936 WGY946 WGY956 WGY966 WGY986	Denton, TX (2nd alternate NCS) (FEMA) Oklahoma, City, OK (OK EOC) Santa Fe, NM (NM EOC) Baton Rouge, LA (LA EOC) Austin, TX (TX EOC) Conway, AR (AR EOC) Olney, MD (FEMA)
District 1:	J.W. McCormick Post Office and Court House, 4th Floor, Boston, MA 20109 Maynard, MA (FEMA) Concord, NH (NH EOC) Montpelier, VT (VT EOC) (Waterbury) Augusta, ME (ME EOC) Hartford, CT (CT EOC) Farmington, MA (MA EOC) Providence, RI (RI EOC)		District 7: WGY907 WGY947 WGY957 WGY977 WGY997	Old Federal Office Building, 911 Walnut St., Kansas City, MO 64106 Kansas City, MO (FEMA) Des Moines, IA (IA EOC) Lincoln, NE (NE EOC) Jefferson City, MO (MO EOC) Topeka, KS (KS EOC)
District 2:	26 Federal Plaza, New York, NY 10287 New York, NY (FEMA)		District 8: WGY908 WGY928 WGY938 WGY948 WGY958 WGY968 WGY998	Denver Federal Center, Building 7, Denver, CO 80225 Denver, CO (1st alternate NCS) (FEMA) Pierre, SD (SD EOC) Cheyenne, WY (WY EOC) Bismark, ND (ND EOC) Helena, MT (MT EOC) Golden, CO (CO EOC) Salt Lake City, UT (UT EOC)
District 3:	Curtis Bldg., 7th Floor, Sixth and Walnut St., Philadelphia, PA 19106 Philadelphia, PA (FEMA) Olney, MD (Primary Net Control Station or NCS) Harrisburg, PA (PA EOC) Pikesville, MD (MD EOC) Charleston, WV (WV EOC) Delaware City, DE (DE EOC) Richmond, VA (VA EOC) Emmitsburg, MD Washington, D.C. (Lorton, VA) Washington, D.C.		District 9: WGY909 WGY929 WGY939 WGY949 WGY959 WGY969 WGY999	211 Main St., Room 220, Building 205, San Francisco, CA 94129 San Francisco, CA (FEMA) Santa Rosa, CA Carson City, NV (NV EOC) Sacramento, CA (CA EOC) Phoenix, AZ (AZ EOC) Honolulu, HI (HI EOC) Barrigada, Guam (Guam EOC) American Samoa (EOC)
District 4:	1371 Peachtree St, N.E., Suite 700, Atlanta, GA 30309 Thomasville, GA. (3rd alternate NCS)(FEMA) Balboa Heights, Canal Zone Nashville, TN (TN EOC) (Winchester) Columbia, SC (SC EOC) Atlanta, GA (GA EOC) Montgomery, AL (AL EOC) Jackson, MS (MS EOC) Tallahassee, FL (FL EOC) Raleigh, NC (NC EOC) Frankfort, KY (KY EOC)		District 10: WGY910 WGY920 WGY930 WGY940 WGY950 WGY960 WGY970 WGY911 WGY912 WGY913 WGY914 WGY915	Federal Regional Center, Bothell, WA 98011 Bothell, WA (FEMA) Boise, ID (ID EOC) Olympia, WA (WA EOC) Salem, OR (OR EOC) MERS Bothell, WA (FEMA) Soldotna, AK Juneau, AK (AK EOC) MERS Maynard, MA Berryville, VA (Winchester, VA) Winchester, VA MERS Thomasville, GA National Communications System, Arlington, VA (May use Ft. Myer or Warrenton/Remington facilities) MERS Denton, TX Berryville, VA MERS Denver, CO FEMA, Unknown
District 5:	300 S. Walker St., 24th Floor, Chicago, IL 60606 Battle Creek, MI (4th alternate NCS) (FEMA) Madison, WI (WI EOC) St. Paul, MN (MN EOC) Columbus, OH (OH EOC) Springfield, IL (IL EOC) Indianapolis, IN (IN EOC)		WGY916 WGY917 WGY918 WGY919	



FEMA community relations worker consoles disaster victim in Rio Nido, CA.

Canyon Three, where the mud is flowing. Photo by Dave Gatley.



Participants in the NTMS/NTCN system include six Federal regional centers and 49 industry operating centers scattered throughout the U.S. Forty-two HF radio frequencies have been dedicated to the NTCN and an automatic link establishment (ALE) system is used by the NTCN using the Harris RF-3200E radio system.

FEMA, FCC and NCS (KNY callsigns) have been the only participants noted during NTCN exercises to date. Frequencies monitored during NTCN exercises include 5211.0, 10493.0 kHz and frequencies noted below with the NC designators.

Major participants known to be part of the NTCN system include: ALASCOM, Ameritech, AT&T, Bell Atlantic, Bellcore, GE, GTE, Hughes, McCaw, MCI, NYNEX, PacBell, PTI, Sprint, BellSouth, Southwestern Bell, US West, GSA, FCC, and FEMA.

Possible NTCN activity has been monitored on the following HF frequencies: 2283 2302 2353 2382 4458 4522 4538 4618 4623 6765 6781 6845 7320 9051 9054 9064 9067 9070 9276 11428 11432 11448 11474 13800 13804 13854 15613 15642 15989 18938 18946 22864 22867 25344 25347 27550

Known designators (NC)/frequencies for the NTCN include:

NC02	4458.0
NC04	Unknown
NC10 or NC12	9052.0
NC11	Unknown
NC?	9065.5

All of these government systems should provide the utility listener with interesting listening during times of national disaster and emergencies.

■ The Feds and Inmarsat

On area that has not been fully explored by most monitors is federal government agency use of the Inmarsat geostationary satellite communications systems. Inmarsat downlink communications can be monitored in the 1530-1545 MHz range with a suitably equipped ground station. Turnkey Inmarsat receiving

systems using the Icom R7000/R7100/R8500 communications receivers are now available to the hobbyist from a company in Wisconsin, Swagur Enterprises. You can get more information by writing Box 620035, Middleton, WI 53562-0035 or calling 608-592-7409.

As we get deeper into hurricane season

during these summer months, ute monitors should at least keep FEMA's two nationwide calling channels in your receiver's memory channels. No one knows when or where the next disaster will strike, but you can bet that FEMA and numerous other government and civilian agencies will be there.

Table Three: United States Federal Government HF Hot List

AT&T	6803.1 7480.1* 14360.0 20095.0
Bellcore	5099.1 7552.1 11451.0 18063.0 (Bell Communications Research)
Civil Air Patrol (CAP)	4466.0 4469.0* 4506.0* 4582.0 4585.0* 4601.0* 4602.0* 4604.0* 4627.0* 4630.0 7635.0* 7682.0 14902.0
Drug Enforcement Administration (DEA)	7657.0 11076.0 14686.0* 18171.0
Defense Logistics Agency (DLA)	5063.5 11576.5* 17458.5 24740.0
Defense Mapping Agency (DMA)	7726.5 7812.5 13550.0 17520.0
Department of Energy (DOE)	6803.0* 7428.0 18416.0
Department of Interior (DOI)	3253.0 4863.0(L) 5380.0 5287.5 6766.0 7880.0
Department of Justice (DOJ)	7672.0* 10401.5 14541.0 18220.0
Director of Military Support (DOMS)	13722.0 14350.0 14402.0 20906.0
Environmental Protection Agency (EPA)	3360.0 4990.0 6821.0*
Federal Aviation Administration (FAA)	6870.0 7475.0 7611.0(L)* 8125.0 11288.0 11637.0 13312.0 13457.0 15851.0 19410.0 24550.0(L)
Federal Bureau of Investigation (FBI)	5058.5 7903.5 14493.5
Federal Communications Commission (FCC)	4481.5 7788.5 10653.5 14969.5
Federal Emergency Management Agency (FEMA)	5211.0 10493.0*
Other agencies to watch on these FEMA channels include the various state EOCs (Emergency Office of Communications) and the American Red Cross.	
Federal Highway Administration (FHWA)	5255.0 7419.0 9197.0 10891.0*
Immigration and Naturalization (INS)	5912.5(L) 9435.0(L) 14585.0(L) 24838.5
Maritime Administration (MARAD)	5255.0 7419.5 9197.0 10891.0
MITRE Corp	4952.0 12165.0* 20873.0
USMC Mountain Warfare Training Center (MWTC)	5031.5* 10179.5
NASA	3385.0 6982.5 14455.0*
National Guard (NG)	3277.0(L) 4001.5 4035.0 4240.0 4244.5 4250.0 4296.0 4441.5 4520.0 4555.0 4580.0 4607.0 4608.5* 4610.0 4653.0 4780.0* 4785.0(L) 4860.0 4867.0* 4927.5 4960.0* 5045.0(L)* 5062.0 5087.0 5203.5* 5205.0 5215.5 5432.5 5821.5 6010.0 6766.0 6910.5 6992.0 7361.0(L) 8038.5 8047.0* 8056.0 8057.5 8158.5 8161.5 8180.0(I) 8622.0 9357.0 13722.0* 14350.5 14450.0 14653.0 20906.0
National Coordinating Center for Telecom (NCC)	5236.0 10586.5# 14396.5* 18932.0
National Communications System (NCS)	2302.4 4619.4 6766.4 6768.4 9051.0 9054.0 9065.4 9067.0 9070.0 11428.0 11449.4 13801.4 13805.4 13809.4 13854.0 15614.4 18938.0 18946.0 25344.0 25347.0
National Technical and Information Administration (NTIA)	9973.0* 13423.0 18178.5
Office of Emergency Transportation (OET)	6870.0 7611.0(L) 9076.0 11029.5 13434.0* 13457.0 15851.0(L) 17422.5
U.S. Air Force MARS	3311.0* 4590.0 7540.0 13927.0 13993.0* 14408.0 14533.2(L) 14606.0 14832.0 15807.0 19937.0 20807.0 4341.0 8495.0 11816.0
U.S. Air Force Reserve	9990.0 10165.0 10815.0 14930.0
U.S. Army	3348.5(L) 6997.5(L) 13997.5 14403.5 14465.0 14488.5
U.S. Army MARS	6785.0 11693.5 12070.0 16382.0
U.S. Army Corp of Engineers (USACOE)	4018.5(L) 4024.5(L) 5761.5(L) 7309.5* (1111th Signal Battalion)
U.S. Army (WAR46)	8048.5 10797.5 16318.5 17478.5*
2nd U.S. Army (GA)	8048.5* 10797.5
2nd U.S. Army (SC)	5087.0 10233.5* 14653.0 16077.0
U.S. Army Material Command (USAMC)	4048.5 7528.5 11434.5 15473.5
U.S. Coast Guard	8912.0 11494.0
U.S. Customs Service	5901.0 9270.0* 11494.0 14955.0
U.S. Department of Agriculture (USDA)	10710.0 13655.0*
U.S. Navy	4000.0 4041.0 4042.5 4402.5 4513.5 7363.5 7365.5 7381.0 7382.5 7386.0 7498.5 7684.0* 12222.0 14383.5 4035.0(L) 4520.0 5300.0 5300.5 9120.0 9120.5* 10493.0 11628.5* 12057.0 20994.0
U.S. Navy/Marine Corps MARS	5038.5* 12076.0 23355.5 6997.5(L) 13997.5 14488.5 14665.0
USTRANSCOM	
Veterans Administration (VA)	
44th Med Brigade	

Notes:

1. * indicates a primary frequency, (L) indicates LSB, and # indicates an automatic link establishment (ALE) channel. Unless otherwise indicated above, all modes are USB and frequencies in kilohertz (kHz).

2. Even though they are listed as members of the government HF SHARES system — Housing and Human Services (HHS) and the General Services Administration (GSA) HF frequencies have not been found. Current wisdom indicates that these two agencies may not be authorized HF operations/frequencies.

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BAT 13	Rechargeable "AA" Nicad, Radio Shack	\$2.75
BAT 15	Rechargeable pack, Uniden BC-3000	\$31.95
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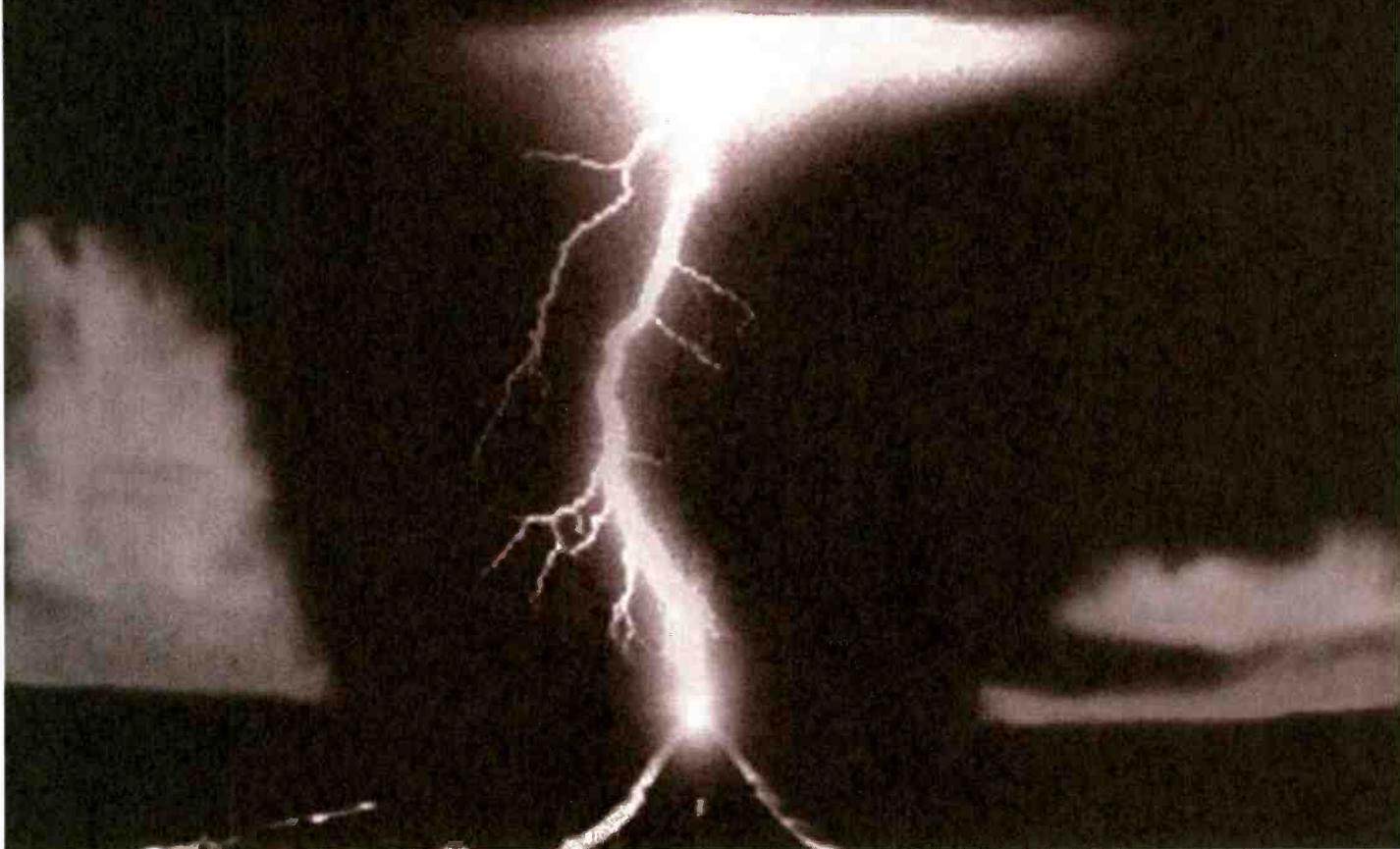
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CLOSE ENCOUNTER WITH A TWISTER



By Steve Douglass

When twisters threaten, an invisible army mobilizes. Equipped with the latest sensing technology, linked via a high-tech information network, and armed with new scientific insight into violent weather, storm spotters prowl the plains stalking the most violent natural phenomenon on Earth.

Storm spotters are well-trained weather observers tasked with alerting the public when severe weather threatens life and property. These unsung heroes are a very important part of the severe weather warning system. During storm season, spotters spend hundreds of unpaid hours in the worst weather imaginable, relaying real-time information to the government entities

whose purpose it is to issue take cover warnings in time to save thousands of lives.

It was with such a dedicated volunteer storm spotter that I received my real education on the inner workings and majesty of tornados. Terry Whitaker is one of the dedicated weather spotting volunteers for the local weather service and has been part of an amateur radio severe weather network for many years. If one was looking for the perfect person to tag along with on storm spotting forays, it would be Terry.

Today's volunteer spotters are high-tech hunters. The tools of the trade have come a long way from just a pair of binoculars, a two-way radio and a map. The ham spotters in the Texas Panhandle are some of the busiest and the best.

They also take advantage of every possible technological advancement to improve the odds of their being in the right place at the right time, well ahead of forming storms.

Whenever storms threaten the Texas Panhandle, the spotters activate an area-wide UHF radio network consisting of high powered radio repeaters that link spotters instantly to each other and the National Weather Service offices in Amarillo. Using GPS (global positioning satellite) receivers slaved to lap top computers and employing a location technology called Automated Packet Reporting System (APRS), weather spotters can, at a glance, consult a moving map display showing their position as well as other hams in the field, thus aiding in the

coordination of observers.

Near real-time radar information in the field is a tremendous help. A dedicated spotter can either tap into Internet radar sites via a laptop computer connected to a cellular phone, or an experienced radar reader at the closest NEXRAD (next generation doppler radar) site can relay information directly over the ham radio network.

Mobile weather sensing devices that record vital measurements such as barometric pressure, wind speed, humidity, and dew points now help spotters observe the current weather conditions at their assigned observation location. This can also warn of advancing severe weather; for example, a sudden drop in barometric pressure may indicate a tornado is forming.

Some spotters go the extra mile by using portable direct broadcast satellite receivers and dishes so they can receive current storm watches, warnings, and radar observations broadcast constantly by the Weather Channel.

Scanning radios programmed with the frequencies of area law enforcement and civil defense emergency networks keep spotters informed of what official agencies are observing. Favorite frequencies to monitor include those of the National Severe Storm Laboratory's Vortex scientists. If you monitor these guys in your town, you know you are in for tornados ... and plenty of them. The purpose of Project Vortex is to help develop better tornado prediction models so that communities can be warned further in advance of the conditions that form killer tornados.

Although I was well acquainted with the

NEXRAD radar dome located in Amarillo, Texas. (Photo by Steve Douglass)



ways of weather in the Texas Panhandle and have chased storms before, I decided this season to start out right by taking storm spotter classes given each year by the local branch of the National Weather Service. Not only are these classes fascinating looks into the mechanics behind tornado formation, but they earn spotters their Skywarn advance storm spotter certification for the year.

■ An unforgettable field trip

One Project Vortex revelation would serve us well later in the season. An interesting weather phenomenon had been observed in 1995 that may explain why some storms, relatively weak at first, can rapidly intensify and grow tornadic. When several severe storms in Oklahoma collapsed, they sent an "outflow" wave of cold air across the Texas Panhandle. When this wave collided with moderately strong storms developing on the Texas-New Mexico border, the resulting turbulence added greatly to their power and internal mesocyclonic spin, spawning large tornados. As storm spotters, we were asked to watch for this phenomena in an attempt to verify the Vortex data.

On June 12, 1997, Terry and I headed out into the fray. The National Weather Service was predicting a record severe weather day. The area was being flooded with low level moisture colliding with cool dry air from the west. Upper, lower, and mid-level winds were all moving in opposite directions, creating the shear needed to produce rotating super cell thunderstorms; some of these storms would be tornado bearing.

Terry checked in with the National Weather Service (NWS) and the local TV weather broadcasters. All recommended that we proceed to an area just west of Perryton, Texas, where the weather systems were predicted to collide.

When we arrived, the National Severe Storms Laboratory's data showed a "cap" was in place. Otherwise known as the Mexican Plume, the cap is a thin layer of dry warm air capable of suppressing thunderstorm development. Like a lid on a simmering pot, rising warm air (the stuff thunderstorms are made of) could crash into the cap and go nowhere but down. But if there is a weakness in the cap or the rising warm moist air is hotter than the cap, it can punch through a hole like the lid blowing off a boiling pot.

If that happened today, thunderheads could explode up and through the hole, forming severe storms and tornados in just a matter of minutes.

We were camped right on the volatile "dry-line," the battle zone between two opposing weather systems. Just after lunch the atmospheric collision of warm moist Gulf air with cool dry mountain air would break the cap.

Huge cumulonimbus towers began to shoot up just outside of Perryton only a mile from where we were stationed. We would have a front row seat for the action.

There are two major components that exist in a thunderstorm, the updraft and the downdraft. Usually, the updraft or "inflow" can be found at the back of the storm. Since the winds are being drawn up into the storm there is no rain or hail in the inflow.

A storm draws its power from the inflow. Although from a spotter's point of view the inflow is the best place to observe the storm, one still has to be careful. Lightning is a major threat, and in that interface where the updraft and downdraft meet, tornados form.

There is another weather component that can take storm spotters by surprise: the rear flanking downdraft. As the strong updraft tops out and slams into the fast moving jet stream miles above the earth, it can be turned straight down behind the thunderstorm. These invisible winds have been known to flatten houses and send aircraft spiraling down into the ground.

We noticed other storms were building to the south. It looked like the city of Pampa was now also under the gun, confirmed by other spotters reporting from that storm area.

Our storm intensified and began to move.

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Storm spotter Terry Whitaker watches a developing wallcloud that could produce a tornado. (Photo by Terry Whitaker.)

We followed it as it headed into the Oklahoma Panhandle. At one point we stopped on a hill to observe a wall cloud forming. A wall cloud is a prominent lowering of the cloud that can spin out tornados with little notice. Just above it the updraft towers bloomed and twisted, clear signs of a forming mesocyclone, the violent rotation needed to spawn tornados.

Terry and I quickly grabbed our photographic gear. If we were to see a tornado it would happen very soon. The wall cloud thickened, lowered and swirled. Ten minutes later it dissipated, producing nothing.

Although our scientific knowledge about what causes tornados has increased measurably in the last few years, why some severe storms produce tornados and others don't is still a mystery.

To the south we could see better game, a huge thunderstorm still going great guns about a hundred miles away. Terry and I pondered whether we should try to play "catch up" and chase that storm down. If it was like our storm, chances were that it would collapse before we could get into position.

■ Too close for comfort

Stopping for gas and grub, Terry took the time out to check back in with the National Weather Service. They gave us the bad news.

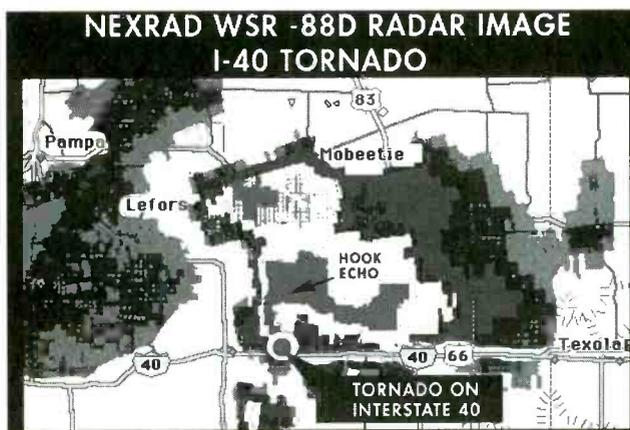
Just as in the scenario noted by Project Vortex, as our storm died it sent an outflow wave of cold wet air rolling across the plains that collided with the storm now sitting squarely on Interstate 40, the most heavily traveled high-

way in the Texas Panhandle.

This collision of three strong weather forces — the warm dry air from the west, warm moist air from the south, and the cool moist air from our storm in the north — mixed in a violent vortex that was already producing multiple tornados. All available storm spotters were called down south.

We raced at "faster than prudent" speeds on narrow rural highways with emergency lights flashing and our Skywarn placard in place. Consulting a moving map on Terry's lap-top, I navigated while Terry drove. My heart leapt as I glimpsed a state trooper, lights flashing, in our rearview mirror. To our surprise, he didn't pull us over, instead he flashed by at a speed that made our pace look slow. The scanning radio revealed why: Tornados were skipping across I-40.

NEXRAD image of I-40 Tornado. (Image courtesy Douglass Crowley, Amarillo National Weather Service office.)



In record time we were under the trailing edge of the storm, which was moving very slowly. The entire supercell thunderstorm was spinning in on itself like a huge top. This type of storm is very dangerous for spotters. Usually spotters place themselves on the west or southwest side in the inflow, but this storm rotated, as would the points of inflow and outflow, making it hard to stay behind the storm. Spotters would literally have to circle the storm, running the risk of encountering either a rain wrapped tornado or the massive downdraft and having their vehicles beaten by softball-sized hail.

As we topped a hill Terry and I could see a massive, spinning, wall cloud 10 miles in diameter. Ahead the road disappeared in a haze of white. This was the downdraft. We would have to punch through to the core to see anything. What awaited us on the other side was anyone's guess.

As we penetrated the core we ran into small hail but surprisingly it was not falling. It was flying horizontally through the sky. The winds and mesocyclone was so strong in this storm that it propelled the hail sideways like marbles caught in a monster roulette wheel.

Thirty seconds later we left the hail behind and punched through into relatively clear air. The wind-whipped wheat pointed into the storm, indicating clearly that we were in the inflow. I checked the map, we were only five miles from Interstate 40. I looked up to plot the position of the wall cloud.

And then I saw it. A long V-shaped funnel snaking out of the sky only a few miles away. It was the classic cone-shaped funnel, growing in seconds from a mere wisp into a menacing tornado, kicking up dirt and debris as it touched down. Very scary, yet quite beautiful.

Terry slammed on the brakes and radioed our tornado sighting on the radio network.

While I shot video, Terry estimated the size, position, and speed of the tornado. The base was a couple hundred yards wide and moving west at about 15 miles an hour, which in itself was quite unusual because the storm itself was headed east.

In fact, this was one of the most unusual tornados I had ever seen. The classic cone-shaped tornado turned into a wild twisting elephant trunk sucking up the countryside. Shooting out of the wall cloud almost horizontally, the base of the twister tore west, picking up speed. It reminded me vividly of the classic twister in the *Wizard of Oz*. It stayed on the ground almost 10 minutes, became a long skinny rope and then dissipated.

We broke down our gear and sped

to the scene. Damage assessment is part of the job and we were sure there was plenty of it. The scanner revealed the extent.

The tornado had run directly down Interstate 40, tossing semi-trucks and cars like toys. Fifteen trucks were torn apart. One truck was ripped open like a can of sardines. The TVs it was carrying were sucked up and thrown for miles. The worst injuries were to a couple who were sucked through the roof of their Mercedes and were found lying at the side of the road a half a mile away. The couple was being rushed by ambulance to a nearby hospital.

When we arrived at the I-40 junction, we found it a mass of confusion. Thousands of cars and trucks were backed up for miles. Troopers worked desperately to open a lane for emergency vehicles. There was no hope for us to travel any further on I-40, which was fine with us, because we now had more pressing business. Another wall cloud had formed and another tornado touchdown was imminent.

We crossed I-40 and headed south to find a high viewpoint from where to watch the storm. Following a winding road on a hill we found ourselves overlooking a foul smelling cattle feedyard. Although noxious, it was the best viewpoint. Just a mile to the east the huge rotating wall cloud swirled and dipped down low. From our position on the hill it looked practically eye level.

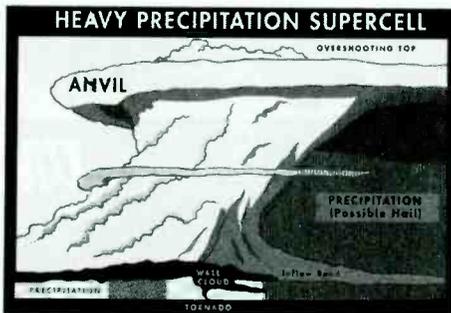
There are rare moments in one's life that are so intense they define the way we view the world from that point on. I had a sudden realization that this was one of those moments.

As I stood on that hill, the storm rumbled like a great machine over my head. Strange metallic sounding thunder claps, which are now thought to be a recognizable component of tornadic storms, echoed through the boiling churning sky. Suddenly a wave of excitement and fear swept over me. I felt incredibly small and vulnerable to the monster storm that swirled around us, yet thrilled to be here. I fought to suppress my instinctive impulse to flee.

As the storm rotated, a wall of rain and hail that had been on the front of the storm now revolved around to the back, effectively cutting off the inflow, which slammed a door on the energy needed to sustain the wall cloud's rotation. What was once an ominous, potential producer of tornados quickly died, suffocated.

Although this granted the area a stay of execution, it was short-lived and we knew it. Looking for other sources of inflow, the storm "back-built" and set up another area of rotation just a mile to our west. Terry and I suddenly realized we were now in the wrong place: potentially in the path where the next tornado would strike.

Getting on I-40 we headed back west in search of a better viewpoint from behind the



HP Super Cell graph. (Information source: NOAA.)

storm. Our lane was empty, the tornado damage blocking any traffic coming from the east. The eastbound lane was bumper-to-bumper with traffic blocked by the highway patrol.

As we searched for another high vantage point the storm dropped another tornado, practically on top of us. Behind us and to the south of the highway another rope-like twister touched down. It also sped back west; we the chasers quickly became the chased. In our rear view mirror we watched as the tornado spun in our direction, but as it gained on us, it suddenly lifted back into the cloud.

As the sun set the storm weakened, but not before spawning a total of nine twisters, causing millions of dollars of damage, and injuring 12 people. However, because of the picture Project Vortex had put together with its accumulated data, spotters were better able to recognize the conditions that breed tornados and give advance warning to the communities in their paths.

Because of those warnings, most people in the damaged area were able to take shelter. The only injuries that occurred were to those trapped by the twister on I-40 — many of whom admitted they had not been listening to their car radios for weather reports.

With the current state of technology and the data gleaned by projects like Vortex, the warning time has grown the last few years from 5 to as much as 20 minutes in advance of a tornado. If we follow our present course and continue to fund research into storm mechanics, it is possible that in the near future we could expand the warning times to almost an hour before a tornado forms. Even then, storm spotters will still be needed to verify and warn residents that there's a "tornado on the ground."

TOP TEXAS PANHANDLE WEATHER WATCH SCANNER FREQUENCIES

When hurting severe storms in the Texas Panhandle, monitoring the following frequencies on your scanner will keep you informed. Texas locations unless otherwise indicated.

Freq.	Description	Freq.	Description
46.10	Deaf Smith /Hereford Co. Fire	155.205	Curry Co. Civil Defense
46.12	Randall Co./ Canyon Fire	155.370	Dept of Public Safety Intercity
122.000	Amarillo Radio (Aircraft Weather Advisories)	155.460	Amarillo Dept of Public Safety (Base)
122.650	FAA Weather Watch (Aircraft)	155.475	New Mexico State Police (Statewide)
146.720	Plainview Ham Storm Spotters	155.490	Clovis NM P.D.
146.760	Abernathy Ham Storm Spotters	155.520	New Mexico State Police (Special Emerg.)
146.760	Elk City Okla. Ham Storm Spotters	155.520	Hale Co. S.O.
146.820	Perryton Ham Storm Spotters	155.565	Childress Co. S.O.
146.900	Pampa Ham Storm Spotters	155.565	New Mexico State Police (East N.M.)
146.920	Amarillo Ham Severe Weather Watch (Races VHF)	155.580	New Mexico State Police (East N.M.)
146.960	Childress Ham Storm Spotters	155.595	Bailey Co. S.O.
147.000	Spearman Ham Storm Spotters	155.625	Lamb Co. S.O.
147.060	Borger Ham Storm Spotters	155.655	Hutchinson Co. S.O.
147.150	Gruver Ham Storm Spotters	155.670	Okla. Hwy Patrol (Statewide)
147.300	Fritch Ham Storm Spotters	155.730	Parmer Co. S.O.
147.360	Tulia Ham Storm Spotters	155.775	Deaf Smith Co. S.O.
147.380	White Deer Ham Storm Spotters	155.775	Ochiltree Co. S.O.
154.055	Potter Co. Fire	155.790	Lipscomb Co. S.O.
154.340	Amarillo Fire Dept. Primary	155.880	Armstrong Co. S.O.
154.680	Dept of Public Safety Mobiles To Base	155.895	Swisher Co. S.O.
154.710	Carson Co. S.O.	155.995	Hartley Co. S.O.
154.725	Randall Co. S.O.	155.025	Oldham Co. S.O.
154.740	Lamb Co. S.O.	158.865	Amarillo Department of Emergency Management
154.770	Childress Co. S.O.	161.640	KVII TV, Amarillo Ch 7 Storm Search 7 Teams/Remotes
154.800	Potter Co. S.O.	161.670	KAMR TV, Amarillo Ch 4 Storm Chase Teams/Remotes
154.805	Moore Co. S.O.	162.475	NOAA Weather Radio (Clovis, NM)
154.815	Lipscomb Co. S.O.	162.550	NOAA Weather Radio (Amarillo Area)
154.845	Hall Co. S.O.	442.000	Gruver Ham Storm Spotters UHF
154.865	Carson Co. S.O.	444.100	Aitua Okla. Ham Storm Spotters UHF
154.920	New Mexico State Police (Statewide.)	444.200	RACES/ARES Ham Storm Spotters (UHF)
154.950	Dept of Public Safety/Police Mutual Aid	444.800	Plainview Ham Storm Spotters
154.995	Roberts Co. S.O.	444.875	Woodward Okla. Ham Storm Spotters
155.010	Wheeler Co. S.O.	450.0375	KFDA TV, Amarillo Ch 10 Storm Intercept/ Remotes
155.070	Gray Co. S.O.	453.325	Amarillo Emergency Service
155.130	Hemphill Co. S.O.		
155.145	Amarillo Tornado Siren Activation		

Mother, Jugs, and Speed? Not even close!

Profile of a Modern Ambulance System

By Les Butler KB8WKE



AMR/United Class A Motor Home Ambulance/Command. Photos by Les Butler

Unit 671 priority one, (671 go ahead). For Southfield you're making 18353 West 13 mile Rd. the Village apartments apartment 1, mappage 3 grid 9 cross street of old stage and Southfield on chest pains. Your incident number is 677 at 20:51."

This is the kind of communications you'll hear when monitoring an ambulance frequency

like AMR (American Medical Response) on 155.28 MHz. Remember the movie *Mother, Jugs, and Speed?* Starring Bill Cosby and Raquel Welch, it's a great comedy about an ambulance company run on a shoestring budget. But, today's ambulance companies operate at a much different level.

In large metropolitan areas, all of the small "mom and pop" operations have been bought out or merged into one of today's megacompanies. One of these is AMR, which is itself now owned and operated as a division of Laidlaw, although it has retained its name. AMR is located in Oakland County, Michigan, and services four counties — Wayne, Oakland, Monroe and Genesee.

This modern-day ambulance company boasts nearly 800 employees, 35 dispatch-

ers, and 180 vehicles. During the average day approximately 550 calls are received and 450 patients are transported. The difference of 100 represents cancellations by firefighters and or patients who refuse transport ... Yes, some people *refuse* medical treatment and transportation.

AMR's vehicles are assigned posts within each of its county borders — basically a parking place. Vehicles park in strategic locations throughout their service area. During a slow night in one county, vehicles will be shuffled into a busier county. AMR currently has 100 ALS (Advanced Life Support), 55 BLS (Basic Life Support), and 45 Wheelchair vehicles. The wheelchair vehicles provide a service to the handicapped five days a week during normal business hours and have a dedicated dispatcher.

Within Wayne County's border lies the city of Detroit: population approximately 1 million. AMR supplies three ambulances to supplement Detroit's fleet of EMS units. These three units have a radio code of Medic 51, 52, and 53. They are dispatched directly by Detroit dispatchers on 155.16 MHz. The AMR or United units (the result of another buyout)



Interior view of patient transport AMR ambulance.



Each dispatcher has five monitors in front of him displaying runs waiting, run status, and working runs, plus maps.

then call AMR base on 155.205 to keep them advised of their status.

On busy evenings when Detroit needs additional units AMR will supply them, whenever possible, from Wayne or Oakland counties, and they will be assigned the radio code of United 1, 2, 3 etc. They will then be dispatched via 155.205 and the dispatchers will then call Detroit to advise them of the units' status.

All vehicles are dispatched and tracked via

Teletrac AVLs (Automatic Vehicle Locators). Dispatch can see precisely where each vehicle is at any given moment and even guide the units to the scene by telling them what turns to make or correcting wrong turns as they occur. Also dispatched from AMR's command center are the fire departments of Franklin Village and Brandon Township.

The usual day shift in dispatch consists of five call tak-

ers and five dispatchers. Each dispatcher has five monitors in front of him displaying runs waiting, run status, and working runs, plus maps of whatever county the dispatcher selects to display the location of the ambulance units.

Tricky Coordination

The radio systems start get-

ting elaborate when dealing with four different counties. Table 1 is a chart of frequencies used. All frequencies are in megahertz (MHz).

The radios used are as follows: Oakland County uses Syntor 9000s (64 channels), Spectra (128 channels) and Oakland County trunked preps (MTSX 2000, leased from the county). Genesee County uses Syntor 9000's (64 channels), Spectra (128 channels), and Wayne County uses Motorola Spectra (128 channels) and Maxtrac (16 channels). Monroe County uses Motorola Radius GM 300s.

All the radios have a status button on them so the medics can keep dispatch advised of their status. Think of this feature as a kind of one-way MDT (mobile data terminal). The dispatcher receives the text information on the computer screen, but the ambulances have



Radio systems found inside new AMR ambulances.



Table One			
Oakland County	Genesee County	Wayne County	Monroe County
155.28 Primary	151.355	155.205	155.235
155.235 Secondary	155.16		
Ambulance to Hospital Comms.			
155.34 H.E.A.R. *	155.34 H.E.A.R. *	155.34 H.E.A.R. *	155.34 H.E.A.R. *
851.0625	463.075 Med 4	463.05 Med 3	
851.4625	463.175 Med 8	463.075 Med 8	
852.0625	463.15 Med 7	463.0 Med 1	
852.2125	Tx. PL 156.7	463.175 Med 8	
852.4625	Rx. PL 97.4	Tx. PL 151.4	
853.4625		Rx. PL 97.4	
854.0625			
854.4625			
855.0625			
855.4625			
852.1125			
853.5375			
854.5375			
856.0625			
* Denotes H.E.A.R. (Hospital Emergency Access Radio)			
Uniden Trunk Tracker Identifications			
Oakland County Advanced Life Support ambulances			
10416	28B0	All -Hospitals	
10448	28D0	EMS to Hospital Beaumont Royal Oak	
10480	28F0	EMS to Hospital Beaumont Troy	
10512	2910	EMS to Hospital Botsford	
10544	2930	EMS to Hospital Crittenton	
10576	2950	EMS to Hospital Huron Valley	
10608	2970	EMS to Hospital North Oakland	
10640	2990	EMS to Hospital Oakland General	
10672	29B0	EMS to Hospital Pontiac Osteopathic	
10704	29D0	EMS to Hospital Providence Novi	
10736	29F0	EMS to Hospital Providence Southfield	
10768	2A10	EMS to Hospital Sinai	
10800	2A30	EMS to Hospital St. Joseph Pontiac	

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no monitor to receive text messages from dispatch. The computer system server uses Windows NT to operate the new Baker Radio Communication System. This system connects all of their radios and telephones into one "communication system." They never have to worry about missing a radio transmission because AMR also uses about 800 alphanumeric pagers.



The McDonnell Douglas mainframe (above) was replaced by two Pentium PCs (below) a year ago.



■ The Course of a Call

A typical call will go as follows: the phone rings, it's immediately answered by a call taker. The enhanced 9-1-1 address is verified and is simultaneously typed into the system. Questions are asked to ascertain the problem and immediately looked up on the cue cards. The call taker then follows the procedure on the card. As he works to calm the patient, the dispatcher receives the information on the screen and, in turn, dispatches a unit or units to the scene.



The units are then put into service. They inform dispatch when they arrive at the hospital and again when they leave so they can be put back into service.

This is now all controlled via two PC's by Digital which have two Pentium 133 MHz CPU's on board and act as the server. All of the individual units are also Pentiums and one mouse handles the three screens in front of the dispatcher. This new system is also running Windows 95. Information Technology Technician Tim Teer tells me the system is very fast and a pleasure to use.

As seen in the picture, the old system (replaced a year ago) ran a McDonnell Douglas mainframe. The new dispatch area (also updated in

the last few months to twice its original size) is designed to help streamline the operation. Even the seating is done county by county.

Even *Mother, Jugs and Speed* made it clear the ambulance business isn't for the weak at heart. The same can be said for serving in a modern-day ambulance dispatch center. I salute these professionals for a job well done!



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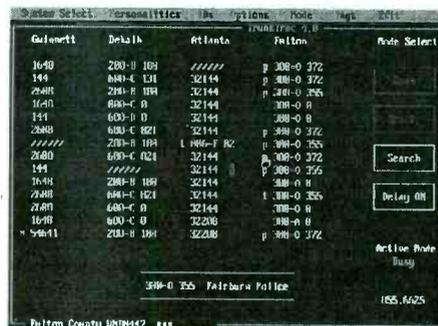


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Effective Antennas For Emergency Operation

By Joseph J. Carr

For days you followed the news reports on TV as a hurricane moved across the Atlantic. Yesterday afternoon you took the usual precautions: board up windows; gas the car and light plant generator; lay in supplies of groceries, batteries, and medicines; and check your radios. For hours the wind howled as 120+ mph winds blew away or destroyed everything that was not tied down. You were real happy that you had removed or battened down everything in the yard that could be blown away. The wind ceased for awhile when the eye passed over, but soon it came with a vengeance from the other direction. After what seemed like an eternity you emerged from your house — or what's left of it — to survey the destruction.

If you are a ham operator, then you might want to check into an emergency traffic network to help pass “health and welfare” messages, or send one to your own loved ones. If you are a shortwave listener or scanner buff, then you might want to turn on the receiver to keep up with what's happening. The local TV and AM/FM broadcast band stations are off the air because of the storm, and won't be back on for hours. In the meantime, you might want to grab a distant station to hear how bad it really was.

The problem that you face is how to make portable and mobile radio systems more effective. If the principal attribute is immediate portability, then one is pretty much stuck with the antennas that come with the rig. But if you are going to stay put for awhile, then there is quite a bit that can be done to make impromptu antennas work better.

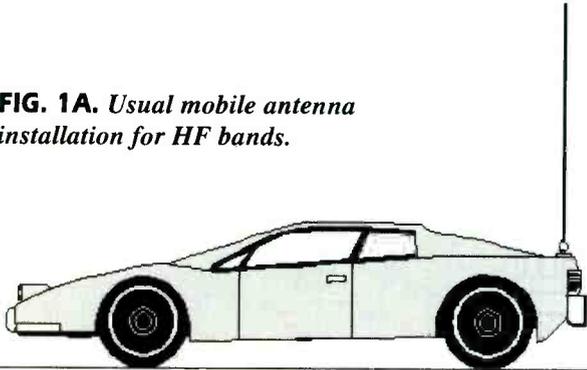
■ Improving VHF/UHF Reception

One of the things that can be done to improve VHF/UHF operation is to gain as much height for the antenna as possible (in fact, this helps at all frequencies). Coupling the rig to an antenna on top of a mast, in a high tree, or on a high hill will result in increasing the communications range. VHF/UHF signals travel radio line-of-sight, which is a bit further than the optical line-of-sight — equal to 4/3 of the Earth's curvature, or in other words, a bit beyond the



Warren Fairley Weather-Stock

FIG. 1A. Usual mobile antenna installation for HF bands.



horizon. Increasing the height of the antenna increases the line-of-sight distance. Of course, if you can possibly rig up a repeater, then that's even better.

■ Improving HF Reception

Height will also help HF communications. Being on top of a mountain makes it easier for both skip and local communications. I recall one time participating in an Amateur Radio Relay League (ARRL) Field Day contest (held every June). Our 7.5-watt two-meter band (144-148 MHz) transmitter worked from a mountain top in Virginia all the way into Pennsylvania...a distance of more than 100 miles.

During the same weekend, I was working the 25-watt 40-meter (7.0 - 7.3 MHz) CW transmitter, racking up contacts in Hawaii, Alaska, California, Oregon and all over the West. After about three hours it was noticed that the antenna transmission line had parted from the antenna, and we were essentially using about 40-feet of 300-ohm twin-lead transmission line for an antenna (no wonder the antenna tuner settings were odd)! The mountain top height and the skip conditions helped us make those contacts.

■ The Swedish Missionary

Some years ago I attended a week-long writer's conference at a Christian college in the midwest. One of the people sharing the dormitory with us was a Swedish pentecostal missionary who had just returned from the Sudan, where he worked at a medical missionary station. He was also a ham radio operator, as well as being a medical doctor. He gave me some interesting advice on por-

table and mobile operations that I will share with you.

The Sudanese desert is mile after mile of nothing but trouble. It is so harsh that dead camels are found along the trails they call roads. If the heat doesn't kill you, then the snakes and other wild life will do it quite nicely. And if Nature fails, then there are plenty of armed bandits available to do the job. As a result of these situations, communications were very important.

The missionary told me that he put his faith in God and an HF SSB transceiver. The model that he had comes in two varieties, one for the ham bands and one for the commercial and maritime bands (the internal circuitry differences were nil — lifting a single connection converted the frequency limited ham version into the commercial version). His organization required him to check in twice a day, once in the morning and once in the evening. If he missed two radio checks, the four-wheelers and helicopters went out to find him and his medical team.

The frequencies that they used were 3,880 kHz (3.88 MHz) in the ham band, and around 4,500 kHz (4.5 MHz) in the commercial bands. The antenna was a nine-foot stainless steel whip mounted on the Land

Rover. Because antennas for these frequencies are 60-70 feet long, the short antenna required a loading coil to make it resonant. A short antenna for short-wave is an inefficient antenna, no matter how you make it. But there are some things that can be done.

Figure 1A shows the usual configuration on an automobile. A whip antenna is mounted on a base-mount bolted to the rear of

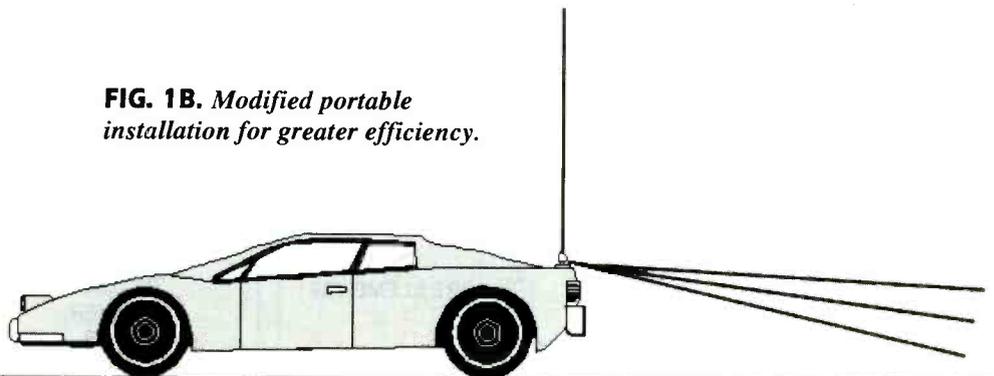
the car. The only "ground" available to this antenna is the body of the car, and that's a pretty poor excuse for a ground. The Swede told me their solution to increasing the efficiency of the antenna: install two or more quarter wavelength radials (Fig. 1B). The radials form an artificial or "counterpoise" ground, making the performance of the antenna much more effective.

When I first moved into a new house I used a Hustler HF mobile antenna and two radials hanging out of an upstairs bedroom window to get me on the ham bands in the weeks before I found time to erect a proper antenna. It worked quite well. Not as well as a properly designed and installed dipole.

The radials are attached to the body of the vehicle at the same point as the shielded braid of the coaxial cable. In other words, at one of the mounting bolts of the antenna mount. The Swede had installed a five-way binding post in place of one of the bolts in order to facilitate quick connection and disconnection of the antenna (Fig. 1C).

The radials are made of ordinary wire, and are quarter wavelength long. The length (L) in feet is found from $L = 246/F$, where F is the desired operating frequency in MHz. For the Swede's case, he worked on both 4.5 and 3.88 MHz, so cut four radials, two

FIG. 1B. Modified portable installation for greater efficiency.



for each frequency. These were 54.7 feet and 63.4 feet, respectively.

When he made camp each evening or when he arrived at a village where the mobile medical team would be operating for awhile, he would get the coiled-up radials out of the back of the vehicle, unroll them and connect one end to the binding post at the base of the antenna. The radials were then laid out on the ground, spread out as much as circumstances permitted. It's alright if the radials touch the ground.

Another trick used by the Swede was to carry a 50-foot slip-up mast in one of the Land Rovers, along with an ample supply of guy ropes and a cinder block base. If they were going to be at a location for a longer period of time, then they rigged the mast. At the top of the mast, they put a VHF antenna cut for a band close to the ham two-meter band. Also near the top was the center insulator for an inverted-vee dipole antenna (see Fig. 2).

The inverted-vee dipole is a half wavelength, center fed dipole antenna made of wire, and fed with either 52-ohm or 75-ohm coaxial cable. The lower ends of each quarter wavelength element is insulated from ground by tying it off on a tent stake. Alternatively, end insulators can be used, which are then connected to the stakes with rope.

The normal overall length of a half wave dipole is found from $L(\text{feet}) = 468/F$ (each element is half this length), but for the inverted vee variety it must be about 6 percent longer to account for the drooped radials and their proximity to the ground. The overall length of the inverted vee is therefore $L(\text{feet}) = 496/F$.

The inverted vee dipole offers a single point of mounting installation, and that can be important in portable applications. But

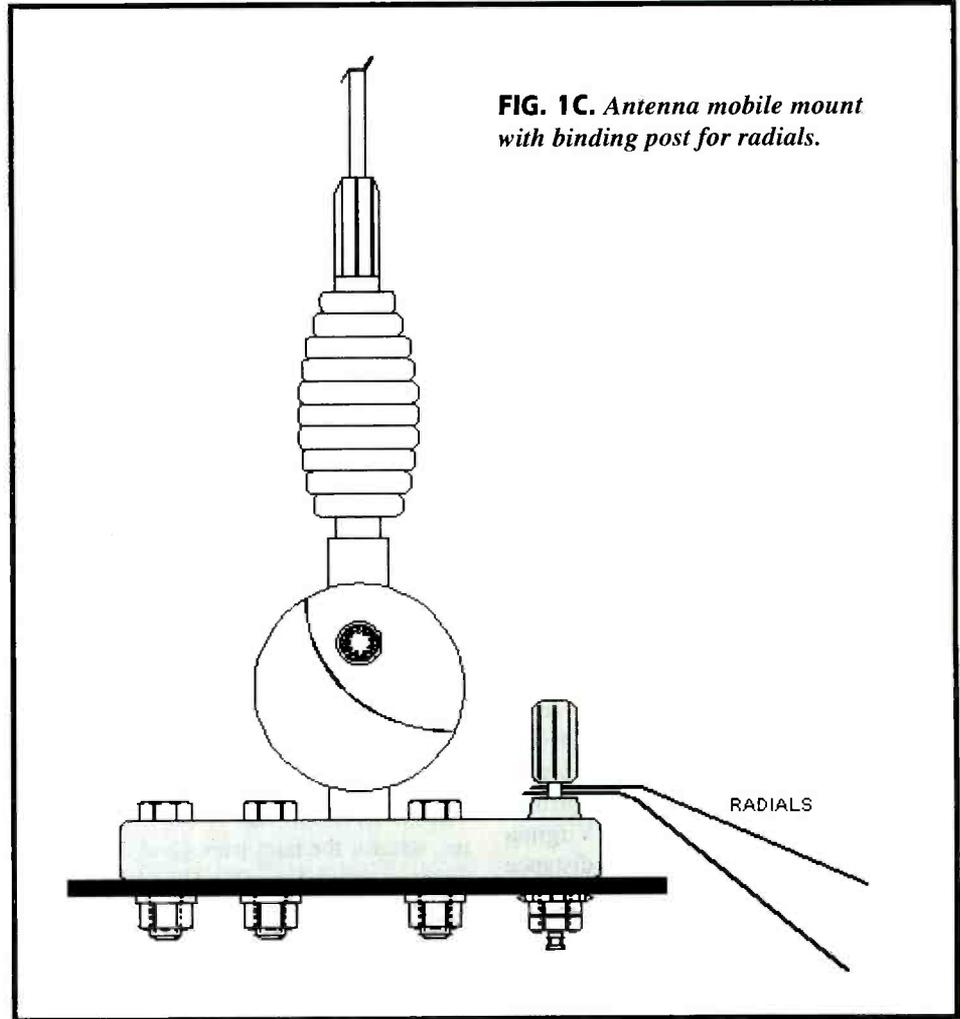


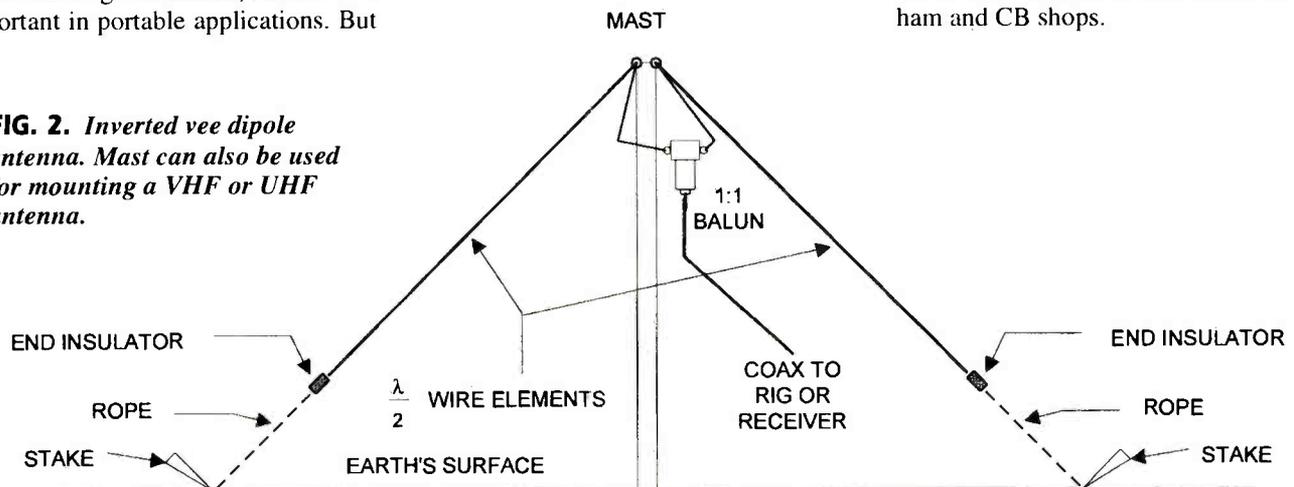
FIG. 1C. Antenna mobile mount with binding post for radials.

where two mounting points are available, then a regular horizontal, half wavelength dipole is generally preferred.

The lengths of these antennas can be calculated from the formulas. However, it must be realized that the local installation

determines, to some degree, the actual necessary length. As a result, the antenna should be trimmed to the actual proper length using either an antenna impedance meter or a Voltage Standing Wave Ratio (VSWR) meter (look for the minimum value in each case). Both instruments are available from ham and CB shops.

FIG. 2. Inverted vee dipole antenna. Mast can also be used for mounting a VHF or UHF antenna.



Although the example above was for antennas in the lower end of the HF bands, they also work in the upper bands as well. A CB rig, or a 10-meter ham rig, will work a lot better when a mobile antenna (operated stationary, of course) is fitted with two or more quarter wavelength radials.

In my experiments, and the experience of the Swede, two radials were used. These increased signal strength considerably. The best situation is to have as many radials as possible. The traditional number for vertical AM broadcast towers is 120 radials, although a distinct diminishing returns effect is seen when more than 15 or 16 are used. As a practical matter, two to six radials per band are optimum. However, if all you can use is one, then use it...it's still better than none.

The radial concept works well in portable situations, but is also useful in base station cases inside a building. For several years I operated 40-meter CW bands from a boarding house room at college. The rig was a 50-watt 1950s vintage transmitter built from a kit. I worked all over the world with that rig and an antenna similar to Fig. 3. The coaxial cable from the rig was connected to an antenna tuner, which in turn was connected to a random length wire antenna run out the window. The form of the antenna tuner depends on whether the wire radiator element is less than quarter wavelength, right on quarter wavelength or greater than quarter wavelength (my homebrew tuner,

like most commercial tuners, could accommodate all three cases).

For awhile, when the landlady was concerned over neighbors' reactions, the radiator element was in the attic. During most of the time this antenna was used the radials were run out the window to distant points in the yard. But for awhile (again the neighbors) two radials were stapled to the baseboard of my room (warning: high RF voltages exist at the end of the radial, so make sure they don't touch anything...and are not touched). It still worked well, but was a mite touchier to tune.

The ground rod in Fig. 3 is a desirable option. If you use one anywhere but a brackish marshland, get one that's at least 6 to 8 feet long. Anything shorter is less effective. Of course, those long ground rods are usually stuck once they are in that deep, so don't use one in a site that you want to abandon in short order.

Conclusion

The antenna can make or break a communications system. No matter how good the transmitter, receiver or transceiver, if the antenna is ineffective then the best rig in the world might as well be a pair of tin cans connected by string.

If you want to find out more about radio antennas, let me immodestly recommend my books Joe Carr's *Receiving Antenna Handbook* (\$19.95, HighText Publications,

Inc., 1-800-247-6553) and *Practical Antenna Handbook* - 2nd Edition (\$29.95, TAB/McGraw-Hill, 1-800-233-1128).

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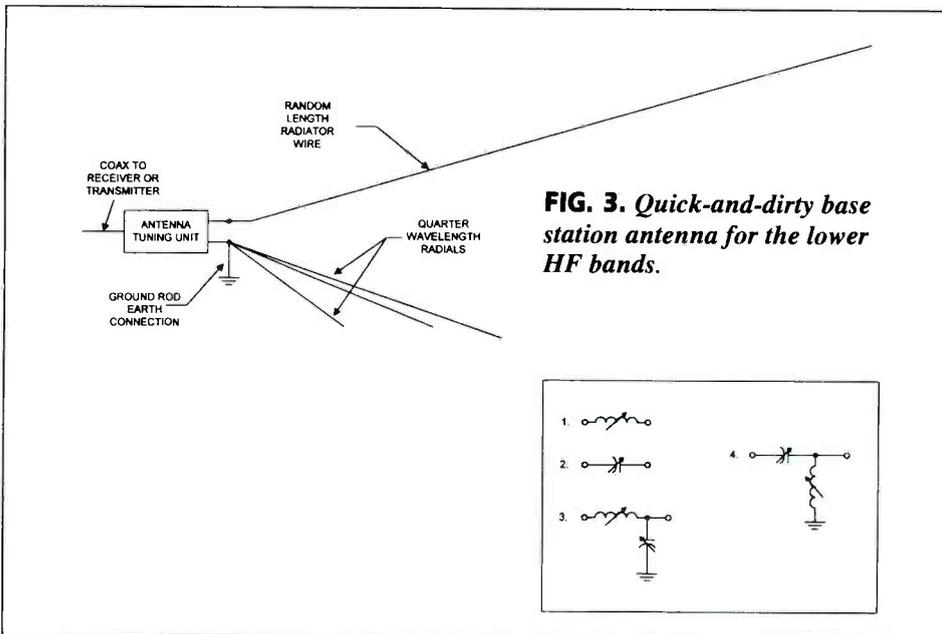


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Scanners at the Ready: Twister Search '98

As I write this article frantic preparations are underway — I'm a storm chaser and there is a lot to do to get ready for a week in Tornado Alley. This will be my third year as Communications Manager for Warren Faidley's International Severe Storm Interceptor (ISSI) team. Warren is the nation's foremost weather photographer. He leads an elite group of chasers across the southern Great Plains each spring in search of nature's most violent weather: supercell thunderstorms and tornadoes. It's one of the most challenging, adventurous, thrilling, and just plain fun time a person can have.

This year I'm also serving as the team leader for the Lycos Twister Search '98. In this role, I'll be reporting, with Warren, on conditions in the field for Lycos, the Internet company, during the week of May 13th through 19th, at www.lycos.com/twister. Our content will also be distributed by The Weather Channel's web site, Weather.com. By the time you read this report though, the event will have passed. Unfortunately, contracts were not finalized in time to provide you with advance notice.

How does this relate to scanning? Well, it's because scanners are so critical to the mission of the Communications Manager that I'm a ready, willing and able member of the team. The chase combines so many things that I'm fascinated by: weather, driving, cars and trucks, exploration, the great camaraderie of the team, and, perhaps best of all, the radios.

My Lycos Twister Search '98 Chase Truck, dubbed "CHASE 3 - Communications," is a 1998 Ford Explorer XLT equipped with the following:

- Davis Weather Station (anemometer, windvane, barometer, etc.)

- Alinco DR-119 Ham Transceiver (2 meter)

- Uniden-BearTracker BCT-7

- Uniden-BearTracker BCT-12 with weather alert and news media scan

- Uniden-Bearcat BC-895 TrunkTracker (advanced scanner with trunking)

- Radio Shack TRC-487 CB with weather and weather alert

- AOR AR-8000

- OptoElectronics Scout 4.0 Frequency Counter

- Valentine Radar Detector

- Action-Sportvision TV with scan capabilities

- Cellular Phones (2) for voice and data

- Laptop computer with:

- Delorme GPS
- Delorme Mapping Software
- Percon CD-ROM
- BC-895 Software
- Cellular modem
- Internet Access

- Emergency overnight bag

- First aid kit

- Hereford Anti-odor masks (the smell of the cattle-pen towns can be brutal!)

■ How we use the Equipment

Following is a sampling of some of the equipment which may be used in one or more of the trucks and their function:

Ham Radios

At least one member in each chase truck is a licensed Amateur Radio (ham) operator, holding a Technician Class license or higher. We utilize ham radio simplex (low-power, direct) for communicating between trucks while driving to our destination. We use ham repeaters if the trucks get separated by long distances and to check with the National Weather Service (NOAA) offices, local weather spotters and other hams about conditions while out on the twister search. Should we see cloud rotation and/or a tornado, we can use the ham rigs to contact the Weather Service and local authorities to warn those who may soon be affected.

CB Radios

We use these low-tech radios as a backup to our ham gear. If our amateur communications go out, we'll have another means to communicate. Also, we use the CB to talk (and have a little fun with) the truckers who oftentimes are the only other motorists out on some very lonely stretches of highways. Truckers almost always have CBs, and if they're coming out of a storm that you're heading towards, you can find out whether it contained any hail.

BearTracker BCT-7 Scanner

The BearTracker BCT-7 is a versatile and very easy-to-use scanner. It's fully pre-programmed with Highway Patrol agencies for each state in the nation. Just press one button to scroll through all the two-letter state codes, TN, TX, UT, and the like, and the radio automatically gets set to scan the Highway Patrol and/or county and local police frequencies in the designated state.

The radio also scans Depart-



ment of Transportation (DOT) channels (great for hearing about road and weather conditions), the news media (you can monitor the assignment desk editors and traffic reporters also chasing the storms), fire and EMS, CB, and weather. You can also program up to 100 of your own frequencies into the preprogrammed mix. For tornado chasing across multiple states, this scanner is essential.



BearTracker BCT-12 Scanner

Similar to the BCT-7, this unit is the size of a radar detector and is visor or windshield mountable. You cannot program your own frequencies for this radio, but it's great for using as a weather alert monitor.

Bearcat TrunkTracker BC-895

This scanner allows you to follow the new communications system of the Oklahoma Highway Patrol, the Kansas Highway Patrol, as well as radio traffic in Wichita and Sedgewick counties. With great sensitivity and ease of use, this radio is a little large for mobile use, but it can be a critical element in any successful chase. We also like the weather alert mode (as a backup to the BCT-12). The BC-895 is also computer programmable and controllable. We use a laptop to program and back up the programming in the radio and we can control it from the PC if we wish.

Cellular Phones

Our final, and most expensive, means of backup communications also allows us to keep in touch with the Weather Service, local television meteorologists, any support staff that is not travelling with us, and our friends and family back home while on the road.

We use two cell phones for the chase: a phone for normal voice communications and a phone dedicated as a data link with the Internet, The Weather Channel and Lycos.



Radar Detectors/ECM

You all know what that's for. We take care to drive safely. Most of the roads are straight with hardly any undulations. The biggest danger can be cattle that have wandered out in the middle of a road. We are very thorough about our care for the trucks, insuring that the tire pressure is always up, windshield-washer fluid is filled, and all mechanical components are in prime shape. With that said, we do have to drive, shall we say, "spiritedly" to chase down a tornado which may form hundreds of miles away and only last a few minutes. This is why radar and electronic countermeasures (ECM) are so important.

Television

Scanning TV's are used constantly to check for local weather reports which may contain Doppler and other radar images. When you get outside a "metro" area such as Amarillo, the signal from local network affiliates drops off fairly quickly (despite the flat terrain) so that you must monitor UHF low-power TV translator stations that cover very small population centers.

DSS Satellite TV

We use DirectTV when we have a moment to stop and check the radar from the Weather Channel. The DATRON satellite dish on Chase 2 automatically elevates and locks onto the satellite signal. We can have the radar images up within minutes.

GPS Equipment

The Global Positioning Satellite (GPS) gear allows us to know exactly where we are at all times. As a stand-alone unit (Lowrance) or tied to software that runs on laptops, the GPS data also enables us to review all our road options well in advance of when we need to turn. Need a southwesterly option that may be a dirt farm-to-market road? The GPS equipment will tell us all about it.

Frequency Counter

The frequency counter allows us to read the radio frequency of a nearby transmitter (such as a local emergency management official) and "reaction tune" the AOR-8000 scanner to automatically receive the broadcast. Thus, if someone is nearby and is transmitting on an unknown frequency, this equipment will not only tell us the frequency, it will instantly tune a radio to receive the broadcast.

Future Equipment

We're always kicking around ideas for equipment that we might use in future years. Here are some ideas we have. We would be very interested to hear if you have ideas on additional gear that we might find helpful.

Satellite Phone

We looked into using a sat-phone to feed live video to the 'Net at 56K (can you image a tornado live on Lycos?). It's an expensive and somewhat complicated undertaking, but it's something we'll consider for the next go around.

Weather Radar

We're not sure if there is anything commercially available in weather radar, at a reasonable price, that can be mounted on a sport-utility vehicle, but we would love to have it. The federal government sponsored a meteorological team named Vortex which had a mobile Doppler weather radar, but that's an enormous, multi-million dollar device. We were thinking more on the lines of some sort of marine or aircraft radar. Of course, our idea is to watch a storm build by eyesight and get a sense of what's going on inside a supercell with the radar.

Radio Direction Finding Equipment

Occasionally you will hear a report on the scanner such as "rotation in the clouds" or "tornado on the ground" from a local county sheriff or emergency management agency. While frequency guides and lists will help identify the transmitting agency, we have considered using direction finding (DF) equipment as a means to insure that we're heading in the direction of the reporting authority.

We've identified a source for advanced DF equipment (Doppler Systems of Arizona), but the problem is that part of the gear is comprised of four antennas which need to be mounted on the corners of your

vehicle roof. There can be no other antennas or other obstructions on the roof or the pattern will be distorted. Obviously, we have to load up the SUVs with scanner, ham, CB, cell, television and other antennas, so this system is not practical.

■ More on the Scanners

This will be our first year with the BC-895 Trunktracker and it's a godsend. Not only does the radio have CTCSS program and search capability, for the first time we can develop multiple program lists for chasing in various regions of Tornado Alley and download them to the radio on the fly. We use the Scanner Master BC-895 software, but other fine software is also available.

For the event we'll probably end up with the following sets of programs:

Trip Lists

1. Arizona

This set of frequencies and tones are for use during our ride from Las Vegas (where we pick up our trucks that I previously outfitted with my chase partners Phil Henry and Jeff Bernard) to Amarillo. The program will include frequencies for the major cities that we'll pass through such as Flagstaff. Actually, that's the only "major" city that we pass through.

2. New Mexico

This program will be for the balance of the ride which occurs through this southwestern state. As during our ride through Arizona, we'll focus, of course, on State Highway Patrol, county sheriffs, Bureau of Indian Affairs, National Parks, Forests and other governmental agencies. We do also pass through a truly large city, Albuquerque, but it runs an Ericsson trunking system.

Chase Lists

Storm chasing lists are comprised of the following primary elements (you can set up your ten BC-895 banks in the following manner as well):

- A. State Police/Highway Patrol
- B. State Emergency Management/Ham Radio Repeaters (if not using ham rig for these freqs.)
- C. State Forest and Park Services (there may not be many forests, but there are grasslands)
- D. National Forest and Park Services
- E. County Sheriffs
- F. Inter-agency/Inter-system/Mutual Aid channels
- G. Local Police
- H. Local Fire/County Fire
- I. Local Emergency Management/Civil Defense
- J. News Media

Other agencies we may monitor include utility companies for storm damage reports and railroads, just because they criss-cross the countryside and, well, we're train nuts too.

Chase Lists by Region

The following list of chase region programs was not finalized at the time of this writing, but represents how we might organize the different chase zones. Each zone covers a ten to twenty county area.

1. Amarillo Proper

(Amarillo is our home base for the trip, although we always take an overnight bag with us in case we chase far from the city and need to

- spend a night away from "home.")
- 2. West/Northwest Panhandle
(We often chase to the west of Amarillo, including places like Dalhart and counties such as Deaf Smith.)
- 3. Northeast Panhandle
- 4. Lubbock
- 5. Wichita Falls
- 6. Big Springs
- 7. Abilene
- 8. Oklahoma Panhandle
- 9. Northwestern Oklahoma (excluding panhandle)
- 10. Southwestern Oklahoma
- 11. Oklahoma City
- 12. New Mexico
(One list covers our New Mexico chase zone, the northeastern and east central portion of the state.)
- 13. Southeastern Colorado
- 14. Garden City/Dodge City, Kansas
- 15. Great Bend, Kansas
- 16. Wichita

That's about the extent of our chase region, although we are capable of making it as far north as Nebraska if need be. You can see how having the frequencies (and tones in some cases) programmed for each region in advance of the event is a huge timesaver. We like to use *Police Call, Monitor America* (both of which this editor has co-written) and the Percon Regional CD-ROMs to create the databases.

If we encounter some exciting communications and dramatic storms, we'll report on how the radios and programs performed during the trip. Stay tuned.

International Severe Storm Interceptors

The International Severe Storm Interceptors (ISSI) is a private, volunteer organization comprised of international storm chasers, meteorologists, journalists and support team professionals who forecast and chase severe weather, including tornadoes, hurricanes and lightning. The events are recorded on film (still and motion picture), and video tape. Data and footage acquired by ISSI is used for a variety of purposes: over 50% of all chase related materials are used for educational purposes, and they are often used in scientific and safety programs, including those of the American Red Cross, FEMA and the National Weather Service.

The often dramatic footage is also used for editorial and commercial purposes such as news and feature stories, commercial advertising, cable television and in motion picture productions. During storm chase operations, ISSI often relays critical weather data to the National Weather Service and Emergency Management spotter networks utilized by many rural communities. All ISSI personnel are trained in first aid and CPR.

ISSI still images, video footage and motion picture film are marketed by the Weatherstock Inc. News and Photo Agency in Tucson, Arizona, and eight worldwide agents.

ISSI operations begin in the spring with tornado chases in the central United States. Lightning storms are pursued in the Southwest during the summer months and hurricane chases along the eastern US, Mexico and Gulf Coast regions are conducted in the late summer and early fall.

ISSI is currently the world's only private, large-scale storm chase team.

(From Warren Faidley's Web site: www.stormchaser.com)

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Weather Stations



The Weather Monitor II (7440) comes complete with anemometer with 40 feet (12.2 m) of cable, external temperature sensor with 25 feet (7.6 m) of cable, junction box with 8 feet (2.4 m) of cable, AC-power adapter, detailed instruction booklet and one year limited factory warranty.

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Davis Interface Cable Adapter Module 7760-A	\$59.95
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Radio Transceivers

NEW/RELM®MPV32-A Transceiver

Mfg. suggested list price \$515.00/Special \$299.95

Law enforcement and fire departments depend on the RELM MPV32 transceiver for direct two-way communications with their police or fire department, civil defense agency or amateur radio officer. The MPV32 is our most popular programmable frequency agile five watt, 32 or optional 64 channel handheld transceiver that has built-in CTCSS, which may be programmed for any 39 standard EIA tones. Designed for repeater use. Frequency range 136.000 to 174.000 MHz. The full function, DTMF compatible keypad also allows for DTMF Encode/Decode and programmable ANI. Weighing only 15.5 oz., it features dealer programmable synthesized frequencies either simplex or half duplex in 2.5 KHz. increments. Other features include PC programming and cloning capabilities, scan list, priority channel, selectable scan delay, selectable 5 watt/1 watt power levels, liquid crystal display, time-out timer and much more. When you order the MPV32 from CEI, you'll get a complete package deal including antenna, 700 ma battery (add \$20.00 to substitute a 1000 ma battery), battery charger, belt clip and user operating instructions. Other useful accessories are available. A heavy duty leather carrying case with swivel belt loop part #LCMP is \$49.95; rapid charge battery charger, part #BCMP is \$69.95; speaker/microphone, part #SMMP is \$54.95; extra high capacity 1000 ma. ni-cad battery pack, part #BPMP1 is \$79.95; extra 700 ma. ni-cad battery pack, part #BPMP7 is \$59.95; cloning cable part #CCMP is \$34.95; PC programming kit, part #PCKIT030 is \$224.95. A UHF version with a frequency range of 450-480MHz, part #MPU32 is \$349.95.

Your RELM radio transceiver is ideal for many different applications since it can be programmed with just a screwdriver and programming instructions in less than ten minutes. Programming is even faster with the optional PC kit. The technician programming instructions part #PIMPV is \$18.00.

TrunkTracking Radios

Bearcat®235XLT-A TrunkTracker

Mfg. suggested list price \$429.95/CEI price \$269.95
300 Channels • 10 banks • Trunk Scan and Scan Lists
Trunk Lockout • Trunk Delay • Extra battery & charger
10 Priority Channels • Programmed Service Search
Size: 2-1/2" Wide x 1-3/4" Deep x 6" High

Frequency Coverage: 29.000-54.000 MHz., 108-174 MHz., 406-512 MHz., 806-823.995 MHz., 849.0125-868.995 MHz., 894.0125-956.000 MHz.

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

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RELM RH256NB-A 25 watt VHF mobile transceiver	\$284.95
Sangean ATS909-A portable shortwave receiver	\$229.95

Radio Scanners

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Bearcat 760XLT-A base/mobile	\$179.95
Bearcat 230XLT-A handheld/SPECIAL	\$194.95
Bearcat 235XLT-A TrunkTracker scanner	\$269.95
Sportcat 150-A handheld with 800 MHz	\$144.95
Bearcat 80XLT-A handheld with 800 MHz	\$129.95
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SAVE \$45 on 1 TrunkTracker

Save \$45 when you purchase your Bearcat 895XLT or BC235XLT scanner directly from Communications Electronics Inc., PO Box 1045, Ann Arbor MI 48106 USA. Telephone orders accepted. Call 1-800-USA-SCAN. Mention offer TT4. TERMS: Good only in USA & Canada. Only one coupon is redeemable per purchase and only on specified product.

Bearcat®895XLT-A Radio Scanner

Mfg. suggested list price \$729.95/Special \$319.95

300 Channels • 10 banks • Built-in CTCSS • S Meter

Size: 10-1/2" Wide x 7-1/2" Deep x 3-3/8" High

Frequency Coverage: 29.000-54.000 MHz., 108.000-174 MHz., 216.000-512.000 MHz., 806.000-823.995 MHz., 849.0125-868.995 MHz., 894.0125-956.000 MHz.

The Bearcat 895XLT is superb for intercepting trunked communications transmissions (see BC235XLT description) with features like TurboScan™ to search VHF channels at 100 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a Signal Strength Meter, RS232C Port to allow computer control of your scanner via optional hardware and 30 trunking channel indicator annunciators to show you real-time trunking activity for an entire trunking system. Other features include Auto Store - Automatically stores all active frequencies within the specified bank(s). Auto Recording - This feature lets you record channel activity from the scanner onto a tape recorder. CTCSS Tone Board (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: P5001 Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter \$14.95; P5002 DC power cord - enables permanent operation from your vehicle's fuse box \$14.95; MB001 Mobile mounting bracket \$14.95; EX711 External speaker with mounting bracket & 10 feet of cable with plug attached \$19.95. Comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty.

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Latest and Greatest Hurricane Frequencies

Count yourselves lucky — *MT* readers are first to see the full rewrite of a hurricane frequency list that's kicked around the radio scene longer than I want to remember. My original list has lately been kept up by Bill Snyder, AA6KC, but now I'm returning the favor.

■ Hurricane Tracking

Florida's National Hurricane Center (NHC) issues tropical cyclone warnings for the North Atlantic, Caribbean, Gulf of Mexico, and East Pacific. They identify on-air as KJY 74, "Miami Monitor." NHC's lettered, HF frequencies are backups. If satellite links fail, you'll hear them working the "Hurricane Hunter" planes. Lately, data has also been heard on the US Air Force's Global High Frequency System (GHFS).

Usually, these aircraft go by "Gull" or "Teal," plus a number. They're most often heard on the GHFS with phone patches through MacDill in Florida or Ascension Island in the mid-Atlantic. Sometimes you'll also catch NOAA 42, 43, and 46, operated by the "weather bureau" — America's National Atmospheric and Oceanic Administration (NOAA). Cable News Network and The Weather Channel love to interview all these flight crews over discrete channels such as 11226 kilohertz.

■ Radio to the Rescue!

When hurricanes hit isolated islands, hams usually get the first word out. A storm within 300 miles of land activates the NHC's National Hurricane Watch Net on 14325 kHz. They take observations from affected areas and repeat NHC's latest emergency information.

News media love this frequency, as it's unbeatable for nail-biting drama. Hams will send wind readings until the last minute. They'll vanish, ominously, then reappear, with wobbly signals from wires thrown over uprooted trees, or from aircraft as they count missing roofs. I even heard the rescue of a sinking boat once.

Also tune 3800 to 4000 kHz, lower sideband (LSB), for all the local emergency nets. They move around so much I did not include them in the list, but some of them will be in the



Wefax of Hurricane Andrew

net directory published by the American Radio Relay League in Newington, Connecticut.

Following a hurricane, check the U.S. Federal Emergency Management Agency (FEMA) frequencies. Phones will likely be down and initial disaster traffic will go by radio. "Nightwatch" fans might even catch one of these command post aircraft on loan to FEMA from the Air Force.

■ How to Read the List

- In US networks, MARS is the amateur Military Affiliate Radio Service. SHARES stands for Shared Resources, a Federal disaster net with around 23 agencies. SECURE is State Emergency Capability Using Radio Effectively.
- All US Navy radiofacsimile (fax) is gone, except on fleet request, but the US Coast Guard has expanded its schedule. Fax carrier frequencies are 1.9 kHz below the frequency listed when you're tuning in the upper sideband (USB) mode.
- WOO, WOM, and KMI are the public high seas telephone stations operated by AT&T, the long-distance company.
- CW stands for Morse telegraphy, and all listed stations except WLO are now part of Globe Wireless. SITOR is Simplex Telex (teleprinting) Over Radio, types A and B, both error-correcting radioteletype. Simplex is when both stations use the same frequency.

I hope all this is helpful. Please report the inevitable additions and corrections. May you enjoy good listening — far away from any hurricanes!

1998 Hurricane Frequency List

Mode is upper sideband unless otherwise indicated

- 476.0 KFS-San Francisco, CA, Pacific weather (CW)
- 478.0 WNU-Slidell, LA, Gulf and Caribbean at 0350, 0950, 1550, 2150 (CW)
- 500.0 Maritime CW calling and distress (phasing out)
- 518.0 U.S. Coast Guard and others, navigational telex (NAVTEX/SITOR-B)
- 2052.0 U.S. Coast Guard, Kodiak, AK, fax charts at 0400, 1000, 1800, 2200
- 2182.0 Maritime voice calling and distress (guarded until 1999)
- 2196.0 Federal Aviation Administration, Caribbean hurricane net
- 2670.0 U.S. Coast Guard groups, local bulletins, announced on 2182
- 2754.0 Canadian Forces, Victoria, BC, fax charts at 0245, 1025, 1515, 2115
- 3122.0 U.S. Coast Guard, safety of flight
- 3303.0 U.S. Department Of Transportation, evacuation F-1
- 3331.0 SHARES—Federal Aviation Administration, southwest region emergency and maintenance net
- 3341.0 FEMA "Foxtrot-6," secondary nighttime channel
- 3407.0 Hurricane aircraft, air-to-ground "Alpha"
- 3622.5 JMH-Tokyo, Japan, fax weather charts at 0110 and 1910
- 4055.0 SHARES—Federal Aviation Administration, southern region emergency net
- 4081.5 British military, relief use in Bahamas
- 4209.5 International NAVTEX/SITOR-B, like 518 kHz
- 4210.5 International marine safety information (SITOR-B)
- 4125.0 Maritime calling and distress frequency, some weather info
- 4146.0 Maritime simplex channel 4A
- 4149.0 Maritime simplex channel 4B
- 4268.0 Canadian Forces, Victoria, BC, fax charts at 0245, 1025, 1515, 2115
- 4310.0 WNU-Slidell, LA, Gulf and Caribbean at 0350, 0950, 1550, 2150 (CW)
- 4298.0 U.S. Coast Guard, Kodiak, AK, fax charts at 0400, 1000, 1800, 2200
- 4317.9 U.S. Coast Guard, New Orleans, LA, continuous fax weather charts
- 4343.0 WLO-Mobile, AL, hourly weather during Gulf storms (CW)
- 4346.0 U.S. Coast Guard, San Francisco, CA, night fax weather charts
- 4363.0 WOM-Mobile, AL, Gulf at 1300 and 2300
- 4387.0 WOO-Oceangate, NJ, Atlantic at 1200 and 2200
- 4402.0 KMI-Pt. Reyes, CA, Pacific at 0000 and 1200
- 4411.0 WLO-Mobile, AL, Gulf at 0500
- 4426.0 U.S. Coast Guard, Portsmouth, VA, Atlantic at 0330, 0500, 0930
- 4426.0 U.S. Coast Guard, San Francisco, CA, Pacific at 0430 and 1030
- 4466.0 Civil Air Patrol, Northeast US
- 4469.0 Civil Air Patrol, Gulf Coast Hurricane Net
- 4582.0 Civil Air Patrol, emergencies
- 4585.0 Civil Air Patrol, Pacific and mid-Atlantic coasts
- 4721.0 Canadian Forces, Halifax, NS, continuous fax



	weather charts		
4724.0	U.S. Air Force, Global High Frequency System	8682.0	U.S. Coast Guard, San Francisco, continuous fax weather charts
5008.0	U.S. Department of Transportation, evacuation F-2	8722.0	WOM-Ft. Lauderdale, FL, Gulf at 1300, 2300
		8749.0	WOO-Oceangate, NJ, Atlantic at 1200, 2200
5135.0	SECURE Gulf Coast net	8764.0	U.S. Coast Guard, Honolulu, HI, Pacific at 0000, 0600, 1200, 1800
5140.0	SECURE Florida net		
5211.0	National Emergency Coordination Net night primary, also FEMA "Foxtrot 11" and SHARES	8764.0	U.S. Coast Guard, San Francisco, CA, Pacific at 0430, 1030, 1630, 2230
		8764.0	U.S. Coast Guard, Portsmouth, VA, Atlantic at 0330, 0500, 0930, 1130, 1600, 1730, 2200, 2330
5302.0	FEMA, possibly urban search and rescue	8806.0	WLO-Mobile, AL, Gulf warnings at 0500
5320.0	U.S. Coast Guard, Miami, FL, and Portsmouth, VA	8876.0	Hurricane aircraft air-to-ground "Echo"
5562.0	Hurricane aircraft air-to-ground "Bravo"	8968.0	U.S. Air Force, Global High Frequency System
5610.0	Hurricane aircraft air-to-ground "Charlie"	8983.0	U.S. Coast Guard, search and rescue, busy channel
5680.0	Maritime calling and distress frequency	8992.0	U.S. Air Force, MacDill Global
5693.0	U.S. Coast Guard and Navy (aviation)	9074.5	U.S. Department Of Transportation, evacuation F-5
5696.0	U.S. Coast Guard, search and rescue (busy channel)		
5710.0	U.S. Air Force, MacDill, weather recon heard here	9110.0	U.S. Coast Guard, Boston, MA, continuous fax weather charts
5821.0	FEMA "Foxtrot 14" channel, northeast region heard here	9197.0	SHARES-Federal Highway Administration
		9380.0	U.S. Coast Guard and U.S. Navy Hurricane Warning Net, Puerto Rico
6215.0	Maritime calling and distress frequency	9970.0	JMH, Tokyo, fax weather charts at 0110 and 1910
6224.0	Maritime simplex channel Ch. 6A	10015.0	Hurricane aircraft air-to-ground "Foxtrot"
6227.0	Maritime simplex channel Ch. 6B	10195.0	FEMA "Foxtrot 25"
6230.0	Maritime simplex channel Ch. 6C	10493.0	National Emergency Coordination Net day primary, also FEMA "Foxtrot-26," and SHARES
6314.0	U.S. Coast Guard, Boston, MA, Atlantic at 0140 (SITOR-B)	10536.0	Canadian Forces, Halifax, NS, continuous fax weather charts
		10588.0	FEMA "Foxtrot 27"
6340.5	U.S. Coast Guard, Boston, MA, continuous fax weather charts	10780.0	U.S. Air Force, Cape Radio, FL, and GHFS backup frequency
6341.7	WLO-Mobile, AL, weather at 0345 (SITOR-B)	10891.0	SHARES-Federal Highway Administration
6416.0	WLO-Mobile, AL, hourly weather during Gulf storms (CW)	10935.0	US Coast Guard, Caribbean disaster ops
6456.0	Canadian Forces, Victoria, BC, fax charts at 0245, 1025, 1515, 2115	11028.0	U.S. Department of Transportation evacuation F-6
6496.4	Canadian Forces, Halifax, NS, continuous fax weather charts	11175.0	U.S. Air Force, Global High Frequency System
		11226.0	U.S. Air Force, MacDill, weather aircraft heard here
6501.0	U.S. Coast Guard, Guam, Pacific at 0930 and 1530	11230.0	British military, relief use in Bahamas
6501.0	U.S. Coast Guard, Honolulu, HI, Pacific at 0600 and 1200	12290.0	Maritime calling and distress frequency
6501.0	U.S. Coast Guard, Kodiak, AK, Pacific at 0203 and 1645	12353.0	Maritime simplex channel 12A
6501.0	U.S. Coast Guard, Portsmouth, VA, Atlantic at 0330, 0500, 0930, 1130, 1600, 2200, 2330	12356.0	Maritime simplex channel 12B
6673.0	Hurricane aircraft air-to-ground "Delta"	12359.0	Maritime simplex channel 12C
6739.0	U.S. Air Force, Global High Frequency System	12362.0	Maritime simplex channel 12D
6785.0	U.S. Army Corps Of Engineers	12365.0	Maritime simplex channel 12E
6809.0	FEMA "Foxtrot-21" channel, urban search and rescue	12579.0	U.S. Coast Guard, Boston, MA, Atlantic at 0140 and 1630 (SITOR-B)
7305.0	JMH, Tokyo, fax weather charts at 0110 and 1910	12579.0	U.S. Coast Guard, Honolulu, HI, Pacific at 0130, 1330, 2030 (SITOR-B)
7373.5	U.S. Department Of Transportation, evacuation F-3	12730.0	U.S. Coast Guard, San Francisco, continuous fax weather charts
		12750.0	U.S. Coast Guard, Boston, MA, continuous fax weather charts
7382.5	SHARES-U.S. Navy MARS	12753.0	Canadian Forces, Victoria, BC, fax charts at 0245, 1025, 1515, 2115
7475.0	SHARES-Federal Aviation Administration, southern region	12789.9	U.S. Coast Guard, New Orleans, LA, continuous fax weather charts
7507.0	U.S. Coast Guard and Navy Hurricane Warning Net, Puerto Rico (FAA participates out of Puerto Rico)	12826.5	WNU-Slidell, LA, Gulf and Caribbean at 0350, 0950, 1550, 2150 (CW)
		12844.5	KFS-San Francisco, CA, Pacific at 0450, 1050, 1650, 2250
7540.0	SHARES-Air Force MARS	12847.0	WCC-Chatham, MA, Gulf, Caribbean, Atlantic at 1250 and 1650 (CW)
7554.0	SHARES-Bellcore, some teletype as well	12886.5	WLO-Mobile, AL, hourly weather in Gulf storms (CW)
7582.0	U.S. Department Of Transportation, evacuation F-4	13002.0	KPH-San Francisco, CA, Pacific at 0500 and 1900 (CW)
		13033.5	WCC-Chatham, MA, Gulf, Caribbean, Atlantic at 1250 and 1650 (CW)
7635.0	SHARES-Civil Air Patrol Command Net	13083.0	KMI-Pt. Reyes, CA, Pacific at 0000 and 1200
7773.5	U.S. Coast Guard, Caribbean use	13089.0	U.S. Coast Guard, Guam, Pacific at 0300 and 2130
8125.0	SHARES-Federal Aviation Administration, eastern region	13089.0	U.S. Coast Guard, Honolulu, HI, Pacific at 0000 and 1800
		13089.0	U.S. Coast Guard, San Francisco, CA, Pacific at 0430, 1030, 1630, 2230
8291.0	Maritime calling and distress frequency	13089.0	U.S. Coast Guard, Portsmouth, VA, Atlantic at 1130, 1600, 1730, 2200, 2330
8294.0	Maritime simplex channel 8A	13092.0	WOM-Mobile, AL, Gulf at 1300 and 2300
8297.0	Maritime simplex channel 8B	13200.0	U.S. Air Force, Global High Frequency System
8416.5	U.S. Coast Guard, Boston, MA, Atlantic at 0140 and 1630 (SITOR-B)	13245.0	Antigua and Antilles inter-island net
		13267.0	Hurricane aircraft air-to-ground "Golf"
8416.5	U.S. Coast Guard, Honolulu, HI, Pacific at 0130, 1330, 2030 (SITOR-B)	13354.0	National Hurricane Center "Miami Monitor"
8416.5	U.S. Coast Guard, San Francisco, Pacific at 0000 and 1800 (SITOR-B)		
8459.0	U.S. Coast Guard, Kodiak, AK, fax charts at 0400, 1000, 1800, 2200	13432.5	U.S. Department Of Transportation, evacuation F-7
8503.9	U.S. Coast Guard, New Orleans, LA, continuous fax weather charts	13457.0	SHARES-Federal Aviation Administration
8558.4	KFS-San Francisco, CA, Pacific at 0450, 1050, 1650, 2250 (CW)	13448.2	FEMA "Foxtrot 36" radioteletype (straight Baudot) copied here
8570.0	WNU-Slidell, LA, Gulf and Caribbean at 0350, 0950, 1550, 2150 (CW)	13510.0	Canadian Forces, Halifax, NS, continuous fax weather charts
8586.0	WCC-Chatham, MA, Gulf, Caribbean, Atlantic at 1250 and 1650 (CW)	13626.0	Federal Aviation Administration, southern/eastern regions emergency nets
8618.0	KPH-San Francisco, CA, Pacific at 0500 and 1900	13630.0	Federal Aviation Administration, southern/eastern and inter-regions emergency nets
		13993.0	SHARES-Air Force MARS
		13997.0	JMH, Tokyo, fax weather charts at 0110 and 1910
		14325.0	National Hurricane Watch Net, amateur and government
		14383.5	SHARES-U.S. Navy MARS
		14390.5	MARS disaster operations
		14391.5	U.S. Navy MARS
		14396.5	SHARES-National Coordinating Center for Telecom
		14450.0	FEMA "Foxtrot 41" evacuations heard here
		14493.5	SHARES-Federal Bureau of Investigation
		14837.5	FEMA "Foxtrot 43"
		14902.0	SHARES-Civil Air Patrol, rescue and relief
		14905.0	Air Force Contingency channel
		15016.0	U.S. Air Force, Global High Frequency System
		16348.0	Federal Aviation Administration, various regional nets
		16420.0	Maritime calling and distress frequency
		16528.0	Maritime simplex channel 16A
		16531.0	Maritime simplex channel 16B
		16534.0	Maritime simplex channel 16C
		16806.5	U.S. Coast Guard, Boston, MA, Atlantic at 1630 (SITOR-B)
		16806.5	U.S. Coast Guard, Kodiak, AK, Pacific at 1500 (SITOR-B)
		16806.5	U.S. Coast Guard, San Francisco, Pacific at 0000 and 1800 (SITOR-B)
		16933.2	WCC-Chatham, MA, Gulf, Caribbean, Atlantic at 1250 and 1650 (CW)
		17016.8	KPH-San Francisco, CA, Pacific at 0500 and 1900 (CW)
		17022.5	WLO-Mobile, AL, half-hourly weather in Gulf storms (CW)
		17026.0	KFS-San Francisco, CA, Pacific at 0450, 1050, 1650, 2250 (CW)
		17151.2	U.S. Coast Guard, San Francisco, CA, continuous fax weather charts
		17117.6	WNU-Slidell, LA, Gulf and Caribbean at 0350, 0950, 1550, 2150 (CW)
		17242.0	WOM-Ft. Lauderdale, FL, Gulf at 1300 and 2300
		17314.0	U.S. Coast Guard, San Francisco, CA, Pacific at 1630 and 2230
		17314.0	U.S. Coast Guard, Portsmouth, VA, Atlantic at 1730
		17421.0	U.S. Department Of Transportation, evacuation F-8
		17901.0	Hurricane aircraft air-to-ground "Hotel"
		17976.0	U.S. Air Force, Global High Frequency System
		18220.0	JMH, Tokyo, fax weather charts at 0110 and 1910
		18825.0	Maritime simplex channel 18A
		18828.0	Maritime simplex channel 18B
		18831.0	Maritime simplex channel 18C
		18834.0	Maritime simplex channel 18D
		18837.0	Maritime simplex channel 18E
		18840.0	Maritime simplex channel 18F
		18843.0	Maritime simplex channel 18G
		19680.5	International marine safety information (SITOR-B)
		20361.0	FEMA "Foxtrot 56" replaced 19757.0
		21937.0	Hurricane aircraft air-to-ground "India"
		22159.0	Maritime simplex channel 22A
		22162.0	Maritime simplex channel 22B
		22165.0	Maritime simplex channel 22C
		22168.0	Maritime simplex channel 22D
		22171.0	Maritime simplex channel 22E
		22487.0	WLO-Mobile, AL, hourly weather in Gulf storms (CW)
		22527.0	U.S. Coast Guard, San Francisco, daytime fax weather charts
		22575.5	WNU-Slidell, LA, Gulf and Caribbean at 0350, 0950, 1550, 2150 (CW)
		22581.5	KFS-San Francisco, CA, Pacific at 0450, 1050, 1650, 2250
		22783.0	WOM-Ft. Lauderdale, FL, Gulf at 1300 and 2300

Abbreviations used in this column

AM	Amplitude Modulation	GHFS	Global High Frequency System
ARQ	Synchronous transmission and automatic repetition teleprinter system	FM	Frequency Modulation
ARQ-E3	Single channel ARQ teleprinter system	MARS	Military Affiliate Radio Service
ARQ6-90	Six-character blocks simplex ARQ teleprinter system	MFA	Ministry of Foreign Affairs
CW	Continuous Wave (Morse code)	RTTY	Radioteletype
EAM	Emergency Action Message	SAM	Special Air Mission (US Air Force VIP flights)
FAX	Facsimile	Simplex	All stations on same frequency
FEC	Forward error correction teleprinter system	Unid	Unidentified transmission
FEC-A	One-way traffic FEC teleprinter system	US	United States
FEMA	Federal Emergency Management Agency	USS	United States Ship
		VIP	Very Important Person
		VOLMET	"Flying weather," an aviation broadcast, name loosely from French

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

- 2592.0 IPL-Livorno Radio, Italy, with navigation warning, at 2156. (Ary Boender-Netherlands)
- 2656.0 IPA-Ancona Radio, Italy, with navigation warning, at 2151. (Boender-Netherlands)
- 3413.0 Shannon-Irish VOLMET, flying weather at 1241. (Ray Carmen-OH)
- 4295.0 HWN- French Navy, Paris, with tests to FAAA, in RTTY at 2129. (Boender-Netherlands) *FAAA is a group call for messages to all French warships-Hugh*
- 4560.0 YHF-Mossad, Israel, new frequency, AM numbers at 0400. (John Maky-AR)
- 4665.0 MIW 2-Mossad, Israel, numbers in AM, at 0017. (Jack Dix-NY)
- 4982.0 SAM 56973-US Air Force, with Secretary of State aboard, calling Andrews at 0915. (Paul Bunyan-MO)
- 5211.0 Nightwatch-US Air Force airborne command post, calling WGY 912 on FEMA "Fox-11," at 1559. (Bunyan-MO) *Might have been the periodic National Emergency Coordination Net drill -Hugh*
- 5240.5 FDG-French Air Force, Bordeaux, with standard voice test loop of days and months in French, plus uncopyable addition, at 0800. (Boender-Netherlands)
- 5275.0 Unid-French Canadian fishing boat net, using first names as callsigns, discussing weather at 0000. (Ron Perron-MD)
- 5411.0 Many US Navy stations, in long-lasting net, probably data link coordination, first heard at 0348. (Bunyan-MO)
- 5435.0 Unid-Mossad numbers format, AM numbers at 0300. (Maky-AR) ART 2-Mossad, AM numbers at 1900. (Boender-Netherlands)
- 6080.0 Unid-Spanish female 5-digit numbers, in AM at 0754. (Cam Castillo-Panama)
- 6516.0 Unid-Commercial fishing boats discussing catch and dredging methods at 1506. (Perron-MD) *This is a legal frequency, international channel #606. There's a lot of coastal activity here -Hugh*
- 6697.0 Griswald-US military unit on Navy channel, working Male Plug, went to secure mode at 0256. (Perron-MD)
- 6712.0 Possible French Air Force, in French, aero weather at 0145. (Perron-MD)
- 6757.0 Nightwatch 01-US Air Force, challenging traffic from Scorecard, who had been logged out for inactivity, then went to secure mode, at 0240. WAR 46-US Air Force, several radio checks with Nightwatch 01 on Z-165 (this frequency), then went to Z-150 (5800 kHz) at 0600. (Jeff Haverlah-TX)
- 6761.0 Blue 01-US Air Force, scheduling inflight refueling for six with similar callsigns, at 1250. (Perron-MD)
- 6850.0 Spanish female 5-digit numbers, in AM at 0227. (Castillo-Panama)
- 6959.0 Lincolnshire Poacher, Cyprus, numbers at 1900. (Boender-Netherlands)
- 6971.0 Counting station, with 5-number groups at 2000. (Boender-Netherlands)
- 6980.0 Spanish female 5-digit numbers, in AM at 0813. (Castillo-Panama)
- 6993.0 Air Force Two, reporting bad cryptographic gear to Andrews Command Center at 0042. (Perron-MD) Air Force Two, working Andrews, enroute to Charleston, SC. (Bunyan-MO) *Last VIP mission for this aircraft,*

- 7357.0 *good old SAM 26000 -Hugh*
- 7357.0 AAR3USA-US Army MARS, Ft. Belvoir, VA, several radio checks, also mentioned that this was a new frequency, at 1600. (Perron-MD)
- 7583.0 Unid-CW "cut" numbers in 5-figure groups at 0700 (Boender-Netherlands)
- 7860.0 Spanish female 5-digit numbers, in AM, at 1007. (Castillo-Panama)
- 7885.0 Spanish female 5-digit numbers, in AM, at 0232. (Castillo-Panama)
- 7918.0 YHF-Mossad, Israel, replaces 4560 at 0400, AM numbers at 0200 (Maky-AR)
- 8971.0 Rockfish 02-US Customs, calling Blue Star at 0009. U4C-US Joint Task Force, likely drug interdiction with helicopter 20 Charlie, guiding Buzzsaw 55 to contact point at 0047. Alpha Whiskey, asking Blue Star if Cutter Dallas had heard King 01, at 0227. A80, with Shot Rock, requesting half-hourly ops-normal reports from Shadow 31, a C-130 from Special Operations Wing, FL, at 0330. (Perron-MD)
- 9006.0 Spar 65-US Air Force VIP aircraft, working Spar 67, tried to call Andrews Air Force Base on "565." Realized that they were really on Mystic Star frequency "Fox-505," and so decided to try Andy on Fox-639 (7469). Raised him there. (Bunyan-MO)
- 9016.0 Mulberry-US Air Force, with voice and unsuccessful data to Nightwatch 01, made joke about "new fancy computer," at 0505. (Haverlah-TX)
- 9045.0 5YE-Nairobi Meteorological, good copy of fax weather chart for Africa, at 2202 (Dix-NY)
- 9120.0 SAM 26000-US Air Force VIP VC-137C, working Andrews and Cactus on frequency "Fox-005," enroute to Champaign-Urbana, IL, to pick up the President, after the first Air Force One (SAM 27000) became stuck in the mud there. (Bunyan-MO) *Nice catch! -Hugh*
- 9968.0 "Lynx"-CW identification, otherwise all noise, at 0026. (Edward DeFreitas-CT)
- 11157.0 Papa-US Navy, possible data link coordination with Foxtrot and Lima. (Bunyan-MO)
- 11175.0 Coast Guard 2135-US Coast Guard helicopter, Miami, with phone patch via MacDill, FL, to Miami Air regarding penetration of local Air Defense Identification Zone, at 1415. Teal 53-US Air Force 53rd Weather Recon WC-130, with patch to Miami Monitor (National Hurricane Center), then weather data. (Perron-MD) Yukla 23-US Air Force E-3, phone patch to Tinker Air Force Base, for weather, then to Raymond 24, re radar maintenance, given 11214 kHz working frequency, at 1803. (Allan Stern-FL)
- 11244.0 Bow Legged-US Air Force, being given Z145 (5705), Z160 (6715), and Z175 (9016) by McClellan Global, CA, for Nightwatch 01, at 1326. Lost Shoe, with EAM "for USS Asheville," simulcast on 17976 (GHFS) and perhaps 9016 (Z-175), at 1949. (Haverlah-TX)
- 12270.0 Lobo Control-US Air Force, Howard Air Force Base, working Shark 16 and 18 at 1944. (Perron-MD)
- 12610.5 VCT-Globe Wireless, Tors Cove, Canada, English news in FEC at 0617. (Bob Hall-RSA)
- 13907.0 Nightwatch 01-US Air Force airborne command center, making patch to Raymond 21 via WAR 46, on "Zulu-225," at 2242. (Bunyan-MO)
- 14686.0 Atlas-US Customs, working US Coast Guard aircraft 37 Charlie. (Perron-MD)
- 14920.0 Russian Man, 5-figure numbers, in AM at 1400. (Boender-Netherlands)
- 15475.0 Spanish female 3/2 numbers, heard for two minutes at 0140. (Gary Neal-TX)
- 16404.5 English female numbers, with carriers, at 1721. (Bunyan-MO)
- 17441.3 5YE-Nairobi Meteorological, with cyclone warning for Reunion Island, RTTY at 0070. (Hall-RSA)
- 17982.0 Ant House-US military, calling Top Spot, called frequency "channel CC," at 2105. (Bunyan-MO)
- 18318.0 OMS-Bratislava MFA, Slovakia, RTTY news in Slovak, at 1447. (Dix-NY)
- 18320.7 RFFIC- Marine Dipermil Paris, bulletin to all personnel in Arq-e3 at 1340. RFTJ-French Navy, Dakar, in ARQ-E3 at 1633. (Hall-RSA)
- 18645.0 CLP1?-MFA, Havana, possibly new frequency, Spanish news in RTTY at 0709. (Hall-RSA)
- 19204.7 RFHI-French military, Noumea, in ARQ-E3 at 0852. (Hall-RSA)
- 19747.5 6VU79-Dakar, Senegal meteorological office, with weather bulletin in RTTY at 1713. (Hall-RSA)
- 20518.0 KSHA-French embassy, Kinshasa, coded traffic to MFA, Paris, in ARQ6-90 at 0953. (Hall-RSA)
- 24370.0 RFGW-French MFA, Paris, coded traffic to L4N, Sofia, Bulgaria in FEC-A at 1701. (Hall-RSA)
- 26470.0 WJFP-Narrowband FM simulcast of Ft. Pierce, FL, commercial FM station, music at 1845. (Bunyan-MO) *Legal broadcast cueing channel. The skip is back! -Hugh*



Decoding Third Shift Cyrillic

Prior to the break-up of the former Soviet Union, their maritime fleet was the largest single user of radioteletype (RTTY) on the shortwave bands. Although not as plentiful as before, traffic is still exchanged between vessels of the new Commonwealth of Independent States and their respective shore stations.

All baudot RTTY is transmitted in upper case (capital letters). Each character is sent as a combination of five zeros and ones, or marks and spaces. With only five bits per character, transmission of more than 32 characters is impossible. To accommodate letters, numbers and special characters, two shifts are used. A letters shift is utilized for the letters of the alphabet from A to Z. A figures shift accommodates both numerals and punctuation. The two-shift system permits the transmission of all the required "Latin" characters.

The Russian language, however, has many additional native characters (33 in number). A special third shift for Cyrillic (the Russian character alphabet) was developed and is known as Third Shift Cyrillic.

Even though most decoding equipment cannot represent Cyrillic characters, the Cyrillic characters do yield 100% Latin transliterations. Some decoders can actually display Cyrillic characters on the video monitor or computer. Decoding in Cyrillic provides far more reliable translations of vessel call signs and names than decoding using the international alphabet.

Soviet RTTY (normally 50 Baud/170 Shift) is now most active between the following frequencies (500kHz spacing). This table represents the lowest and highest band frequencies logged since the July 1st, 1991, World Administrative Radio Conference (WARC) 87 maritime changes went into effect.

FROM	TO
6263.0	6314.0
8373.0	8412.5
12553.5	12575.0
16796.0	16804.5
22350.5	22373.0
25193.0	25208.0

How to Decode

Soviet RTTY is usually sent at 50 Baud, 170 Shift. The proper polarity — reverse or normal — will depend on the receiver you are using.

Select a good signal. (The region between 12560.0 and 12575.0 kHz is a good place to look for one). To display the transmission in Cyrillic (if your decoder/computer program supports this option), ensure that the alphabet selected is Cyrillic and that "unshift on space" (UOS) is off. To display the transmission in Latinized characters, select the international alphabet and ensure that UOS is on.

If the transmission seems unintelligible, reverse the polarity. You will find that about 95 percent of all traffic is sent at one polarity. (Again, polarity depends on your receiver. For example, a signal that decodes in normal using ICOM receivers or the JRC NRD-525, must be decoded in reverse if an NRD-535D is used.)

The Problem with Printers

Decoding Cyrillic RTTY on a video/computer monitor is almost foolproof, but printing it is an entirely different kettle of *ryba* (fish).

First of all, most printers cannot print Cyrillic characters. All characters are automatically "Latinized." To further complicate matters, all printers are not created equal. Each make/model assigns its own special character codes. Since the Cyrillic alphabet uses these special codes in transliteration, the output from two different makes of printers can prove to be quite dissimilar.

Don't despair. All is not lost. Tune in to a strong Soviet RTTY signal. Decode a full screen of traffic in Cyrillic. Allow your printer to run as well, or use the screen print function once the screen is full. Remove the output from the printer. Compare each Cyrillic character on the screen with its printed counterpart until you have verified every single character in the Cyrillic alphabet. Then make a table for yourself. Some Cyrillic characters are rarely used and you

may have to repeat this process with several screens before you capture them all. But when you are done, you will have a transliteration chart that is personalized for your printer.

Next, learn the Cyrillic alphabet and get into the habit of always decoding in Cyrillic on the screen. This advice is not simply purist in intention. Unless you decode in Cyrillic, you will be prone to decoding errors. Decoding in Cyrillic generally results in 100 percent message accuracy. Decoding using the International (Latinized) alphabet is subject to 10 to 30 percent errors. These errors always seem to occur at the start of each new line of transmission, and they will ensure that you never get the correct sending vessel's name. (The decoder seems to go to numbers before it recovers).

This applies to messages you wish to print as well. Printed output from Cyrillic screen characters yields 100 percent error-free transliteration based on the table constructed for your printer. Printed output from an International (Latinized) screen also yields 10 to 30 percent garbage. Your editor made this discovery by taping and redecoding signals in both character sets.

The problem, I suspect, has something to do with the three shift codes being sent to a printer designed to handle only two. Your printed output, as well, will be a strange mixture of upper and lower case words and characters, often changing case in the middle of a word. This is normal.

Note the special characters that have been substituted for their Cyrillic counterparts in the sample below:

pered4u polu4ila spasibo u menq wse
horolo l~bl~ celu~=natala~"

Every once in a while a surprise may be in store for you. Your editor has decoded traffic from Soviet vessels using 75 or 100 Baud instead of the standard 50.

In next month's column we'll examine the typical message content and composition of Soviet maritime vessel traffic to their coastal stations.



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"Keen" on Broadcasting

David Bobbett has been appointed new editor of the *World Radio-TV Handbook*, now based in Milton Keynes, England. (In this case, Keynes is pronounced to rhyme with "means.")

Milton Keynes, about 45 miles northwest of London, is the largest of the so-called "new towns" built in the south of England over the last 50 years. It has some interesting radio connections. The city area includes Bletchley Park, the wartime headquarters of the Government Code and Cypher School (later renamed Government Communications HQ—GCHQ—the British equivalent of the US National Security Agency) where the German Enigma codes were broken. (See Dec '95 MT.)

Quite separately, various places around what is now Milton Keynes were used as studio and transmitter sites by British clandestine broadcasters during the war (Chris Greenway, BBC Monitoring, *World of Radio*)

■ Voz Cristiana Powers Up

Andrew Flynn, CE of Voz Cristiana, Santiago, Chile, was visiting Quito and interviewed by Ken MacHarg on HCJB *DX Parryline*. Besides tests to Mexico on 21550, a second frequency has started testing, 11890 mornings to Brazil. The site is in a fruit-growing area west of Santiago. Test tapes were played from Santiago, not yet Miami, which they hope to have operational by August. License was granted at Marchend. Will broadcast only in Spanish, Flynn said in the interview, but website confirms Spanish and Portuguese.



As soon as more transmitters are refurbished, and crystals, synthesizers are working, parts of this schedule will start appearing:

Mexico/CAM 1300-0100 on 21550, 0100-0600 on 11690
NSAm/Carib 1100-1400 on 15375, 1400-2100 on 17680, 2100-0600 on 9630
Brazil 0800-1100 on 11890, 1100-2100 on 21500, 2100-0500 on 11---?
(11890 seems to be working though has VOA up 5 kHz)
SSAm 0900-1200 on 6070, 1200-2000 on 9635, 2000-0400 on 6070
(6070 is being vacated by Cuba)

Minor frequency changes may be necessary. VC wants to occupy the chosen frequencies as soon as possible. Of the eight transmitters, the final two could be sent to some other location or used to broker time for other Christian broadcasters. It may take up to six months to get up and running. Will have a mix of music and teaching like Christian Voice in Zambia, some programs in-house productions, others from outside. Now replying by whatever means is convenient, such as E-mail, fax, but plans eventually to have new QSL cards.

The site covers about 7 hectares, has five towers of 73m supporting curtains, and four towers of 50m with log-periodics. Working on a homemade 49mb antenna which will also work on 31m once matched. Power is from commercial source, but expensive, and during test period is not on air in evenings at peak-power times. Possibly hydro-electric later, but is 30-40 km from Andes up to 6 km high, in a dry area. Will see how costs go the first year and then decide.

CV wants to reach the whole world, including English to Africa, Spanish to LAm, Arabic to ME/NAf, Russian, Mandarin, Hindi. Looking for a new site to serve Asia, including one in Sri Lanka already established. Plans to add local radio, but not TV, and has no plans for digital. Simpler URL will get to them: <http://www.christian-vision.org> (via gh)

ANTARCTICA LRA36, 15476, operates M/W/F only at 1900-2100 (Gabriel Iván Barrera, Argentina)

BELGIUM RTBF, the Belgian French language network that ceased SW operation in 1992, is thinking about joining the community of international broadcasters again at the insistence of French community politicians. Three possibilities: the first is that RTBF will rent airtime on RVI/VRT's shortwave transmitters or on Deutsche Telekom Juelich. Second is renting an audio subcarrier on the French language TV5 and the third is broadcasting via the Worldspace satellite. Will take several months until a decision is made and money found. (Guido Schotmans, RVI *Golfkids*, DX-Antwerp)

BOUGAINVILLE Radio Free Bougainville currently uses 3865 at 0900-1100, in English and local languages, 80 Watts from Central Bougainville. Local community still refers to region as "The Republic of Bougainville." QSLs and general info for five IRCs, from Sam Voron, 2 Griffith Avenue, Roseville, NSW, Australia 2069. Tel: +61 2 9417 1066. (Mick Ogrizek, *Electronic DX Press*)

BULGARIA R. Bulgaria's 0200 is audible here on 9485 tho clobbered by utility QRM. 11720 also audible but variable; times given for *Bulgaria Calling* as being at the end of these hours: Fri 1900, 2300, Sat 1100, 2100, Sun 0200. On occasion, DX tips concentrate on SWBC rather than amateur (John Norfolk, OK, *Review of International Broadcasting*)

CAMBODIA Clandestine Khmer Rouge radio, for years the Cambodian guerrillas' propagandist mouthpiece, did not come on the air and broadcast at its regular time May 13. Reason not immediately clear but government troops were attacking the last remnants of the once-feared guerrilla army on northern Cambodia's border with Thailand. The radio, which is believed to broadcast from a mobile transmitter near the

Thai border, has gone off the air in the past for brief periods, apparently due to technical problems (Reuters via David Alpert) Was 1100-1200 and 2330-2430 daily to As on 5407v (BBCM)

CANADA [non] R. Asia Canada, the Tamil station in Toronto denied MW 1670 there, expanded its SW broadcasts to cover NAm in mid-May (gh) Ear-busting level on 9815/11845 around 2220 in Tamil (Jay Novello, NC) From Merlin UK sites, 2200-0200 (Dan Ferguson, *swtalk*) Good but not ear-busting signals on 11845 and 9815 until 2400*, immediately switching at *0000 to 11925 and 7325, until about 0157*. Website says there is also a morning transmission at 1000-1400 UT weekdays, vague about the frequencies, but not heard on any of the above; and to be continuous from 0400 UT Sat to 0400 UT Monday. Also says they plan to start SAm service, and they have something for every continent, even if it is a 170-MHz band transmission in Australia. Frequent IDs in passing spoken in English. Just how many Tamil-speakers are there around the world, especially in Canada and USA, to make this a viable service? (gh)

COSTA RICA AWR rescheduled *Wavescan* to UT Monday at 0000, on 9725, and seemingly more rapidly delivered than before, by satellite?—rather than four weeks old. Bill Matthews does both the global DX news segment and the North American (gh)

RFPI converted 15050-USB low power 24h to 15049-AM high power 30 kW 1600-0300 and tried leaving it on until 0800 with excellent results; and 21465-AM shifted to 21460 to avoid HCJB around 1800-2400 (gh)
R. 88 Estéreo, 6071.1, Pérez Zeledón, heard at 2258 with sports, 0000-0106+ music (Henrik Klemetz, Colombia, *NU* via DSWCI *DX Window*) tentatively the weak signal on 6070.98 at 1140-

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-98=Winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there.

1151 one day, 1055-1100 the next (Takayuki Inoue, Japan) Bought the transmitter of R. Rumbo (Ulis Fleming, Costa Rica, *Cumbre DX*)

CUBA RHC in English at 2230-2330 on new 9550 again clashes with Ukraine this summer, when checked before and after 2300 in anticipation of hearing *DXers Unlimited* around 2305. In fact, RHC was way under RUI in Ukrainian. This frequency conflict has gone on for years. Back at 2100, 13715 was barely propagating and supposed new USB 13740 was actually on 13750. At 0130 check the USB frequency was 13605, not 13660 as Arnie Coro once predicted (gh)

Not only is RHC a spur-producer, but Cuban utility transmitter CLA puts spurs even in the broadcast bands. One day at 2210, we found a QRA marker from CLA on 21610.6—not an image from 22 MHz, and no fundamental could be found (gh, OK)

ECUADOR HCJB started using 21470 to Europe at 1817-1900*, then expanded it to 2228*, after we had asked them to move at least 5 kHz to avoid clashing with RFPi Costa Rica on 21466. But HCJB refused, despite all the open spaces on the 13m band, so RFPi had to move to 21460, really too close to HCJB's USB frequency 21455. At 0000-0700 to NAM, 12015 ex-15295.

Ken MacHarg announced that after 7.5 years, he and Polly were quitting HCJB as of July 1, and moving to South Florida to be involved in ministries for the poor; succeeding him as *DX Partyline* host is Allan Graham (gh)

EGYPT Cairo comes clean. At 0300 I found Radio Cairo with a much improved signal on 9475. I haven't heard such a clear signal from Cairo since the days of the United Arab Republic back in the late 60's (Peter Hallam, N. Ireland, *World of Radio*)

EQUATORIAL GUINEA Personnel at R. Nacional earn about \$75 per month on average. Money received is thought a gift, and kept. They get overseas mail once a week, and letters addressed to a director or program director are opened for anything of value. Don't address anything to a specific person; they change positions in the government often (Eugene R. Bernald, Pan American Broadcasting, Cupertino, CA, via Dan Henderson, *NU* via *DSWCI DX Window*)

ETHIOPIA [non] Voice of Oromo Liberation: A spokesperson of SBO, the organization behind this station, told me in a telephone conversation that their offices in Berlin were "visited" during the Easter weekend and searched by an unknown group. They broke into the rooms at night, and left them in a mess; seemingly nothing had been stolen. SBO believes that this was a political operation carried out by some sort of secret service. During our conversation, the SBO spokesperson also mentioned a possible broadcasting activity towards Somalia, backed by an unnamed Ogaden organization (Harald Kuhl, Germany, *BC-DX*)

FRANCE Since J98 began, RFI's English at 1200 via French Guiana has been missing from 13625, tho 13640 in French is still there. At 1255 I found the apparent replacement, 15530, carrying an interview with Fr. Roy Bourgeois who is heading the effort to close down the School of the Americas. 15530 had that typical Guiana whine on it, and much weaker 15540 was in parallel, almost synchronized and not a satellite-hop apart—so could that be some other relay? There was there no advance notice of these changes: Not the way to run an international radio station (gh) 15530 is French Guiana and 15540 Gabon (RFI sked via Wolfgang Büschel)

You like RFI? You like SW? In 1999, RFI will end a lot of frequencies all over the world, preferring FM local broadcasting. So if this real information displeases you, let them know your disappointment (Denis, France, rec. radio.shortwave via George Thurman)

GERMANY DW has mailed a questionnaire to subscribers to its English-language program guide which was cancelled at the beginning of 1998 in favor of program info via Internet only. Now they are offering a biannual *English Programme* by postal mail to replace the quarterly *tune in*; people wanting a free subscription must send back a request by June 30 (via Gigi Lytle, *Review of International Broadcasting*)

Brother Stair started using 3945 in May via DTK Jülich at 2000-0600, outside the 75m band in Europe in anticipation of overcrowding in the 3950-4000 band this coming winter (Kai Ludwig, Germany, *World of Radio*)

The Deutsche Telekom site at Nauen will provide guided tours to visitors on Sunday, Sept 13 at noon-2 pm local. It's 4 km north of Nauen on the B273 motorway, west of Berlin (*BC-DX*)

IRAN [non] V. of Southern Azerbaijan, clandestine believed from Israel in Azeri, hostile to Iranian government, daily 0515-0615 on 11935, 1530-1630 on 13645 (BBCM) Later moved 0515 broadcast to 13645 too (Wolfgang Büschel, *BC-DX*)

Democratic V. of Iran, believed via Central Asia, says it has no particular political affiliation: 1730-1800 on 6210, 5835; and irregularly around 0310-0340 on 6210 (BBCM)

IRELAND [non] Emerald Radio carried out a week of special broadcasts via WWCR in late April. I could only stand a few minutes of it, as it was almost unintelligible due to background percussive "music" so loud as to be in foreground. This was compounded by low-quality phone feed. What was so urgent that this had to be done live rather than a few days delayed by high-quality tape? The first rule of SW broadcasting: don't do anything to impair intelligibility (gh)

JORDAN R. Jordan has introduced a new programme in English on Sunday at 1430 on 11690, *Arabakh*—not sure about spelling. It is devoted to the music and songs of Arabic lands. Nice to see such programmes devoted to culture and national music, instead of a constant diet of modern pop music which we can hear on local radio (Edwin Southwell, England, *World of Radio*)

KOREA NORTH R. Pyongyang, 2100 English to Europe on new 9335. Strong signal in

London but modulation almost as distorted as the ideology! They have dropped *The Song of General Kim Il Sung* at the beginning of transmission. But the "news" doesn't seem to have changed much—the top story being the 85th birth anniversary of the late "Great Leader" and the fact that people throughout the world have been holding meetings to mark the earth-shattering event (Roger Tidy, England, *World of Radio*)

KOREA SOUTH KBS is re-organizing its external services. The International Broadcasting Division (Kukche Pangsongguk) a.k.a. Radio Korea International and the Liberty Program (Sahoe Kyoyuk Pangsongguk) (programs for Koreans in North Korea and other neighboring countries) are merging to form Tae-oe Pangsongguk or literally "External Broadcasting Station." This is a major change. It would be akin to RFE/RL and VOA merging to form one broadcasting organization with the same name (Toru Yamashita, Asia Broadcasting Institute via Bill Harms) I think it is because the new South Korean President is taking a softer approach towards North Korea (Harms)

LAOS Khaosan Pathet Lao, KPL news agency on F1B 50 baud RTTY: daily 0930-1000 in English to As on XWK01A 14640, or alternate XWK01B 10114 (BBCM)

LIBYA R. Jamahiriya has been providing strong reception all day long and all the way to their sign-off around 0345-0350 on their 15-MHz frequencies; 15415 usually has the cleanest audio, with 15235 next best. 15435 was buried under louder co-channel Arabic station (Jordan, I guess). But all three Libya transmitters suffer from the same problems: hum and low audio levels. Don't they believe in audio processing? Do their engineers lack training? (Randy Stewart, MO)

MALI RTM Bamako, 1730-17.59:33*, French, ID before s-off. No // v9633. Noted here for the first time on exactly 11960.00 again. Had been silent at least two or three years on this channel. Modulation is crystal clear now, so it's seemingly new and overhauled equipment in use (Wolfgang Büschel)

MONACO [non] R. Monte Carlo, Arabic via Sackville 0300-0320 on 9755 was rumored to be quitting but // has changed from 5960 to 6040 (Bill Westenhover, RCI)

NIGERIA [non] Clandestine, 11540/6205, Radio Kudirat. The United Democratic Front of Nigeria's (UDFN) US representative had this to say about his station: It's true that the UDFN is running this station. NALICON (National Liberation Coalition), the group previously running the station, was perceived as too militant. This made getting grants for the station difficult. This is not to say that we are not putting up our own money, but we do rely heavily on grants for funding. After all, getting money for broadcasts is one of the least threatening things an exile group can do. Our address is: P. O. Box 9663, London, UK, SE1 3ZD (via Hans Johnson, *Cumbre DX*) Note that the postal code is different, which may explain why some listeners have had their reports returned (Johnson)

PAPUA NEW GUINEA Radio West New Britain is located at Kimbe, West New Britain Province, and uses one 10 kW HF transmitter on 3235, at 1930-2200 and 0700-1200; there are no daytime broadcasts. Station proposes to cease all SW broadcasts soon, in favour of mediumwave and FM (Mick Ogrizek, *Electronic DX Press*)

PERU 6115, Radio Unión, my favorite program *Tierra Fecunda* with great folk music and nice clear signal, apparently runs from 1000 to 1055, and is one of the best sources for great Andean music (Don Moore, IA)

R. Chaski, 5981.6 at 2315-2340 with hymns, evangelical course in Quechua, ID says 5970 from Cuzco (Rafael Rodríguez R., Colombia)

R. La Voz de Bolívar, 5460.5v, new station 0909-1005 fade (Mark Mohrmann, VT, *Cumbre DX*) Also heard 0928-1014+, in provincia de Bolívar, departamento de La Libertad (Henrik Klemetz, Colombia, *ibid.*)

PHILIPPINES DZMM heard on 13170-USB around 2300 in Tagalog and English; probably for fisherman. Same frequency has ship-to-shore later in day (Alan Davies, Manila, *BC-DX*)

PORTUGAL Hams were hopping one Friday night due to a noisy intruder on 14245, extremely distorted broadcast station including music. George McClintock found it to be //9570, which I then identified as RDP International. In the 2300-0330 period, the other currently scheduled frequencies are 11770, 11840, 13640 (or maybe testing 13635) and 13760. None of these work out to be 2A-B mixing products on 14245,



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so what I suspect happened was RDP failing miserably to tune up a transmitter on 13 MHz, which is new to them, and where I could not find them at all. Remains to be seen if this will happen again, or on the same frequency. But the 14245 blob was not to be heard the next night. Thanks to William R. Wilkins for the new RDP sked (gh)

SAHARA [non?] R. Nacional del Sahara, 9605 at 1800-0100, needs reception reports (Arseli Etxeguren, Spain, via Karl Leite, *radio-escutas*)

SA'UDI ARABIA Radio Riyadh, 15170, 1400-1600*, new French relay of home service on MW. Thanks to a tip from Noel Green. ID as "Radio Riyadh" before signing-off at 1600. Listed by *WRTH* as Foreign Language Programmes within the domestic services. They briefly announced their English service too at 1600 but then cut off and no other frequency on 15 MHz could be heard. English and French were listed until early 1990's by the *WRTH* as using two 9 MHz channels (9705/9720) though not easy to hear here in Europe (Wolfgang Büssel)

ST. KITTS [?] I heard WA3PUN, Ed, from here in Harrisburg talking on 75 meters to Scott Becker in St. Kitts. According to Ed, Scott told him the radio ship was supposed to start sailing from Boston to St. Kitts shortly. This is the first time I heard anything about where the ship might be going. Ed was on Yesterday USA with Bill Bragg until Ed had a dispute with Bill and Bill discontinued Ed's program. At that time Scott Becker contacted Ed and asked if some of Ed's programs could be put on Scott's website. Scott also promised Ed some time on the shortwave radio ship. That is how Ed has come to be in contact with Scott (Tom Dimeo, K3DOL, PA, *World of Radio*)

SOMALIA Radio Free Somalia: uses 7100, 1000-1200 daily, in Somali, from a site at Galkaya, NE Somalia. NE Somalia was to be renamed as "Republic of Puhitland" on Apr 15 1998 by the local people. Uses 800 Watts, with a 5 Watt relay station set up 700 km to the north at Bossusso, on 9420 or 9425, 1000-1200. QSLs available from Sam Voron - see Radio Free Bougainville item. (Mick Ogrizek, *Electronic DX Press*)

TAIWAN Where is New Star Broadcasting Station located? On May 10, 1998, I took my scooter and rode some 30 km to the coast. In Wu Ku I stopped for a quick radio check, but no extremely strong signals could be detected on shortwave. Both New Star and CBS/RTI were rather weak and had noisy signals. I went to the utmost northern point of Pali, where the Tanshui river runs into the Taiwan Strait. There was an army checkpoint there and some noisy powerlines, so I went south a little and sat on the beach with my trusty Panasonic RF-B65L and a Walkman, with the short- and mediumwave towers in Tanshui directly in sight. The following observations were made...

Frequencies: 8300, 9725, 11430. Time: 0407-0430 UT. Station: New Star Broadcasting Station. Details: numbers read by lady in Chinese, but with different messages on each channel. In the background the audio of CBS/ Radio Taipei International could be heard // 9280 and 9610. 11430 kHz had transmitter problems and was frequently off air for a couple of seconds. SINPO: on all channels 5555! But 13750 at the same time was weak and noisy, SINPO 35333. Draw your own conclusions.

I have to add that on other channels I could also hear CBS/RTI programs in the background (e.g. 15 MHz or 6185 kHz under Huayi BC from China), but not as pronounced as on New Star. Even on CBS/RTI frequencies I could hear other CBS/RTI programs in the background, e.g. the Chinese entertainment program under the news program on 9610 after 0430. (Hans van den Boogert, *DSWCI DX Window*)

TANZANIA Radio Tanzania's Taha Usi, Chief Engineer, had this to say about his station: Our shortwave operation is limited to just one frequency and transmitter right now: 5050 0200-2100+ with all services- General, Regional, and External in Swahili and English. Power is just 5 kW. Has used 100 kW transmitters in the past on 5985 and 7285 but they are grounded (translate: they are broken -Johnson) Our 50 kW transmitters are no longer in service, either. We do not have any 10 kW transmitters here (an update to '98 *WRTH*) (via Hans Johnson, *Cumbre DX*)

TIBET [non] Voice of Tibet - Internet Edition - India. Supplied note: "Voice of Tibet, the Tibetan broadcasting station in Dharamsala, has launched a web site. We can listen to the Tibetan program every day on line by real-audio." Self description: "Voice of Tibet (VOT) broadcasts a daily 30 minute service every day on shortwave. Programme production is carried out by Tibetan journalists stationed in several countries, including Europe and the US. All VOT programmes are produced in Tibetan language, and focus mainly on Tibet related issues. The programmes are aired in the evening in the target area, and VOT is now in the process of raising money for starting up a morning service." URL: <http://www.vot.org/> (Osada Yukiya, *DEV MEDIA* via Don Moore)

TIMOR EAST [non] The East Timor International Support Group in Darwin, Australia, plans to build a station called R. Free East Timor, to broadcast 1 hour a day in Tetum, Bahasa Indonesia, and to link up with Indonesian pro-democracy movement; RealAudio at <http://www.easttimor.com/> (*Clandestine Radio Watch* via Bill Matthews, *TIAWR Wavescan*) Why build a station for such little airtime? Why not rent time somewhere? (gh)

TURKEY TRT is experimenting to change modulation characteristics, most likely at Çakirlar site. Often TRT is blowing tremendous carrier signals on air, but their signals suffer by only 30 to 60% modulation. Also the 500 kW outlets are often overmodulated; 250 kW outlets from same location show clearer peak level modulation. My latest

info about Çakirlar is, that all the transmitters there operate with a modulation level of 50-60%. Emirler is only a bit better (Wolfgang Bueschel, *BC-DX*)

Station says: "...we started receiving complaints about modulation more and more. All the tubes completed their economical lives and should have been replaced long ago. There are many other parts that need be replaced; however, no new parts arrive; and most probably, this will not change until we get the transmitters, etc. back from the Turkish Telecom (which we hope is soon). At the moment, it is the Turkish Telecom that owns and operates the transmitters and antennas that broadcast TRT programs. In this situation engineers and techs in charge of our HF sites ... are a bit over-cautious. At present, the 9445 outlet at 1730-1930 in German and English, also Turkish at 2100-0700 carry a fine peak level modulation signal. From listener reports we understood that the modulation problems arise in the programs emitted mainly from one transmitter in Çakirlar (TRT International Technical Relations Service, Turkish Radio-TV Corporation, E-mail: utis@turnet.net.tr in *BC-DX*)

UGANDA Radio Uganda's Leopold B. Lubega, Principal Broadcasting Engineer, had this to say about his station: For our Home Service, we are concentrating on MW and FM. We really don't have any domestic listeners to this service on shortwave, but we maintain it for listeners in neighboring and overseas countries. We did have an External Service at one time, but those 250 kW transmitters were destroyed in the war with Idi Amin (1978, *I believe - Johnson*). The only working transmitters we have left are a pair of 10 kW and they operate as follows:

Red Channel	Blue Channel
4976 0300-0545	5026 0300-0545
7196 0600-1230	7110 0600-1230
4976 1300-2100	5026 1300-2100

We have used 3340 in the past for testing transmitters. Although it is one of our frequencies, we are not using it or any other frequency at the moment (via Hans Johnson, *Cumbre DX*)

UKOGBANI Transmission sites for Merlin Network One:

9645	2200-0100	Woofferton
9780	2200-2400	Rampisham
11915	2100-2300	Woofferton
11985	2100-0100	Rampisham
13690	1900-0100	Skelton
15200	1700-1900	Woofferton
15590	1900-2100	Woofferton

Address for QSLs for the Merlin Network One programs aired on Wednesdays is: Merlin Network One, P.O. Box 76, Bush House - 724 NE Wing, London WC 2B 4PH, U.K. (Dan Ferguson, *VOA, Cumbre DX*)

It's nice to have this info at last, but this does not explain why Rampisham 11985 and Skelton 13690 are far from synchronized at 2100. Is one of them using a multiple satellite feed "within" Britain? Or is the delay introduced for some other reason? (gh) One is closer to London and may use microwave link (Wolfgang Büssel) These MNO broadcasts are a six-month experiment from April (*BDXC-UK Communication*)

USA From May 29, VOA's Worldwide English made a total format change, eliminating most block programs in favor of a 2-hour *News Now* cycle with specific topics at certain times during each block, repeated over and over (gh) (*See Programming Spotlight*)

With the format change, *Communications World* will cease to exist in its present 29-minute format. The program will be reduced to three segments, each nine minutes long. The A segment will usually consist of media news. The B segment will have longer reports and interviews. The C segment will contain audience feedback or more reports. Each will be broadcast four times, for a total of twelve Saturday broadcasts. These will be at 0136 UT Sat and every two hours through 2345.

The three nine-minute segments will be reassembled into a half hour show for World Radio Network in London who will continue to rebroadcast the half hour segment on its satellite network and in RealAudio format via the Internet.

"These changes will change the nature of *CW*. Previously, as a half-hour block program, *CW* was the domain of those of us interested in broadcasting and electronic media ... talking our special language. But, in the *News Now* format, *CW* will be broadcast to general audiences. As such, *CW* is going to have to become respectable. There are certain things on the old *CW* that you're not going to hear on the new *CW*" (Kim Elliott, on *VOA Communications World*)

WORLD OF RADIO on WWCR: Thu 2030 on 15685, Sat 0600 on 3210 and 5070, Sun 0630 on 5070, Tue 1230 on 15685; WGTG Sat 2330v on 5085-USB. There are many more times to hear it on RFP1, Costa Rica: Fri 2000, Sat 0400, 1100, 1800, Sun 0200, 0900, 2300, Mon 0700, Tue 1900, Wed 0300, 1000. See our website below for latest details (gh)

US R I got E-mail from VOR confirming the recent death of long-time Radio Moscow announcer Anabelle Bucar. "Many thanks for your note of sympathy in connection with the death of Anabelle Bucar. She was loved and respected by everyone here. It's a great loss for all of us, and we'll certainly miss her." (Olga Troshina, Voice of Russia, via Maryanne Kehoe, *Cumbre DX*)

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

Gayle Van Horn

- 0005 UTC on 6535.8**
PERU: Radiodifusora Huancabamba. Station ID/promotional to listener's letters from USA, Italy and Australia. Peru's **Radio Libertad de Junin** audible 0145-0200 on 5039.4 with station slogans, chat and frequency quotes. (Rafael Rodriguez R., Santafe de Bogota D.C., Colombia/*The Four Winds*)
- 0005 UTC on 9485**
BULGARIA: Radio Bulgaria. World and regional news. Station ID and items covering Serbia. (William McGuire, Cheverly, MD) Letterbox program 1140 on 15175; 1915 on 11720 with report on Albania. (Bob Fraser, Cohasset, MA)
- 0014 UTC on 5013**
DOMINICAN REP: Radio Cristal Intl. Spanish. Local music to announcer's ID. Fair signal with moderate interference from 5015. (Lee Silvi, Mentor, OH; Harold Sellers, Coe Hill, Ont., Canada/*TFW*; Harold Frodge, Midland, MI)
- 0020 UTC on 5930**
CZECH REP: Radio Prague. *Talking Point* on the Czech-German *Discussion Forum*, 1/7345. (Fraser, MA)
- 0035 UTC on 6055**
SPAIN: Radio Exterior Espana. *Euro Forum* discussing relations with France. (Fraser, MA)
- 0100 UTC on 7250**
VIETNAM: Voice of. Station's sign-on anthem. Five minutes of world news to focus on the nation's hospitality to tourist. Asian music to 0127*. (John Marko, Collingdale, PA) VOV noted on 7260 at 0344 with military/anthem style music of mostly poor signal quality to 0356*. (Mark J. Fine, Remington, VA)
- 0105 UTC on 7150**
UKRAINE: Radio Ukraine. Political and economic news, talk of NATO. (McGuire, MD)
- 0123 UTC on 6725.5**
PERU: Radio Satellite. Spanish. "Atencion Santa Cruz" announcements including space gun sound effects between items. Peru's **Ondas del Rio Mayo** on 6811.7, 0132-0203+. (Frodge, MI)
- 0128 UTC on 15170**
TAHITI: Radio Tahiti/RFO. French service with English pop tunes to 0200, news and "Radio Outre Mer" identification. Fair signal in the clear to WYFR interference at 0358. (Sellers, CAN/*TFW*; Silvi, OH)
- 0129 UTC on 11735**
URUGUAY: Radio Oriental. Audible under unknown Russian station with soccer match Nacional vs. Bolivar using slogan, "Oriental la radio del Mundial"; 6140 simulcasting Radio Oriental with coverage of *Vuelta Ciclista de Uruguay* bicycle race. (Horacio A. Nigro, Montevideo, Uruguay/*Hard Core DX*)
- 0200 UTC on 15575**
SOUTH KOREA: Radio Korea Intl. English broadcast to North America, now audible in Ohio during summer evenings. (Silvi, OH) 11715, // 11810 to *South America should also be audible -ed.*
- 0212 UTC on 11965**
SRI LANKA: Deutsche Welle relay via Trincomalee. News by male/female duo on German politics to station ID. Poor-fair signal. (Sellers, CAN/*TFW*)
- 0257 UTC on 6550**
LEBANON: Voice of Lebanon. Musical interval signal and *River Kwai* march music to 0300, national anthem by chorus and band; 0303:30 classical music to announcer's Arabic text. Fair signal in the clear. (Sellers, CAN/*TFW*)
- 0330 UTC on 7160**
ALBANIA: Radio Tirana. Interval signal, ID to national economic update. (McGuire, MD)
- 0432 UTC on 6025**
NIGERIA: FRCN-Radio Nigeria. Time check to ID followed by religious text and hymns in English. Poor signal quality. (Piet Pijpers, Alphen a/d Rijn, Netherlands/*TFW*) **Voice of Nigeria 60 Minutes** magazine program audible on 15120 at 1910. (Fraser, MA; Frodge, MI)
- 0530 UTC on 7270**
GABON: Radiodiffusion Gabonaise. Weak signal with exuberant DJ in French discussing Gabon and briefs on Libreville. Noted heavy QRM (interference) from adjacent station. (Pijpers, NLD/*TFW*)
- 0815 UTC on 15295**
MALAYSIA: Voice of. Easy-listening vocals to announcer duo's chat. Intermittent signal fading, too weak to be sure of English; however, noted definite parallels on 9750 of slightly better quality. (David Clark, Thornhill, Ont., Canada/*TFW*)
- 0821 UTC on 4800**
MEXICO: Radio XERTA. Spanish. Sleepy Mexican music to ID, "estas Radio Transcontinental de America X-E-R-T-A con 50,000 watts de potencia." Frequency, meter band and station location quote. Weak but clear signal quality. (Al Quaglieri, Albany, NY; Frodge, MI) Mexico's **XERMX** heard on 9705 at 0105 in Spanish. (Francesco Clemente, Udine, Italy/*TFW*)
- 1006 UTC on 4990.9**
PERU: Radio Ancash. Spanish. Andean vocals to canned IDs and time check. Peru's **Radio Sudamerica** 5522.2 at 1105; Tentative ID on Peru's **Radio Tawantinsuyo** 6173.9 at 1115, monitored in LSB (lower side band) due to low and muddled poor audio. Vocals, tentative ID at 0029. (Frodge, MI)
- 1120 UTC on 6120**
CANADA: Radio Japan relay via Sackville. Report on the *Second International Dolphin Welfare Conference*. **BBC World Service's** Canadian relay via Sackville noted on 5965 at 1230; Radio Canada Intl 5995 at 2115. (Fraser, MA; Frodge, MI)
- 1129 UTC on 15235**
SWEDEN: Radio Sweden. English to North America, good signal quality // 17870 very weak, fading and inaudible at times with Icom 737 receiver and longwire antenna; 15235 ex 15240. (Silvi, OH)
- 1227 UTC on 15444.93**
SEYCHELLES: FEBA. Tibetan/Nepali. Announcer's text and ID in Tibetan, "FEBA Radio," music pause, chat to interval signal at 1229. Station ID, musical pause to talk in Nepali, (Giovanni Serra, Rome, Italy/*TFW*)
- 1227 UTC on 9675**
PAPUA GUINEA: NBC. Announcer in Pidgin plays host to musical variety of oldies disco and hymns. No station break at 1300, better signal quality in LSB (lower side band). (Frodge, MI)
- 1302 UTC on 17870**
SOUTH AFRICA: Channel Africa. English service (// 17675 under strong signal). Musical pause to text of African topics and correspondents reports. Interview/talk on politics to ID pause. (Serra, Italy/*TFW*)
- 1330 UTC on 13650**
CANADA: Radio Canada Intl. Excellent signal for discussion on US TV sitcoms. RCI website <<http://www.rcinet.ca>> (George Peek/email)
- 1600 on 21455**
ECUADOR: HCJB. Presumed Spanish program fairly clear in USB (upper side band). (Silvi, OH) 2259-2330 on 21455. (Frodge, MI)
- 1601 UTC on 21605**
UNITED ARAB EMIRATES: Radio Dubai. Arabic service to Europe with very good signal. (Silvi, OH) English service to north America noted as; 0330-0355: 11945, 12005, 13675, 15400, 21485 kHz. - ed.
- 1615 UTC on 13805**
NORWAY: Radio Norway Intl. Feature on *International Woman's Day*. (Fraser, MA) Report on national energy program. (McGuire, MD)
- 1630 UTC on 9465**
NORTHERN MARIANAS: Radio Zerkow (via KFBS) in Russian. Religious programming to ID (including Zerkow and KFBS identifications, time/frequency and address in Moscow). (Martin Schoech, Merseburg, Germany/*TFW*)
- 1920 UTC on 11675**
RUSSIA: Voice of. *Science & Engineering* show discusses other life in the universe. (Fraser, MA)
- 1930 UTC on 12015**
ECUADOR: HCJB. *Ham Radio Today* program amid very poor signal; Audible 2003 on 21455. (Fraser, MA)
- 2110 UTC on 9575**
MOROCCO: Radio Mediteranee Intl. French/English. Madonna pop tunes to French pops, minimal text from announcer. (Frodge, MI)
- 2325 UTC on 7300**
TURKEY: Voice of. *That Magnificent Sultan, Suleyman* series, //6135. *Letterbox* on summer vacations 2215 on 9655, //7190. (Fraser, MA)
- 2358 UTC on 21550**
CHILE: Voz Christiana. Test broadcast with 15 minute segments of Spanish music with interval signal and Spanish and Spanish IDs at 0000 and 0032. English IDs at 0014 and 0047. (Silvi, OH; 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.

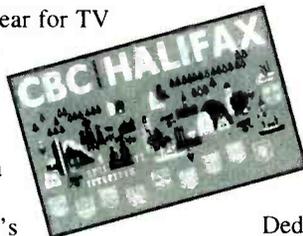
QSLing in TV Land

July remains one of the best months of the year for TV DXing, especially near the end of the month. With normal home receiving equipment, an indoor or outdoor antenna, and a basic understanding of VHF-UHF propagation, distant television signals can be viewed without a microwave link or a satellite earth station.

Check every day on channels 2-6 for television's sporadic E-skip signals; and on rare occasions channels 7 or 8 may be enhanced.

After seeing or hearing a station, send a friendly reception report to the station's chief engineer, with program information they can verify through their station log.

Details may include commercials, program names, or public service announcements. As with any report, keep yours



friendly with an explanation of your TV hobby and what a verification (or QSL) is. A prepared QSL card is helpful, as is return postage. Don't be discouraged if you have not received a reply within a few months. A call to the station has proven to be beneficial with a polite follow up on your report.

Dedicated TV DXers photograph identification slides or programming to include within the report. A tripod is your best solution to decrease movement. Film of 400 ASA is best and do not use your flash!

The *Vhf/Uhf Digest* of the Worldwide TV-FM DX Association offers in-depth monthly columns on FM DXing, TV news, Western TV-DX, and screen photos. For more information send your query to: WTFDA, P.O. Box 501, Somersville, CT 06072.

ARMENIA

Voice of Armenia, 9965 kHz. Full data QSL card signed by Mr Levon Anikian-Foreign Programme Editor-in-Chief, plus letter, schedule and stickers. Received in 75 days for an English report and one U.S. dollar. Station address: Alex Manukian 5, Yerevan 25, Rep. of Armenia. (Randy Stewart, Springfield, MO)

CZECH REPUBLIC

Radio Prague, 13580 kHz. Full data QSL unsigned, plus souvenir station T-shirt, schedule, stickers and pocket calendar. Received in 25 days for a taped report and one U.S. dollar. Station address: Vinohradska-12, 120, 99 Prague, Czech Rep. (Walt Szczepaniak, Philadelphia, PA) 7345 kHz, received in 90 days for a Spanish report. (Jose Moura, Washington, DC) 6200 kHz, received in 18 days for an English report. (Charlie Washburn, North Perry, ME)

DODECANESE ISLANDS

Voice of America relay via Rhodes, 7115 kHz. Full data Waikiki Beach unsigned. Received in 36 days for an English report. Station address: B/K, G759A Cohen, Washington, DC 20547. (William R. Wilkins, Springfield, MO)

DOMINICAN REPUBLIC

Radio Cristal Int'l, 5012 kHz. Full data logo/map card signed by Fernando Herman Gross-Program Director. Received in 60 days for an English report and two U.S. dollars. Station address: Apartado Postal 894, Santo Domingo, Dominican Rep. Station website: <http://www.dominicana.com> (Harold Sellers, ON Canada/Hard Core DX)

GUINEA

Radiodiffusion-Television Guineenne, 7125/9650 kHz. Three no data thank you cards from Seny Camara-DGR. Received in 28 days for a French report of test transmission (power 50 kW) Station address: Boite Postal 391, Conakry, Guinea (Bill Harms, MD/HCDX) Post card QSL, 15310 kHz for test transmission. Address: B.P. 33-22, Conakry, Guinea. (Jari Savolainen, Kuusankoski, Finland/HCDX)

ISRAEL

Kol Israel, 12080 kHz. Partial data QSL card unsigned. Received in 42 days for a taped cassette (not returned). Station address: External Service, P.O. Box 1082, 91 010 Jerusalem, Israel. (Szczepaniak, PA) 7465 kHz, received in 39 days for an English report. (Washburn, ME)

NORTH KOREA

Radio Pyongyang, 15130 kHz. Full data card unsigned. Received in 90 days for a Spanish report. Station address: External Service, Korean Central Broadcasting Station, Pyongyang, Democratic People's Republic of Korea. (Moura, DC)

PHILIPPINES

Radio Veritas Asia, 9670 kHz. Full data verification on station letterhead signed by Ms. Regie De Juan-Galindez, plus color calendar/photo mini poster. Received

in 90 days for an English report, one U.S. dollar and a NC souvenir postcard. Station address: Buick St., Fairview Park, Quezon City, Philippines. Email address: veritas@mnl.sequel.net Fax # (632) 938-1940. (Gayle Van Horn, Brasstown, NC)

POLAND

Polish Radio Warsaw, 7285 kHz. Full data QSL card unsigned, plus schedule, postcard and letter from Rafal Kiepuszewski. Received in 84 days for an English report. Station address: Polskie Radio S.A., Al. Niepodleglosci 77/85, SKR Poczta, 46, 00-977 Warsaw, Poland. (Szczepaniak, PA)

TAJIKISTAN

Radio Netherlands relay via Dushanbe, 4695 kHz. Full data tulip scenery card unsigned. Received in 18 days for an English report, no return postage. Station address: P.O. Box 222, 1200 JG Hilversum, The Netherlands. (Washburn, ME)

TV

CKX-TV Ch. 5 Brandon, Manitoba. Full data prepared QSL card signed by Paul Weger-Chief Engineer, plus station stickers. Received in three weeks for a TV report and mint stamps. Station address: Craig Broadcasting Systems Inc., 2940 Victoria Ave., Brandon, Canada R7S 3Y3. (Robert S. Ross, London, ON Canada/AmFmTvDx)

WKMR-TV Ch. 38 Morehead, KY. Full data prepared QSL card signed by C. Stuart Talbot-Director of Transportation Systems. Received in two months for a TV report and mint stamps. Station address: c/o The Kentucky Network, 600 Cooper Dr., Lexington, KY 40502-2296. (Ross, CAN)

WNPA-TV Ch. 19 Jeanette, PA. Full data prepared QSL card signed by Francis M. Bolin-Chief Engineer. Received in one month for a TV report. Station address: 50 Seco Rd.-Suite D, Monroeville, PA 15146. (Ross, CAN)

WPBY-TV Ch. 33 Huntington, W VA. Full data prepared QSL card signed by Peter Stark-Tech. Supervisor, plus station stickers, business card and contour map. Received in three weeks for a TV report and mint stamps (returned with reply) Station address: P.O. Box 7366, Huntington, W VA 25776-7366. (Ross, CAN)

WUCX-TV Bad Axe, MI. Full data prepared QSL card signed by Thomas G. Garnett-Chief Engineer, plus business card. C.E. says station call recently changed to WDCR-TV. Received in two months for a TV report and mint stamps. Station address: c/o Delta College, University Center, MI 48710. (Ross, CAN)

URUGUAY

Emisora Ciudad de Montevideo, 9650 kHz. Postcard with full data verie statement handwritten on the back and stamped with station seal, signed by Aramazd Yikmeyian-Director General, plus station sticker. Received in 31 days for a Spanish report, cassette tape and one U.S. dollar. Station address: Canelones 2061, Montevideo, Uruguay. (Stewart, MO)

HOW TO USE THE SHORTWAVE GUIDE

1: Convert your time to UTC.

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

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC Sunday will be heard on Saturday evening in America (8:30 pm Eastern, 5:30 pm Pacific).

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

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

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

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

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

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

The frequency listing uses the same day codes as the program listings; if a broadcast is not daily, those day codes will appear before the

station name. Irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "vl" (various languages).

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

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

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

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

HOT NEWS

COMPILED BY JIM FRIMMEL

World Radio Network via Satellite to North America	0900	Radio Prague	1730	Ireland, RTE from Dublin	0400	WRN Announcements
Galaxy Five, 125 degrees West, Transponder 6, (TBS), 3.820 GHz, V-Pol	0930	Radio Netherlands Intl			0600	Radio Finland (M-A)
	1030	Radio Finland	1800	Belgium, Radio Vlaanderen Intl	0655	Radio Finland, Church Service (S)
	1100	Australia, Radio	1830	Radio Netherlands Intl	0800	WRN Announcements
	1200	Ireland, RTE from Dublin	1930	Radio Sweden	1000	Radio Finland, News in Finnish (S-F)
WRN ONE ENGLISH (Audio Subcarrier 6.8 MHz)	1300	Radio Prague	2000	Russia, Voice of Russia WS	1000	Radio Finland, Children's Phone-in, Finnish (A)
0000 Australia, Radio	1330	S Africa, Channel Africa (M-A)	2030	Polish Radio		Radio Finland, Easy listening, Finnish
0100 Radio Finland	1330	UN Radio (S)	2100	Ireland, RTE from Dublin	1010	Radio Finland, News in Finnish
0130 Radio Sweden	1400	Radio Finland (M-A)	2300	Radio Netherlands Intl	1030	Radio Finland, News in Finnish
0200 Radio Prague	1400	VOA Communications World (S)			1100	WRN Announcements
0230 Austria, Radio Austria Intl	1430	Belgium, Radio Vlaanderen IntlIntl	WRN TWO MULTI-LINGUAL (Audio Subcarrier 6.2 MHz)		1200	Raidio na Gaeltachta (News in Irish)
0300 Polish Radio	1500	Radio France International	0030	Radio Finland, Easy listening, EE/Finnish (M-A)	1300	Radio Prague in Czech
0330 Radio Budapest Intl	1500	CANA Radio, Caribbean Tempo (M-F)	0030	Radio Finland, Children's Phone-in, Finnish (S)	1327	WRN Announcements
0400 RTE Dublin, Ireland - Irish Collection	1600	Glenn Hauser's World of Radio (A)	0100	Radio Finland, Documentaries/Drama in Finnish (T-S)	1400	Finland, Regional broadcasts in Finnish
0500 S Africa, Channel Africa (M-A)	1600	Norden This Week & Health Watch (S)	0100	Radio Finland, Classical Music, EE/Finnish (A)	1430	Radio Finland, News in Finnish
0500 Denmark, Copenhagen Calling (S)	1615	Vatican Radio, World News (M-F)	0200	Radio Finland, English	1500	Radio Finland, Variable programming in Finnish
0530 Belgium, Radio Vlaanderen IntlIntl (M-F)	1630	Austria, Radio Austria Intl	0230	Radio Finland, Newsroundup in Finnish	1600	Radio Netherlands in Dutch
0530 UN Radio (A)	1700	BBC, Europe Today (M-F)	0300	WRN Announcements	1700	Voice of Russia in Russian
0530 Glenn Hauser's World of Radio (S)	1700	New Zealand, R NZ Intl (A)	0330	Radio Austria Intl in German	1800	Radio Vlaanderen Intl in Dutch
0600 Polish Radio	1700	Denmark, Copenhagen Calling (S)				
0630 Radio Canada Intl						
0700 Australia, Radio						
0800 Russia, Voice of Russia WS						

Continued on page 52

FREQUENCIES

0000-0100	Anguilla, Caribbean Beacon	6090am				0000-0100	UK, BBC World Service	5970sa	5975am	6175na	9590am
0000-0100	Australia, Radio	9660pa	12080as	13605pa	13755pa			9915sa	11750sa	12095sa	
		15240pa	15510pa	17750as	17795pa	0000-0100 w	UK, Merlin Network One	9645eu	11985na	13690va	
0000-0100 vl	Australia, VL8K Katherine	5025do				0000-0100	Ukraine, R Ukraine Intl	5905eu	5915eu	6020eu	7180na
0000-0100 vl	Australia, VL8T Tent Crk	4910do						7240eu	9445na	9550na	12040na
0000-0100	Canada, CBC N Quebec Svc	9625do				0000-0100	USA, KAIJ Dallas TX	5810am			
0000-0100	Canada, CFRX Toronto	6070do				0000-0059	USA, KHBI N Mariana Is	15665as			
0000-0100	Canada, CFVP Calgary	6030do				0000-0100	USA, KTBN Salt Lk City UT	15590am			
0000-0100	Canada, CHNX Halifax	6130do				0000-0100	USA, KWHR Naalehu HI	17510as	17555pa		
0000-0100	Canada, CKZN St John's	6160do				0000-0100	USA, Voice of America	7215as	9770as	11760as	15185as
0000-0100	Canada, CKZU Vancouver	6160do						15290as	17735as	17820as	
0000-0100	Costa Rica, Adv World R	5030am	9725am	15460am		0000-0030 twhfa	USA, Voice of America	5995am	6130ca	7405am	9455ca
0000-0100	Costa Rica, RF Peace Intl	7385am	15050am					9775am	11695ca	13740am	
0000-0005	Croatia, Croatian Radio	9925am				0000-0100	USA, WEWN Birmingham AL	5825eu			
0000-0027	Czech Rep, Radio Prague	5930na	7345na			0000-0100	USA, WGTG McCaysville GA	5085am			
0000-0100	Ecuador, HCJB	9745na	12015na	21455am		0000-0100	USA, WHRI Noblesville IN	5745am			
0000-0030	Egypt, Radio Cairo	9900na				0000-0100	USA, WINB Red Lion PA	11950am			
0000-0100	Germany, Overcomer Ministr	3945va				0000-0100	USA, WJCR Upton KY	7490na	13595na		
0000-0015 vl	Ghana, Ghana Broadc Corp	3366do	4915do			0000-0100	USA, WRMI/R Miami Intl	9955am			
0000-0045	India, All India Radio	7410as	9705as	9950as	11620as	0000-0100	USA, WRNO New Orleans LA	7355am			
0000-0100	Ireland, Unt Christian BC	6200do				0000-0100	USA, WSHB Cypress Crk SC	7535am	15285sa		
0000-0015	Japan, R Japan/NHK World	6155eu	6180eu	9665af	11705na	0000-0100	USA, WWCN Nashville TN	5070am	7435am	9475am	13845am
		11815as	13650as			0000-0100	USA, WYFR Okeechobee FL	6085na	9505na		
0000-0100	Liberia, LCN/R Liberia Int	5100do				0000-0030	Uzbekistan, R Tashkent	5040as	5955as	5975as	7105as
0000-0100	Malaysia, Radio	7295do						7205as	9540as		
0000-0030	Netherlands, Radio	6020na	6165na	9845na		0015-0100	Japan, R Japan/NHK World	6155eu	6180eu	9665af	11705na
0000-0100	New Zealand, R NZ Intl	17675pa				0030-0100	Austria, R Austria Intl	9655na			
0000-0057	North Korea, R Pyongyang	11845ca	13650sa	15230na		0030-0100	Iran, VOIRI	9022eu	9650eu	9685eu	
0000-0100 vl	Papua New Guinea, NBC	9675do				0030-0100	Lithuania, Radio Vilnius	9855am			
0000-0100	Philippines, FEBC/R Intl	15450as				0030-0100	Netherlands, Radio	6020na	6165na	9845na	9855as
0000-0030 mtwhfa	Serbia, Radio Yugoslavia	9580eu	11870na					11655as	12090as		
0000-0100	Singapore, RCorp Singapore	6150do				0030-0100	Sri Lanka, Sri Lanka BC	9730as	15425as		
0000-0100	Spain, R Exterior Espana	6055am				0030-0100	Thailand, Radio	9655as	11905as	15395na	
0000-0030	Thailand, Radio	9655as	11905as	15395na		0030-0100	UK, BBC Asian Service	9410as	11955as		
0000-0100	UK, BBC Asian Service	3915as	6195as	7110as	9410as	0045-0100	Albania, R Tirana Intl	6115na	7160na		
		11945as	11955as	15280as	15310as	0050-0100	Italy, RAI Intl	6010na	9675na	11800na	
		15360as	17790as								

SELECTED PROGRAMS

Sundays

- 0000 USA, VOA Washington DC (as): Preview.
- 0001 USA, VOA Washington DC (as): World News.
- 0006 USA, VOA Washington DC (as): World News in Depth.
- 0010 USA, VOA Washington DC (as): Regional News.
- 0014 USA, VOA Washington DC (as): U.S. News.
- 0018 USA, VOA Washington DC (as): Sports.
- 0022 USA, VOA Washington DC (as): U.S. Feature.
- 0030 USA, VOA Washington DC (as): Preview.
- 0031 USA, VOA Washington DC (as): World News.
- 0036 USA, VOA Washington DC (as): Encounter.
- 0045 USA, VOA Washington DC (as): Science/Medicine/Environment.
- 0049 USA, VOA Washington DC (as): Business News.
- 0053 USA, VOA Washington DC (as): Features.

Mondays

- 0000 USA, VOA Washington DC (as): Preview.
- 0001 USA, VOA Washington DC (as): World News.
- 0006 USA, VOA Washington DC (as): World News in Depth.
- 0010 USA, VOA Washington DC (as): Regional News.
- 0014 USA, VOA Washington DC (as): U.S. News.
- 0018 USA, VOA Washington DC (as): Sports.
- 0030 USA, VOA Washington DC (as): Preview.
- 0031 USA, VOA Washington DC (as): World News in Depth.
- 0045 USA, VOA Washington DC (as): Science/Medicine/Environment.
- 0049 USA, VOA Washington DC (as): Business and Economic News.
- 0053 USA, VOA Washington DC (as): Music Feature.

Tuesdays

- 0000 USA, VOA Washington DC (as): Preview.
- 0001 USA, VOA Washington DC (as): World News.
- 0006 USA, VOA Washington DC (as): World News in Depth.
- 0010 USA, VOA Washington DC (as): Regional News.
- 0014 USA, VOA Washington DC (as): U.S. News.
- 0018 USA, VOA Washington DC (as): Sports.
- 0030 USA, VOA Washington DC (as): Preview.
- 0031 USA, VOA Washington DC (as): World News in Depth.
- 0045 USA, VOA Washington DC (as): Science/Medicine/Environment.
- 0049 USA, VOA Washington DC (as): Business and Economic News.
- 0053 USA, VOA Washington DC (as): Music Feature.

Wednesdays

- 0000 USA, VOA Washington DC (as): Preview.
- 0001 USA, VOA Washington DC (as): World News.
- 0006 USA, VOA Washington DC (as): World News in Depth.
- 0010 USA, VOA Washington DC (as): Regional News.
- 0014 USA, VOA Washington DC (as): U.S. News.
- 0018 USA, VOA Washington DC (as): Sports.
- 0030 USA, VOA Washington DC (as): Preview.
- 0031 USA, VOA Washington DC (as): World News in Depth.
- 0045 USA, VOA Washington DC (as): Science/Medicine/Environment.
- 0049 USA, VOA Washington DC (as): Business and Economic News.
- 0053 USA, VOA Washington DC (as): Music Feature.

Thursdays

- 0000 USA, VOA Washington DC (as): Preview.
- 0001 USA, VOA Washington DC (as): World News.
- 0006 USA, VOA Washington DC (as): World News in Depth.
- 0010 USA, VOA Washington DC (as): Regional News.
- 0014 USA, VOA Washington DC (as): U.S. News.
- 0018 USA, VOA Washington DC (as): Sports.
- 0030 USA, VOA Washington DC (as): Preview.
- 0031 USA, VOA Washington DC (as): World News in Depth.
- 0045 USA, VOA Washington DC (as): Science/Medicine/Environment.
- 0049 USA, VOA Washington DC (as): Business and Economic News.
- 0053 USA, VOA Washington DC (as): Music Feature.

Fridays

- 0000 USA, VOA Washington DC (as): Preview.
- 0001 USA, VOA Washington DC (as): World News.
- 0006 USA, VOA Washington DC (as): World News in Depth.
- 0010 USA, VOA Washington DC (as): Regional News.
- 0014 USA, VOA Washington DC (as): U.S. News.
- 0018 USA, VOA Washington DC (as): Sports.
- 0030 USA, VOA Washington DC (as): Preview.
- 0031 USA, VOA Washington DC (as): World News in Depth.
- 0045 USA, VOA Washington DC (as): Science/Medicine/Environment.
- 0049 USA, VOA Washington DC (as): Business and Economic News.
- 0053 USA, VOA Washington DC (as): Music Feature.

Saturdays

- 0000 USA, VOA Washington DC (as): Preview.
- 0001 USA, VOA Washington DC (as): World News.
- 0006 USA, VOA Washington DC (as): World News in Depth.
- 0010 USA, VOA Washington DC (as): Regional News.
- 0014 USA, VOA Washington DC (as): U.S. News.
- 0018 USA, VOA Washington DC (as): Sports.
- 0022 USA, VOA Washington DC (as): U.S. Feature.
- 0030 USA, VOA Washington DC (as): World News.
- 0036 USA, VOA Washington DC (as): Press Conference USA.

RADIO ROMANIA CONTEST

Answer the following questions and you could win a 7 or 10-day trip through (but not TO) Romania: *Which are Romania's neighboring countries? *Which building in Bucharest is 2nd in size to the Pentagon? *Owing to its surface, the Danube ranks 2nd in the world; what place does it hold in Europe? *The NE part of Romania is known for the monasteries which have been protected by UNESCO; name 3 of these famous places of worship. *Name 3 Romanians who have made breakthroughs in 20th century culture and civilization.

Send your entry to - Contest: Do you know Romania, RRI English Department, PO Box 111, 60-62 General Berthelot St, 70747 Bucharest, Romania; or call 40-1-303-13-57 ph/fax or 40-1-303-13-57 for more information. Deadline is July 29; winners announced Aug. 2.

FREQUENCIES

0300-0400	Anguilla, Caribbean Beacon	6090am				0300-0400	UK, BBC African Service	3255af	6005af	6190af	9600af
0300-0400	Australia, Radio	9660pa	12080as	13605pa	15240pa			11730af			
		15415as	15510pa	17750as	17795pa						
0300-0400 vl	Australia, VL8K Katherine	5025do				0300-0400	UK, BBC Asian Service	9605as	15310as	15360as	17790as
0300-0400 vl	Australia, VL8T Tent Crk	4910do						21660as			
0300-0400	Australia, Defense Forces R	15635as				0300-0330	UK, BBC World Service	5970sa	5975am	6175na	6195eu
0300-0330 mtwhf	Canada, Can Forces Net	6155ca	9755ca	9780ca				9410eu	9895am	11760me	12095me
0300-0400 vl	Canada, CBC N Quebec Svc	9625do				0300-0400	Ukraine, R Ukraine Intl	5905eu	6020eu	7410eu	9550na
0300-0400	Canada, CFRX Toronto	6070do						12040na	13590na		
0300-0400	Canada, CFVP Calgary	6030do				0300-0400	USA, KAIJ Dallas TX	5810am			
0300-0400	Canada, CHNX Halifax	6130do				0300-0400	USA, KTVN Salt Lk City UT	7510am			
0300-0400	Canada, CKZN St John's	6160do				0300-0400	USA, KVOH Los Angeles CA	9975am			
0300-0400	Canada, CKZU Vancouver	6160do				0300-0400	USA, KWHR Naalehu HI	17510as	17555pa		
0300-0400	China, China Radio Intl	9690na				0300-0400	USA, Voice of America	6080af	6115af	7105af	7280af
0300-0400	Costa Rica, RF Peace Intl	7385am						7290af	7340af	9575af	9885af
0300-0305	Croatia, Croatian Radio	9925na				0300-0330 smtwh	USA, Voice of America	4960af			
0300-0400	Cuba, Radio Havana	6000na	9820na	13605na		0300-0400	USA, WEWN Birmingham AL	5825eu			
0300-0327	Czech Rep, Radio Prague	7345na	9435na			0300-0400	USA, WGTG McCaysville GA	5085am			
0300-0400	Ecuador, HCJB	9745am	12015na	21455am		0300-0400	USA, WHRA Greenbush ME	9400me			
0300-0330	Egypt, Radio Cairo	9475na				0300-0400	USA, WHRI Noblesville IN	5745am	7315am		
0300-0350	Germany, Deutsche Welle	6085na	6145na	6185na	9535na	0300-0400	USA, WINB Red Lion PA	11950am			
		9640na				0300-0400	USA, WJCR Upton KY	7490na	13595na		
0300-0400	Germany, Overcomer Ministr	3945va				0300-0400	USA, WMLK Bethel PA	9465am			
0300-0400	Guatemala, Radio Cultural	3300do				0300-0400	USA, WRMI/R Miami Intl	9955am			
0300-0400 irreg	Iraq, Radio Iraq Intl	11785eu				0300-0400	USA, WRNO New Orleans LA	7395am			
0300-0400	Ireland, Unt Christian BC	6200do				0300-0400	USA, WSHB Cypress Crk SC	5850na			
0300-0400 as/vl	Italy, IRRS	7120va				0300-0400	USA, WWCR Nashville TN	3215am	5070am	5935am	7435am
0300-0400	Japan, R Japan/NHK World	17685pa	17825ca	17855as		0300-0400	USA, WYFR Okeechobee FL	6065na	9505na		
0300-0400	Kenya, Kenya Broadc Corp	4885do	4935do			0300-0310	Vatican State, Vatican R	7305ca	9605am		
0300-0400 vl	Lesotho, Radio Lesotho	4800do				0300-0400 vl	Zambia, R Zambia/ZNBC 1	4910do			
0300-0400	Malaysia, Radio	7295do				0300-0400 vl	Zambia, R Zambia/ZNBC 2	6165do			
0300-0330 mtwhfa	Mexico, Radio Mexico Intl	5985na	9705na			0300-0400 vl	Zimbabwe, Zimbabwe BC	3396do			
0300-0325	Moldova, R Moldova Intl	7520na				0310-0340	Vatican State, Vatican R	7360af	9660af		
0300-0325	Netherlands, Radio	9855as	11655as			0330-0357	Czech Rep, Radio Prague	9480va	11600as		
0300-0400	New Zealand, R NZ Intl	17675pa				0330-0400 vl	Philippines, R Pilipinas	13770as	15330as	17730as	
0300-0400 vl	Papua New Guinea, NBC	9675do				0330-0400	Sweden, Radio	9475am	11665am		
0300-0330 vl	Philippines, R Pilipinas	11885as	15120as	15270as		0330-0355	UAE, Radio Dubai	11945na	12005na	13675na	15400na
0300-0400	Russia, Voice of Russia WS	9665na	12000na	12050na	13640na	0330-0400	UK, BBC African Service	9610af			
		13665na	15180na	15425na	15455na	0330-0400	UK, BBC Asian Service	11955as	15280as	15310as	
		15595na				0330-0400	UK, BBC World Service	5975am	6175na	9895am	11760me
								12095me			
0300-0330	S Africa, Channel Africa	5955af				0330-0400 s	UK, BBC World Service	6180eu	6195eu	9410eu	
0300-0400	Singapore, R Corp Singapore	6150do				0330-0400	Vietnam, Voice of	5905am	7260am		
0300-0400	Sri Lanka, Sri Lanka BC	9730as	15425as			0338-0343	Croatia, Croatian Radio	9925na			
0300-0400	Taiwan, Radio Taipei Intl	5950na	9680na	11745as	11825as	0340-0350	Greece, Voice of	7450na	9375na	9420na	11645na
		15345as				0345-0400	Burundi, Radio Nationale	6140do			
0300-0400 vl	Tanzania, Radio	5050do				0345-0400	Tajikistan, Radio	11620as			
0300-0330	Thailand, Radio	9655am	11905am	15395na		0345-0400 as	Uganda, Radio	4976do			
0300-0400	Turkey, Voice of	7270as	9655va	17705as		0356-0400	Zambia, Christian Voice	3330af	6065af		
0300-0315 mtwhf	Uganda, Radio	4976do									

SELECTED PROGRAMS

Sundays

- 0300 Ukraine, R Ukraine Intl: News. News from Ukraine.
- 0300 USA, VOA Washington DC (af): VOA News. Ten minutes of worldwide news on the hour.
- 0305 Australia, Radio: Feedback. Roger Broadbent answers letters and discusses new programs, reception problems, and questions about Australia.
- 0308 Ukraine, R Ukraine Intl: Ukraine Diary. The most important events in Ukraine during the past week.
- 0310 USA, VOA Washington DC (af): VOA Sunday. Interviews and features about science, sports, agriculture, and business, plus the latest American music.
- 0318 Ukraine, R Ukraine Intl: Hello from Kiev. Weekly mailbag program of letter-reading, responses, and music.
- 0323 Turkey, Voice of: VOT DX Corner (biweekly). Fifteen minutes of listening tips, DX/media news, and music.
- 0330 KWHR (Angel 4): DXing with Cumbre. A what's-on-the-air program hosted by Marie Lamb.

Mondays

- 0300 Ukraine, R Ukraine Intl: Ukraine Today. A program of news, interviews and reports.
- 0300 USA, VOA Washington DC (af): Daybreak Africa. Magazine program of African news, sports, features, and correspondent reports.
- 0301 USA, VOA Washington DC (af): Africa News. News from and about the African continent.
- 0305 UK, BBC London (af/am/eu): Write On. Air your views about World Service; write to PO Box 76, Bush House, Strand, London WC2B 4PH.
- 0308 Ukraine, R Ukraine Intl: Ukraine Diary. See S 0308.
- 0319 Ukraine, R Ukraine Intl: Music from Ukraine. Ukrainian folk music.

- 0330 USA, VOA Washington DC (af): News (Special English). Ten minutes of news in slow English.
- 0340 USA, VOA Washington DC (af): Development Report (Special English). Helpful information for developing nations.
- 0345 USA, VOA Washington DC (af): This is America (Special English). Informatiye reports on life in the United States.

Tuesdays

- 0300 Ukraine, R Ukraine Intl: Ukraine Today. See M 0300.
- 0300 USA, VOA Washington DC (af): Daybreak Africa. See Af 0300.
- 0301 USA, VOA Washington DC (af): Africa News. See Af 0301.
- 0315 Ukraine, R Ukraine Intl: Ukraine Today. See M 0300.
- 0320 Ukraine, R Ukraine Intl: Closeup. The most reliable information about life in Ukraine.
- 0330 USA, VOA Washington DC (af): Studio 38. A bright, fast-paced show highlighting American lifestyles and culture.

Wednesdays

- 0300 Costa Rica, R Peace Intl: World of Radio. Glenn Hauser's essential program for the shortwave listener.
- 0300 Ukraine, R Ukraine Intl: Ukraine Today. See M 0300.
- 0300 USA, VOA Washington DC (af): Daybreak Africa. See Af 0300.
- 0301 USA, VOA Washington DC (af): Africa News. See Af 0301.
- 0315 Ukraine, R Ukraine Intl: Ukraine Today. See M 0300.
- 0320 Ukraine, R Ukraine Intl: Closeup. See T 0320.
- 0330 USA, VOA Washington DC (af): Studio 38. See Af 0330.
- 0335 Cuba, Radio Havana Cuba: DXers Unlimited. Arnie Coro discusses the technical aspects of shortwave listening and amateur radio.
- 0346 Sweden, Radio: MediaScan '1st, 15th'. Satellite news 85%;

medium wave and shortwave news 15%.

Thursdays

- 0300 Ukraine, R Ukraine Intl: Ukraine Today. See M 0300.
- 0300 USA, VOA Washington DC (af): Daybreak Africa. See Af 0300.
- 0301 USA, VOA Washington DC (af): Africa News. See Af 0301.
- 0315 Ukraine, R Ukraine Intl: Ukraine Diary. See S 0308.
- 0320 Ukraine, R Ukraine Intl: Closeup. See T 0320.
- 0330 USA, VOA Washington DC (af): Studio 38. See Af 0330.

Fridays

- 0300 Ukraine, R Ukraine Intl: Ukraine Today. See M 0300.
- 0300 USA, VOA Washington DC (af): Daybreak Africa. See Af 0300.
- 0301 USA, VOA Washington DC (af): Africa News. See Af 0301.
- 0315 Ukraine, R Ukraine Intl: Ukraine Today. See M 0300.
- 0320 Ukraine, R Ukraine Intl: Closeup. See T 0320.
- 0330 USA, VOA Washington DC (af): Studio 38. See Af 0330.
- 0345 UK, BBC London (as): Waveguide (24th). The latest information on international broadcasting with reviews of receivers and news about reception.

Saturdays

- 0300 Ukraine, R Ukraine Intl: News. See S 0300.
- 0300 USA, VOA Washington DC (af): VOA News. See Af 0300.
- 0300 USA, WRMI/R Miami Intl, FL: Wavescan. Adventist World Radio's DX/Media program.
- 0308 Ukraine, R Ukraine Intl: Baroque. A program of Ukrainian culture.
- 0310 USA, VOA Washington DC (af): VOA Saturday. See Af 0310.
- 0330 Costa Rica, R Peace Intl: Continent of Media. Glenn Hauser discusses a full range of broadcasting topics.
- 0338 Turkey, Voice of: VOT DX Corner (biweekly). Fifteen minutes of listening tips, DX/media news, and music.

FREQUENCIES

0400-0500	Anguilla, Caribbean Beacon	6090am				0400-0500	UK, BBC Asian Service	9605as	11955as	15280as	15310as
0400-0500	Australia, Radio	9660pa	12080as	13605as	15240pa			17790as	21660as		
		15415as	15510pa	17750as	17795pa	0400-0430	UK, BBC World Service	3955eu	5975am	6175na	6180eu
0400-0500 vl	Australia, VL8K Katherine	5025do						6195eu	9410eu	9895am	11760me
0400-0500 vl	Australia, VL8T Tent Crk	4910do						12095eu	15575as	17640eu	
0400-0500	Australia, Defense Forces R	15635as				0400-0500	USA, KAIJ Dallas TX	5810am	9815am		
0400-0430 a	Belarus, R Belarus Intl	7210eu	11960eu			0400-0500	USA, KTBN Salt Lk City UT	7510am			
0400-0500	Canada, CBC N Quebec Svc	9625do				0400-0500	USA, KVOH Los Angeles CA	9975am			
0400-0500	Canada, CFRX Toronto	6070do				0400-0500	USA, KWHR Naalehu HI	17555pa	17780as		
0400-0500	Canada, CFVP Calgary	6030do				0400-0500	USA, Voice of America	6080af	7170af	7265af	7275af
0400-0500	Canada, CHNX Halifax	6130do						7280af	7290af	9575af	9885af
0400-0500	Canada, CKZN St John's	6160do						11965me	15205va		
0400-0500	Canada, CKZU Vancouver	6160do				0400-0500	USA, WEWN Birmingham AL	5825eu			
0400-0429	Canada, R Canada Intl	9715me	11835me	11975me		0400-0500	USA, WGTG McCaysville GA	5085am			
0400-0500	China, China Radio Intl	9560na	9730am			0400-0500	USA, WHRA Greenbush ME	9400me			
0400-0500	Costa Rica, RF Peace Intl	7385am				0400-0500	USA, WHRI Noblesville IN	5745am	7315am		
0400-0500	Cuba, Radio Havana	6000na	9820na	13605na		0400-0500	USA, WINB Red Lion PA	11950am			
0400-0500	Ecuador, HCJB	9745na	12015am	21455am		0400-0500	USA, WJCR Upton KY	7490na	13595na		
0400-0450	Germany, Deutsche Welle	5990af	6015af	7225af	9565af	0400-0500	USA, WMLK Bethel PA	9465am			
		11765af				0400-0500	USA, WRMI/R Miami Intl	9955am			
0400-0500	Germany, Overcomer Ministr	3945va				0400-0500	USA, WRNO New Orleans LA	7395am			
0400-0500 vl	Guatemala, Radio Cultural	3300do				0400-0500	USA, WSHB Cypress Crk SC	7535eu	9840af		
0400-0500	Ireland, Unt Christian BC	6200do				0400-0500	USA, WWCR Nashville TN	3210am	5070am	5935na	7435am
0400-0415	Israel, Kol Israel	9435eu	11605eu	17535na		0400-0500	USA, WYFR Okeechobee FL	6065na	9505na	9985va	
0400-0500 as/vl	Italy, IRRS	7120va				0400-0500	Zambia, Christian Voice	3330af	6065af		
0400-0500	Kenya, Kenya Broadc Corp	4885do	4935do			0400-0500 vl	Zambia, R Zambia/ZNBC 1	4910do			
0400-0410 vl/m-f	Malawi, MBC	5993do				0400-0500 vl	Zambia, R Zambia/ZNBC 2	6165do			
0400-0500	Malaysia, Radio	7295do				0400-0500 vl	Zimbabwe, Zimbabwe BC	3396do			
0400-0500 vl	Malaysia, RTM Kuching	7160do				0425-0440 vl	Italy, RAI Intl	5975af	7270af		
0400-0430 mtwhf	Mexico, Radio Mexico Intl	5985na	9705na			0425-0500	Nigeria, FRCN/Radio	3326do	4770do	4990do	6025do
0400-0425	Moldova, R Moldova Intl	7520na				0430-0500	Austria, R Austria Intl	6155eu	13730eu		
0400-0500	New Zealand, R NZ Intl	17675pa				0430-0500 wf	Belarus, R Belarus Intl	7210eu	11960eu		
0400-0430 m	Norway, Radio Norway Intl	9445na				0430-0500 vl	Lesotho, Radio Lesotho	4800do			
0400-0500 vl	Papua New Guinea, NBC	9675do				0430-0500	Netherlands, Radio	6165na	9590na		
0400-0500	Romania, R Romania Intl	9570na	11940na	15335as	17720as	0430-0500	Serbia, Radio Yugoslavia	9580eu	11870na		
0400-0500	Russia, Voice of Russia WS	9665na	12000na	12050na	13645na	0430-0500	Swaziland, Trans World R	3200af	4775af		
		13665na	15180na	15455na	15595na	0430-0500	Switzerland, Swiss R Intl	9885na	9905na		
0400-0430	S Africa, Channel Africa	5955af				0430-0500	UK, BBC World Service	5975am	6175am	11760me	15575as
0400-0500	Singapore, R Corp Singapore	6150do						17640me			
0400-0430	Sri Lanka, Sri Lanka BC	9730as	15425as			0430-0500 as	UK, BBC World Service	3955eu	6180eu	6195eu	9410eu
0400-0430	Switzerland, Swiss R Intl	5840eu	6165eu	9885am	9905am			12095eu			
0400-0500 vl	Tanzania, Radio	5050do				0455-0500	Malaysia, Voice of	6175as	9750as	15295au	
0400-0415	Uganda, Radio	4976do				0455-0500	Nigeria, Voice of	7255af	15120af		
0400-0500	UK, BBC African Service	3255af	6005af	6190af	7160af						
		9600af	15420af								

SELECTED PROGRAMS

Sundays

0400	VOA (af/eu/me): Preview.
0401	VOA (af/eu/me): World News.
0406	VOA (af/eu/me): World News in Depth.
0410	VOA (af/eu/me): Regional News.
0414	VOA (af/eu/me): U.S. News.
0418	VOA (af/eu/me): Sports.
0422	VOA (af/eu/me): U.S. Feature.
0430	VOA (af/eu/me): Preview.
0431	VOA (af/eu/me): World News.
0436	VOA (af/eu/me): Encounter.
0445	VOA (af/eu/me): Science/Medicine/Environment.
0449	VOA (af/eu/me): Business News.
0453	VOA (af/eu/me): Features.

Mondays

0400	VOA (af/eu/me): Preview.
0401	VOA (af/eu/me): World News.
0406	VOA (af/eu/me): World News in Depth.
0410	VOA (af/eu/me): Regional News.
0414	VOA (af/eu/me): U.S. News.
0418	VOA (af/eu/me): Sports.
0430	VOA (af/eu/me): Preview.
0431	VOA (af/eu/me): World News in Depth.
0445	VOA (af/eu/me): Science/Medicine/Environment.
0449	VOA (af/eu/me): Business and Economic News.
0453	VOA (af/eu/me): Music Feature.

Tuesdays

0400	VOA (af/eu/me): Preview.
0401	VOA (af/eu/me): World News.
0406	VOA (af/eu/me): World News in Depth.
0410	VOA (af/eu/me): Regional News.
0414	VOA (af/eu/me): U.S. News.
0418	VOA (af/eu/me): Sports.
0430	VOA (af/eu/me): Preview.
0431	VOA (af/eu/me): World News in Depth.

0445	VOA (af/eu/me): Science/Medicine/Environment.
0449	VOA (af/eu/me): Business and Economic News.
0453	VOA (af/eu/me): Music Feature.

Wednesdays

0400	VOA (af/eu/me): Preview.
0401	VOA (af/eu/me): World News.
0406	VOA (af/eu/me): World News in Depth.
0410	VOA (af/eu/me): Regional News.
0414	VOA (af/eu/me): U.S. News.
0418	VOA (af/eu/me): Sports.
0430	VOA (af/eu/me): Preview.
0431	VOA (af/eu/me): World News in Depth.
0445	VOA (af/eu/me): Science/Medicine/Environment.
0449	VOA (af/eu/me): Business and Economic News.
0453	VOA (af/eu/me): Music Feature.

Thursdays

0400	VOA (af/eu/me): Preview.
0401	VOA (af/eu/me): World News.
0406	VOA (af/eu/me): World News in Depth.
0410	VOA (af/eu/me): Regional News.
0414	VOA (af/eu/me): U.S. News.
0418	VOA (af/eu/me): Sports.
0430	VOA (af/eu/me): Preview.
0431	VOA (af/eu/me): World News in Depth.
0445	VOA (af/eu/me): Science/Medicine/Environment.
0449	VOA (af/eu/me): Business and Economic News.
0453	VOA (af/eu/me): Music Feature.

Fridays

0400	VOA (af/eu/me): Preview.
0401	VOA (af/eu/me): World News.
0406	VOA (af/eu/me): World News in Depth.
0410	VOA (af/eu/me): Regional News.
0414	VOA (af/eu/me): U.S. News.
0418	VOA (af/eu/me): Sports.

0430	VOA (af/eu/me): Preview.
0431	VOA (af/eu/me): World News in Depth.
0445	VOA (af/eu/me): Science/Medicine/Environment.
0449	VOA (af/eu/me): Business and Economic News.
0453	VOA (af/eu/me): Music Feature.

Saturdays

0400	VOA (af/eu/me): Preview.
0401	VOA (af/eu/me): World News.
0406	VOA (af/eu/me): World News in Depth.
0410	VOA (af/eu/me): Regional News.
0414	VOA (af/eu/me): U.S. News.
0418	VOA (af/eu/me): Sports.
0422	VOA (af/eu/me): U.S. Feature.
0430	VOA (af/eu/me): World News.
0436	VOA (af/eu/me): Press Conference USA.

HAUSER'S HIGHLIGHTS MYANMAR: [NON] DEMOCRATIC V. OF BURMA

Studio in Oslo:
1245-1345 15330 via Germany
11520 via Tajikistan;
1430-1455 11850 via Norway
In Burmese plus Shan, Karen, Kayan
(BBCM)

FREQUENCIES

0600-0700	Anguilla, Caribbean Beacon	6090am				0600-0700	UK, BBC African Service	6005af	6190af	7160af	9600af
0600-0700	Australia, Radio	9660pa	11880pa	12080as	13605pa	0600-0700	UK, BBC Asian Service	11835af	11940af	15420af	17885af
		15240pa	15415as	15510pa	17750as			7145pa	9740as	11955pa	15310as
0600-0700 vl	Australia, VL8K Katherine	5025do				0600-0700	UK, BBC World Service	15360as	17760as	17790as	21660as
0600-0700 vl	Australia, VL8T Tent Crk	4910do						5975am	6175am	6180eu	6195eu
0600-0700 vl	Canada, CBC N Quebec Svc	9625do						7325eu	9410eu	11760me	12095eu
0600-0700	Canada, CFRX Toronto	6070do						15565eu	15575eu	17640me	
0600-0700	Canada, CFVP Calgary	6030do				0600-0700	USA, KAIJ Dallas TX	5810am	9815am		
0600-0700	Canada, CHNX Halifax	6130do				0600-0700	USA, KTBN Salt Lk City UT	7510am			
0600-0700	Canada, CKZU Vancouver	6160do				0600-0700	USA, KWHR Naalehu HI	17555pa	17780as		
0600-0700	Costa Rica, RF Peace Intl	7385am				0600-0630	USA, Voice of America	5970af	6035af	6080af	7170eu
0600-0700	Cuba, Radio Havana	9550na	9820na	9830na				7195af	9630af	9680af	11805af
0600-0700	Ecuador, HCJB	9745na	12015na	21455am				11965me	11995af	12080af	15205va
0600-0650	Germany, Deutsche Welle	11915af	13790af	15185af	17820as	0600-0700	USA, WEWN Birmingham AL	5825eu			
		17860af	21680me			0600-0700	USA, WHRA Greenbush ME	11565af			
0600-0700	Germany, Sunrise Radio	5850va				0600-0700	USA, WHRI Noblesville IN	5745am	7315am		
0600-0700	Germany, Overcomer Minist	9500pa				0600-0700	USA, WJCR Upton KY	7490na	13595na		
0600-0615	Ghana, Ghana Broadc Corp	3366do	4915do			0600-0700	USA, WMLK Bethel PA	9465am			
0600-0700	Ireland, Unt Christian BC	6200do				0600-0700	USA, WRMI/R Miami Intl	9955am			
0600-0630 vl	Italy, IRRS	3985va				0600-0700	USA, WRNO New Orleans LA	7395am			
0600-0700	Japan, R Japan/NHK World	5975eu	7230eu	9835na	11740as	0600-0700	USA, WSHB Cypress Crk SC	7535eu	9835af		
		11840as	11850pa	17810as		0600-0700	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am
		4885do	4935do			0600-0700	USA, WYFR Okeechobee FL	5985am	7355va		
0600-0700 vl	Kenya, Kenya Broadc Corp	9810do				0600-0700	Yemen, Radio Aden	9780do			
0600-0700	Kiribati, Radio	3450do				0600-0700	Zambia, Christian Voice	3330af	6065af		
0600-0700	Liberia, Radio Veritas	3400do				0600-0700 vl	Zambia, R Zambia/ZNBC 1	7220do			
0600-0700	Liberia, Star Radio	5100do				0600-0700 vl	Zambia, R Zambia/ZNBC 2	6165do			
0600-0700	Liberia, LCN/R Liberia Int	7295do				0600-0700 vl	Zimbabwe, Zimbabwe BC	5975do			
0600-0700	Malaysia, Radio	4895do	7160do			0605-0610 mtwhfa	Croatia, Croatian Radio	5945eu	9830eu	13820au	
0600-0700 vl	Malaysia, RTM Kuching	6175as	9750as	15295au		0605-0700	Swaziland, Trans World R	4775af	6100af	9500af	
0600-0700	Malaysia, Voice of	3270do	3290do			0630-0700	Finland, YLE/R Finland	11945as	17830as		
0600-0700 vl	Namibia, NBC	11690pa				0630-0700 as/vl	Italy, IRRS	9660eu			
0600-0700	New Zealand, R NZ Intl	3326do	4770do	4990do		0630-0700 smtwha	Malta, VO Mediterranean	7170eu	11805af	11965me	15205eu
0600-0630	Nigeria, FRCN/Radio	7255af	15120af			0630-0700	USA, Voice of America	5970af	6035af	6080af	7195af
0600-0700	Nigeria, Voice of	7180eu	9590eu					9630af	11995af	12080af	
0600-0630 m	Norway, Radio Norway Intl	9675do				0630-0645	Vatican State, Vatican R	11625af	13765af	15570af	
0600-0700 vl	Papua New Guinea, NBC	9510na	11940na			0630-0645 mtwhfa	Vatican State, Vatican R	4005eu	5883eu	7250eu	9645eu
0600-0700	Romania, R Romania Intl	9450au	15490au	17495au	17665au			11740eu	15595eu		
0600-0700	Russia, Voice of Russia WS	21760au	21790au			0641-0656	Romania, R Romania Intl	9550eu	9665eu	11885eu	
		11900af				0645-0655 s	Albania, TWR Tirana	9685eu			
0600-0630	S Africa, Channel Africa	11735af				0645-0655 as	Monaco, Trans World Radio	9755eu			
0600-0630	S Africa, Trans World R	3316do				0645-0700	Vatican State, Vatican R	11625af	13765af	15570af	
0600-0610	Sierra Leone, SLBS	6150do				0655-0700	Albania, TWR Tirana	9685eu			
0600-0700	Singapore, RCorp Singapore	5020do				0655-0700 mtwhf	Monaco, Trans World Radio	9755eu			
0600-0700 vl	Solomon Islands, SIBC	4775af	9500af								
0600-0605	Swaziland, Trans World R	5050do									
0600-0700 vl	Tanzania, Radio										

SELECTED PROGRAMS

Sundays

0600	VOA (af/eu/me): Preview.
0601	VOA (af/eu/me): World News.
0606	VOA (af/eu/me): World News in Depth.
0610	VOA (af/eu/me): Regional News.
0614	VOA (af/eu/me): U.S. News.
0618	VOA (af/eu/me): Sports.
0622	VOA (af/eu/me): U.S. Feature.
0630	VOA (af/eu/me): Preview.
0631	VOA (af/eu/me): World News.
0636	VOA (af/eu/me): Encounter.
0645	VOA (af/eu/me): Science/Medicine/Environment.
0649	VOA (af/eu/me): Business News.
0653	VOA (af/eu/me): Features.

Mondays

0600	VOA (af/eu/me): Preview.
0601	VOA (af/eu/me): World News.
0606	VOA (af/eu/me): World News in Depth.
0610	VOA (af/eu/me): Regional News.
0614	VOA (af/eu/me): U.S. News.
0618	VOA (af/eu/me): Sports.
0630	VOA (af/eu/me): Preview.
0631	VOA (af/eu/me): World News in Depth.
0645	VOA (af/eu/me): Science/Medicine/Environment.
0649	VOA (af/eu/me): Business and Economic News.
0653	VOA (af/eu/me): Music Feature.

Tuesdays

0600	VOA (af/eu/me): Preview.
0601	VOA (af/eu/me): World News.
0606	VOA (af/eu/me): World News in Depth.
0610	VOA (af/eu/me): Regional News.
0614	VOA (af/eu/me): U.S. News.
0618	VOA (af/eu/me): Sports.
0630	VOA (af/eu/me): Preview.

0631	VOA (af/eu/me): World News in Depth.
0645	VOA (af/eu/me): Science/Medicine/Environment.
0649	VOA (af/eu/me): Business and Economic News.
0653	VOA (af/eu/me): Music Feature.

Wednesdays

0600	VOA (af/eu/me): Preview.
0601	VOA (af/eu/me): World News.
0606	VOA (af/eu/me): World News in Depth.
0610	VOA (af/eu/me): Regional News.
0614	VOA (af/eu/me): U.S. News.
0618	VOA (af/eu/me): Sports.
0630	VOA (af/eu/me): Preview.
0631	VOA (af/eu/me): World News in Depth.
0645	VOA (af/eu/me): Science/Medicine/Environment.
0649	VOA (af/eu/me): Business and Economic News.
0653	VOA (af/eu/me): Music Feature.

Thursdays

0600	VOA (af/eu/me): Preview.
0601	VOA (af/eu/me): World News.
0606	VOA (af/eu/me): World News in Depth.
0610	VOA (af/eu/me): Regional News.
0614	VOA (af/eu/me): U.S. News.
0618	VOA (af/eu/me): Sports.
0630	VOA (af/eu/me): Preview.
0631	VOA (af/eu/me): World News in Depth.
0645	VOA (af/eu/me): Science/Medicine/Environment.
0649	VOA (af/eu/me): Business and Economic News.
0653	VOA (af/eu/me): Music Feature.

Fridays

0600	VOA (af/eu/me): Preview.
0601	VOA (af/eu/me): World News.
0606	VOA (af/eu/me): World News in Depth.
0610	VOA (af/eu/me): Regional News.

0614	VOA (af/eu/me): U.S. News.
0618	VOA (af/eu/me): Sports.
0630	VOA (af/eu/me): Preview.
0631	VOA (af/eu/me): World News in Depth.
0645	VOA (af/eu/me): Science/Medicine/Environment.
0649	VOA (af/eu/me): Business and Economic News.
0653	VOA (af/eu/me): Music Feature.

Saturdays

0600	VOA (af/eu/me): Preview.
0601	VOA (af/eu/me): World News.
0606	VOA (af/eu/me): World News in Depth.
0610	VOA (af/eu/me): Regional News.
0614	VOA (af/eu/me): U.S. News.
0618	VOA (af/eu/me): Sports.
0622	VOA (af/eu/me): U.S. Feature.
0630	VOA (af/eu/me): World News.
0636	VOA (af/eu/me): Press Conference USA.

HAUSER'S HIGHLIGHTS
BELARUS: R. MINSK,
A.K.A. R. BELARUS INTERNATIONAL,

English programs are now R. Minsk programs, not religion (Dave Kenny, BBCM) English schedule, all on 11960 and 7210 is, half an hour each: Tue 1930, Tue and Thu 2030, Wed and Fri 0430, Sat 0400 (BBCM)

FREQUENCIES

0900-1000	Anguilla, Caribbean Beacon	6090am			
0900-1000	Australia, Radio	6080as	9580pa	11880pa	17750as
0900-1000 vl	Australia, VL8A Alice Spg	2310do			
0900-1000 vl	Australia, VL8K Katherine	2485do			
0900-1000 vl	Australia, VL8T Tent Crk	2325do			
0900-1000	Canada, CFRX Toronto	6070do			
0900-1000	Canada, CFVP Calgary	6030do			
0900-1000	Canada, CHNX Halifax	6130do			
0900-1000	Canada, CKZU Vancouver	6160do			
0900-1000	China, China Radio Intl	9785pa	9890pa	11755pa	
0900-1000	Costa Rica, RF Peace Intl	7385am			
0900-0930	Czech Rep, Radio Prague	17485af	21745va		
0900-1000	Ecuador, HCJB	9640pa	21455am		
0900-1000 as	Eq Guinea, R East Africa	15186af			
0900-1000 mtwhf	Eq Guinea, Radio Africa	6160pa	9565af	12055as	15205af
0900-0950	Germany, Deutsche Welle	15410af	17715as	17800af	21600af
		21680as			
0900-1000	Germany, Sunrise Radio	5850va			
0900-1000	Germany, Overcomer Ministr	9500pa			
0900-0915 mtwtf	Ghana, Ghana Broadc Corp	3366do	4915do		
0900-0915	Guam, TWR/KTWR	15200as			
0900-0930	Guyana, GBC/Voice of	3290do	5950do		
0900-1000	Ireland, Unt Christian BC	6200do			
0900-1000 as/vl	Italy, IRRS	7120va			
0900-1000	Kenya, Kenya Broadc Corp	4935do			
0900-0930 vl	Kiribati, Radio	9810do			
0900-1000	Liberia, Radio Veritas	5470do			
0900-0915	Liberia, LCN/R Liberia Int	5100do			
0900-1000	Malaysia, Radio	7295do			
0900-1000 vl	Malaysia, RTM Kuching	4895do	7160do		
0900-0930 s	Malta, VO Mediterranean	9660eu			
0900-0925	Netherlands, Radio	9720pa	9820pa		
0900-1000	New Zealand, R NZ Intl	6100pa			
0900-1000 as	New Zealand, R NZ Intl	11690pa			
0900-0930 s	Norway, Radio Norway Intl	15175sau			
0900-1000 vl	Papua New Guinea, NBC	4890do			
0900-1000	Singapore, R Corp Singapore	6150do			
0900-1000 vl	Solomon Islands, SIBC	5020do			
0900-1000 vl	Tanzania, Radio	5050do			
0900-1000	UK, BBC African Service	6190af	11940af	15400af	17830af
		17885af			
0900-0915	UK, BBC Asian Service	6065as	6195as	9580as	9740as
		11765as	11955as	15310as	15360as
		17760as	17790as	21660as	
0900-1000	UK, BBC World Service	9410eu	11760eu	12095eu	15190sa
		15485eu	15565eu	15575eu	17640eu
		17705eu			
0900-1000	USA, KAIJ Dallas TX	5810am	9815am		
0900-1000	USA, KHBI N Mariana Is	9385pa	15665as		
0900-1000	USA, KTVN Salt Lk City UT	7510am			
0900-1000	USA, KWHR Naalehu HI	11565pa	17780as		
0900-1000	USA, WEWN Birmingham AL	5825eu	7405na		
0900-1000	USA, WHRI Noblesville IN	5745am	7315am		
0900-1000	USA, WJCR Upton KY	7490na	13595na		
0900-1000	USA, WRMI/R Miami Intl	9955am			
0900-1000	USA, WRNO New Orleans LA	7355am			
0900-1000	USA, WSHB Cypress Crk SC	9455sa	9835af		
0900-1000	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am
0900-1000	Zambia, Christian Voice	6065af			
0900-1000 vl	Zambia, R Zambia/ZNBC 1	7220do			
0900-1000 vl	Zambia, R Zambia/ZNBC 2	6165do			
0900-1000 vl	Zimbabwe, Zimbabwe BC	5975do			
0905-0910 s	Croatia, Croatian Radio	7185eu	9830eu		
0915-1000	Ghana, Ghana Broadc Corp	6130do	7295dc		
0915-0945	UK, BBC Asian Service	15310as	17790c		
0915-0945 as	UK, BBC Asian Service	6195as	9740as	11765as	15360as
		21660as	17870c		
0930-1000 mtwhfa	Austria, R Austria Intl	15455as			
0930-1000	Canada, CKZN St John's	6160do			
0930-1000	Georgia, Radio	11910eu			
0930-1000	Guam, TWR/KTWR	9865as			
0930-1000	Italy, AWR Europe	7230eu			
0930-1000	Lithuania, Radio Vilnius	9710eu			
0930-1000	Netherlands, Radio	12065as	13710p		
0945-1000	UK, BBC Asian Service	6195as	9740as	11765as	15360as
		17760as	17790c	21660as	
		6065as	9580as	11945as	11955as
		15280as			
0945-1000 a	UK, BBC Asian Service	6065as	9580as	11945as	11955as
		15280as			
0945-1000 smtwhf	UK, BBC Slow Speed News	6065as	9580a	11945as	11955as
		15280as			

1000-1100 vl	Australia, VL8T Tent Crk	2325do			
1000-1100 vl	Canada, CBC N Quebec Svc	9625do			
1000-1100	Canada, CFRX Toronto	6070do			
1000-1100	Canada, CFVP Calgary	6030do			
1000-1100	Canada, CHNX Halifax	6130do			
1000-1100	Canada, CKZN St John's	6160do			
1000-1100	Canada, CKZU Vancouver	6160do			
1000-1100	China, China Radio Intl	9785pa	9890pa	11755pa	
1000-1100	Costa Rica, RF Peace Intl	7385am			
1000-1100	Ecuador, HCJB	9640pa	21455am		
1000-1100 as	Eq Guinea, R East Africa	15186af			
1000-1100 mtwhf	Eq Guinea, Radio Africa	15186af			
1000-1100	Germany, Sunrise Radio	5850va			
1000-1100 as	Germany, Overcomer Ministr	5900eu			
1000-1030	Guam, AWR/KSDA	11790as			
1000-1100	Guam, TWR/KTWR	9865as			
1000-1100	India, All India Radio	11585au	11735au	13700au	15050au
		17387au	17840as		
1000-1100	Ireland, Unt Christian BC	6200do			
1000-1100 as/vl	Italy, IRRS	7120va			
1000-1100	Japan, R Japan/NHK World	9695as	11730as	11850pa	
1000-1100	Jordan, Radio	11690eu			
1000-1100	Kenya, Kenya Broadc Corp	4935do			
1000-1100	Liberia, Radio Veritas	5470do			
1000-1100	Malaysia, Radio	7295do			
1000-1100 irreg	Malaysia, RTM KotaKinabalu	5980do			
1000-1030	Netherlands, Radio	12065as	13710as		
1000-1100	New Zealand, R NZ Intl	6100pa			
1000-1100	Nigeria, Voice of	7255af	15120af		
1000-1100 vl	Papua New Guinea, NBC	4890do			
1000-1100	Philippines, FEBC/R Intl	11635as			
1000-1100	Singapore, R Corp Singapore	6150do			
1000-1100 vl	Solomon Islands, SIBC	5020do			
1000-1030	Switzerland, Swiss R Intl	6165eu	9535eu		
1000-1100 vl	Tanzania, Radio	5050do			
1000-1100	UK, BBC African Service	6190af	11940af	17885af	
1000-1100 as	UK, BBC African Service	15400af	17830af		
1000-1030	UK, BBC Asian Service	6195as	9740as	11765as	15310as
		15360as	17790as	21660as	
1000-1100	UK, BBC World Service	6195am	9410eu	11760me	12095eu
		15485eu	15565eu	15575eu	17640eu
		17705eu			
1000-1100 as	UK, BBC World Service	15190sa			
1000-1100	USA, KAIJ Dallas TX	5810am	9815am		
1000-1100	USA, KHBI N Mariana Is	15665as	15725pa		
1000-1100	USA, KTVN Salt Lk City UT	7510am			
1000-1100	USA, KWHR Naalehu HI	9930as	11565pa		
1000-1100	USA, KWHR Naalehu HI	5985pa	6165ca	7405ca	9590ca
		11720as	15425as		
1000-1100	USA, WEWN Birmingham AL	7425na	9465na	15745eu	
1000-1100 occsnal	USA, WGTG McCaysville GA	9400am			
1000-1100	USA, WHRI Noblesville IN	6040am	9495am		
1000-1100	USA, WJCR Upton KY	7490na	13595na		
1000-1100	USA, WRMI/R Miami Intl	9955am			
1000-1100	USA, WRNO New Orleans LA	7355am			
1000-1100	USA, WSHB Cypress Crk SC	6095na	9455sa		
1000-1100	USA, WWCR Nashville TN	2390am	5070am	5935am	
1000-1100 mtwhf	USA, WWCR Nashville TN	3210am			
1000-1100 as	USA, WWCR Nashville TN	15685am			
1000-1100 mtwhfa	USA, WYFR Okeechobee FL	5950na			
1000-1030	Vietnam, Voice of	9840as	12020as	15010as	
1000-1100	Zambia, Christian Voice	6065af			
1000-1100 vl	Zambia, R Zambia/ZNBC 1	7220do			
1000-1100 vl	Zambia, R Zambia/ZNBC 2	6165do			
1030-1100 s	Austria, R Austria Intl	15455as	17870au		
1030-1055	Belgium, R Vlaanderen Int	9925eu	15595eu		
1030-1057	Czech Rep, Radio Prague	7345eu	11640eu		
1030-1100	Guam, AWR/KSDA	11790as	15170as		
1030-1035	Israel, Kol Israel	15640eu	15650na		
1030-1100	Netherlands, Radio	6045eu	9860eu	12065as	13710as
1030-1100	South Korea, R Korea Intl	11715sa			
1030-1100	Sri Lanka, Sri Lanka BC	11835as	15120as	17850as	
1030-1100	UAE, Radio Dubai	13675eu	15370eu	15395af	21605af
1030-1100	UK, BBC Asian Service	6195as	9740as	11765pa	15310as
		17790as			
1030-1045	Vatican State, Vatican R	5883eu	9645eu	11740eu	15595va

MT MONITORING TEAM

Gayle Van Horn Frequency Manager gayle@grove.net	Jim Frimmel Program Manager frimmel@startext.net	Jacques d'Avignon Propagation Forecasts Ontario, Canada monitor@rac.ca
Dave Datko, California		
Mark Fine, VA		

1000 UTC

1000-1100	Anguilla, Caribbean Beacon	6090am			
1000-1100	Australia, Radio	6080as	9580pa	11880pa	17750as
		2310do			
1000-1100 vl	Australia, VL8A Alice Spg	2485do			
1000-1100 vl	Australia, VL8K Katherine	2325do			

FREQUENCIES

1200-1300	Anguilla, Caribbean Beacon	11775am				1200-1300	UK, BBC World Service	5965na	6195am	9410eu	9515na
1200-1300	Australia, Radio	6020pa	6080as	9580pa	9770as			11760me	12095eu	15220am	15485eu
1200-1300 vl	Australia, VLBA Alice Spg	2310do						15565eu	15575as	17640eu	17705eu
1200-1300 vl	Australia, VL8K Katherine	2485do				1200-1300	USA, KAIJ Dallas TX	5810am	9815am		
1200-1300 vl	Australia, VLBT Tent Crk	2325do				1200-1300	USA, KHBI N Mariana Is	9355as	9385au		
1200-1300	Brazil, Radio Bras	15445as				1200-1300	USA, KTBN Salt Lk City UT	7510am			
1200-1215 vl	Cambodia, Natl Voice of	11940do				1200-1300	USA, KWHR Naalehu HI	9930as	11565pa		
1200-1300 vl	Canada, CBC N Quebec Svc	9625do				1200-1300	USA, Voice of America	6160as	9645as	9760as	11715as
1200-1300	Canada, CFRX Toronto	6070do						15160as			
1200-1300	Canada, CFVP Calgary	6030do				1200-1300	USA, WEWN Birmingham AL	7425na	9465na	15745eu	
1200-1300	Canada, CHNX Halifax	6130do				1200-1300 occsnal	USA, WGTG McCaysville GA	9400am			
1200-1300	Canada, CKZN St John's	6160do				1200-1300	USA, WHRI Noblesville IN	6040am	9495am		
1200-1300	Canada, CKZU Vancouver	6160do				1200-1300	USA, WJCR Upton KY	7490na	13595na		
1200-1229	Canada, R Canada Intl	9640am	9660as	11855am	13650am	1200-1300	USA, WRMI/R Miami Intl	9955am			
		15195as				1200-1300	USA, WRNO New Orleans LA	7355am			
1200-1300	China, China Radio Intl	6950pa	7385pa	9715as	9945as	1200-1300	USA, WSHB Cypress Crk SC	6095na	11660sa		
		11660as	11675as	11980as		1200-1300	USA, WWCR Nashville TN	5070am	7435am	13845am	15685am
1200-1300	Costa Rica, RF Peace Intl	7385am	21460as			1200-1300 mtwhfa	USA, WYFR Okeechobee FL	5950na			
1200-1300	Ecuador, HCJB	12005ca	15115am	21455am		1200-1300	USA, WYFR Okeechobee FL	5850na	6015na	17750na	
1200-1300 as	Eq Guinea, R East Africa	15186af				1200-1228	Uzbekistan, R Tashkent	5060as	5975as	7285as	9715as
1200-1300	Eq Guinea, Radio Africa	9530as						11905as	15295as	17775as	
1200-1300	France, Radio France Intl	9805eu	11600as	15155eu	15195eu	1200-1300	Zambia, Christian Voice	6065af			
		15530am	15540af	17575am		1200-1300 vl	Zambia, R Zambia/ZNBC 1	7220do			
1200-1300	Germany, Sunrise Radio	5850va				1200-1300 vl	Zambia, R Zambia/ZNBC 2	6165do			
1200-1230 s	Germany, Universal Life	9710as				1205-1210	Croatia, Croatian Radio	7125eu	9830eu		
1200-1300	Ireland, Unt Christian BC	6200do				1206-1300 occsnal	New Zealand, R NZ Intl	6100pa			
1200-1300 as/vl	Italy, IRRS	7120va				1209-1215 mtwhf	UK, BBC Caribbean Report	6195ca	15220ca		
1200-1300	Jordan, Radio	11690eu				1209-1215 as	UK, BBC World Service	6195am	15220am		
1200-1300	Kenya, Kenya Broadc Corp	4935do				1210-1240	Mongolia, Voice of	12085au			
1200-1300	Malaysia, Radio	7295do				1215-1300	Egypt, Radio Cairo	17595as			
1200-1300 irreg	Malaysia, RTM KotaKinabalu	5980do				1229-1259	Canada, R Canada Intl	9640am	11855am	13650am	
1200-1250	Myanmar, Voice of	5986do				1230-1300	Austria, R Austria Intl	6155eu	13730na		
1200-1225	Netherlands, Radio	6045eu	9860eu			1230-1300	Bangladesh, Bangla Betar	7185as	9550as		
1200-1206	New Zealand, R NZ Intl	6100pa				1230-1255	Belgium, R Vlaanderen Int	15545na			
1200-1230 s	Norway, Radio Norway Intl	17535as				1230-1300 s	Finland, YLE/R Finland	11900na	15400na		
1200-1300	Palau, KHBN/Voice of Hope	9965as				1230-1300	Guam, AWR/KSDA	13720as			
1200-1300 vl	Papua New Guinea, NBC	4890do				1230-1300	Italy, AWR Europe	7230as			
1200-1255	Poland, Polish R Warsaw	6095eu	7270eu	9525eu	11820eu	1230-1300	South Korea, R Korea Intl	6055as	9570as	9640am	13670as
1200-1300	Singapore, R Singapore Int	6150as				1230-1300	Sri Lanka, Sri Lanka BC	9730as	15425as		
1200-1230	South Korea, R Korea Intl	7285as				1230-1300	Sweden, Radio	13740as	15240au		
1200-1230	Switzerland, Swiss R Intl	6165eu	9535eu			1230-1300	Thailand, Radio	9655as	9885as	11905as	
1200-1300	Taiwan, Radio Taipei Intl	7130as	9610au			1230-1300	Turkey, Voice of	11995as	15185as	15290eu	
1200-1300 vl	Tanzania, Radio	5050do				1230-1300 a	USA, Voice of America	7768eu			
1200-1300	UK, BBC African Service	6190af	11940af	17830af	17885af	1230-1300	Vietnam, Voice of	9840as	12020as	15010as	
		21660af				1240-1250	Greece, Voice of	17525af			
1200-1300	UK, BBC Asian Service	6195as	9580as	9740as	11955as	1240-1255 smtwh	UK, BBC Slow Speed News	7140me	11820me	13660af	15180af
		15280as	15310as	17785as				15555me	17585af		

SELECTED PROGRAMS

Sundays

1200	USA, VOA Washington DC (as): Preview.
1201	USA, VOA Washington DC (as): World News.
1206	USA, VOA Washington DC (as): World News in Depth.
1210	USA, VOA Washington DC (as): Regional News.
1214	USA, VOA Washington DC (as): U.S. News.
1218	USA, VOA Washington DC (as): Sports.
1222	USA, VOA Washington DC (as): U.S. Feature.
1230	USA, VOA Washington DC (as): Preview.
1231	USA, VOA Washington DC (as): World News.
1236	USA, VOA Washington DC (as): Encounter.
1245	USA, VOA Washington DC (as): Science/Medicine/Environment.
1249	USA, VOA Washington DC (as): Business News.
1253	USA, VOA Washington DC (as): Features.

Mondays

1200	USA, VOA Washington DC (as): Preview.
1201	USA, VOA Washington DC (as): World News.
1206	USA, VOA Washington DC (as): World News in Depth.
1210	USA, VOA Washington DC (as): Regional News.
1214	USA, VOA Washington DC (as): U.S. News.
1218	USA, VOA Washington DC (as): Sports.
1230	USA, VOA Washington DC (as): Preview.
1231	USA, VOA Washington DC (as): World News in Depth.
1245	USA, VOA Washington DC (as): Science/Medicine/Environment.
1249	USA, VOA Washington DC (as): Business and Economic News.
1253	USA, VOA Washington DC (as): Music Feature.

Tuesdays

1200	USA, VOA Washington DC (as): Preview.
1201	USA, VOA Washington DC (as): World News.

1206	USA, VOA Washington DC (as): World News in Depth.
1210	USA, VOA Washington DC (as): Regional News.
1214	USA, VOA Washington DC (as): U.S. News.
1218	USA, VOA Washington DC (as): Sports.
1230	USA, VOA Washington DC (as): Preview.
1231	USA, VOA Washington DC (as): World News in Depth.
1245	USA, VOA Washington DC (as): Science/Medicine/Environment.
1249	USA, VOA Washington DC (as): Business and Economic News.
1253	USA, VOA Washington DC (as): Music Feature.

Wednesdays

1200	USA, VOA Washington DC (as): Preview.
1201	USA, VOA Washington DC (as): World News.
1206	USA, VOA Washington DC (as): World News in Depth.
1210	USA, VOA Washington DC (as): Regional News.
1214	USA, VOA Washington DC (as): U.S. News.
1218	USA, VOA Washington DC (as): Sports.
1230	USA, VOA Washington DC (as): Preview.
1231	USA, VOA Washington DC (as): World News in Depth.
1245	USA, VOA Washington DC (as): Science/Medicine/Environment.
1249	USA, VOA Washington DC (as): Business and Economic News.
1253	USA, VOA Washington DC (as): Music Feature.

Thursdays

1200	USA, VOA Washington DC (as): Preview.
1201	USA, VOA Washington DC (as): World News.
1206	USA, VOA Washington DC (as): World News in Depth.
1210	USA, VOA Washington DC (as): Regional News.
1214	USA, VOA Washington DC (as): U.S. News.
1218	USA, VOA Washington DC (as): Sports.

1230	USA, VOA Washington DC (as): Preview.
1231	USA, VOA Washington DC (as): World News in Depth.
1245	USA, VOA Washington DC (as): Science/Medicine/Environment.
1249	USA, VOA Washington DC (as): Business and Economic News.
1253	USA, VOA Washington DC (as): Music Feature.

Fridays

1200	USA, VOA Washington DC (as): Preview.
1201	USA, VOA Washington DC (as): World News.
1206	USA, VOA Washington DC (as): World News in Depth.
1210	USA, VOA Washington DC (as): Regional News.
1214	USA, VOA Washington DC (as): U.S. News.
1218	USA, VOA Washington DC (as): Sports.
1230	USA, VOA Washington DC (as): Preview.
1231	USA, VOA Washington DC (as): World News in Depth.
1245	USA, VOA Washington DC (as): Science/Medicine/Environment.
1249	USA, VOA Washington DC (as): Business and Economic News.
1253	USA, VOA Washington DC (as): Music Feature.

Saturdays

1200	USA, VOA Washington DC (as): Preview.
1201	USA, VOA Washington DC (as): World News.
1206	USA, VOA Washington DC (as): World News in Depth.
1210	USA, VOA Washington DC (as): Regional News.
1214	USA, VOA Washington DC (as): U.S. News.
1218	USA, VOA Washington DC (as): Sports.
1222	USA, VOA Washington DC (as): U.S. Feature.
1230	USA, VOA Washington DC (as): World News.
1236	USA, VOA Washington DC (as): Press Conference USA.

FREQUENCIES

1400-1500	Anguilla, Caribbean Beacon	11775am				1400-1500	Russia, Voice of Russia WS	4730as	4940as	4975as	7510as
1400-1500	Australia, Radio	5995pa	6020pa	6080as	9770as	1400-1500	S Africa, Channel Africa	9445af	17675af	17870af	
1400-1500 vl	Australia, VLBA Alice Spg	2310do				1400-1500	Singapore, RCorp Singapore	6150do			
1400-1500 vl	Australia, VL8K Katherine	2485do				1400-1500	Sri Lanka, Sri Lanka BC	9730as	15425as		
1400-1500 vl	Australia, VLBT Tent Crk	2325do				1400-1500	Switzerland, Swiss R Intl	9575as	15265as		
1400-1500 vl	Canada, CBC N Quebec Svc	9625do				1400-1500 vl	Tanzania, Radio	5050do			
1400-1500	Canada, CFRX Toronto	6070do				1400-1430	Thailand, Radio	9655as	9830as	11905as	
1400-1500	Canada, CFVP Calgary	6030do				1400-1500	UK, BBC African Service	6190af	11940af	17830af	21470af
1400-1500	Canada, CHNX Halifax	6130do				1400-1500	UK, BBC Asian Service	5990as	6195as	9740as	11750as
1400-1500	Canada, CKZN St John's	6160do				1400-1500	UK, BBC World Service	9410eu	9515na	11865na	12095eu
1400-1500	Canada, CKZU Vancouver	6160do				1400-1500	USA, KAIJ Dallas TX	13815am	15725sm		
1400-1500 s	Canada, R Canada Intl	11855am	13650am			1400-1500	USA, KHBI N Mariana Is	9355as			
1400-1500	China, China Radio Intl	7260as	7405na	9535as	9700as	1400-1500	USA, KJES Mesquite NM	11715am			
		11825as				1400-1500	USA, KTVN Salt Lk City UT	7510am			
1400-1500	Costa Rica, RF Peace Intl	7385am	21460am			1400-1500	USA, KWHR Naalehu HI	9930as	11565pa		
1400-1500	Ecuador, HCJB	12005ca	15115am	21455am		1400-1500	USA, Voice of America	6160as	7125as	7215as	9645as
1400-1500 as	Eqt Guinea, R East Africa	15186af				1400-1500		9760as	15160as	15255va	15395as
1400-1500	France, Radio France Intl	11910as	15405as	17560af		1400-1500		15425as			
1400-1500	Georgia, Voice of Hope	15715as				1400-1500	USA, WEWN Birmingham AL	9455na	11875na	15745eu	
1400-1500	Germany, Sunrise Radio	5850va				1400-1500	USA, WGTG McCaysville GA	9400am			
1400-1430 s	Germany, Universal Life	9955na				1400-1500	USA, WHRI Noblesville IN	6040am	15105am		
1400-1500	Germany, Overcomer Ministr	11650eu	11855eu	11920eu	13810eu	1400-1500	USA, WJCR Upton KY	7490na	13595na		
1400-1500	India, All India Radio	9545as	11620as	13710as		1400-1500	USA, WRMI/R Miami Intl	9955am			
1400-1500	Ireland, Unt Christian BC	6200do				1400-1500	USA, WRNO New Orleans LA	7355am			
1400-1430	Israel, Kol Israel	12535eu	15640na			1400-1500	USA, WWCN Nashville TN	9475am	12160am	13845am	15685am
1400-1500 as/vl	Italy, IRRS	7120va				1400-1500	USA, WYFR Okeechobee FL	11502as	11830na	11970na	17750na
1400-1500	Japan, R Japan/NHK World	9505na	11730as	11880af		1400-1405	Vatican State, Vatican R	13765au	15540au		
1400-1500	Jordan, Radio	11690eu				1400-1500	Zambia, Christian Voice	6065af			
1400-1500	Kenya, Kenya Broadc Corp	4935do				1400-1500 vl	Zambia, R Zambia/ZNBC 1	7220do			
1400-1500	Liberia, Radio Veritas	5470do				1400-1500 vl	Zambia, R Zambia/ZNBC 2	6165do			
1400-1500	Malaysia, Radio	7295do				1415-1425	Nepal, Radio	5005do	7165do		
1400-1500 vl	Malaysia, RTM Kuching	4895do	7160do			1430-1500	Australia, Radio	9500as	11660as		
1400-1500 irreg	Malaysia, RTM KotaKinabalu	5980do				1430-1500	Guam, AWR/KSDA	9385as			
1400-1430	Mexico, Radio Mexico Intl	5985na	9705na			1430-1500	Mongolia, Voice of	9720as	12085as		
1400-1500	Netherlands, Radio	9890as	15585as			1440-1500	Myanmar, Voice of	5986do			
1400-1500 occsnal	New Zealand, R NZ Intl	6100pa									
1400-1500 as	Palau, KHBN/Voice of Hope	9985as									
1400-1500 vl	Papua New Guinea, NBC	4890do									
1400-1500	Philippines, FEBC/R Intl	11995as									

SELECTED PROGRAMS

Sundays

- 1400 VOA (af/as/eu/me): Preview.
- 1401 VOA (af/as/eu/me): World News.
- 1406 VOA (af/as/eu/me): World News in Depth.
- 1410 VOA (af/as/eu/me): Regional News.
- 1414 VOA (af/as/eu/me): U.S. News.
- 1418 VOA (af/as/eu/me): Sports.
- 1422 VOA (af/as/eu/me): U.S. Feature.
- 1430 VOA (af/as/eu/me): Preview.
- 1431 VOA (af/as/eu/me): World News.
- 1436 VOA (af/as/eu/me): Encounter.
- 1445 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1449 VOA (af/as/eu/me): Business News.
- 1453 VOA (af/as/eu/me): Features.

Mondays

- 1400 VOA (af/as/eu/me): Preview.
- 1401 VOA (af/as/eu/me): World News.
- 1406 VOA (af/as/eu/me): World News in Depth.
- 1410 VOA (af/as/eu/me): Regional News.
- 1414 VOA (af/as/eu/me): U.S. News.
- 1418 VOA (af/as/eu/me): Sports.
- 1430 VOA (af/as/eu/me): Preview.
- 1431 VOA (af/as/eu/me): World News in Depth.
- 1445 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1449 VOA (af/as/eu/me): Business and Economic News.
- 1453 VOA (af/as/eu/me): Music Feature.

Tuesdays

- 1400 VOA (af/as/eu/me): Preview.
- 1401 VOA (af/as/eu/me): World News.
- 1406 VOA (af/as/eu/me): World News in Depth.
- 1410 VOA (af/as/eu/me): Regional News.
- 1414 VOA (af/as/eu/me): U.S. News.
- 1418 VOA (af/as/eu/me): Sports.
- 1430 VOA (af/as/eu/me): Preview.
- 1431 VOA (af/as/eu/me): World News in Depth.
- 1445 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1449 VOA (af/as/eu/me): Business and Economic News.
- 1453 VOA (af/as/eu/me): Music Feature.

Wednesdays

- 1400 VOA (af/as/eu/me): Preview.
- 1401 VOA (af/as/eu/me): World News.
- 1406 VOA (af/as/eu/me): World News in Depth.
- 1410 VOA (af/as/eu/me): Regional News.
- 1414 VOA (af/as/eu/me): U.S. News.
- 1418 VOA (af/as/eu/me): Sports.
- 1430 VOA (af/as/eu/me): Preview.
- 1431 VOA (af/as/eu/me): World News in Depth.
- 1445 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1449 VOA (af/as/eu/me): Business and Economic News.
- 1453 VOA (af/as/eu/me): Music Feature.

Thursdays

- 1400 VOA (af/as/eu/me): Preview.
- 1401 VOA (af/as/eu/me): World News.
- 1406 VOA (af/as/eu/me): World News in Depth.
- 1410 VOA (af/as/eu/me): Regional News.
- 1414 VOA (af/as/eu/me): U.S. News.
- 1418 VOA (af/as/eu/me): Sports.
- 1430 VOA (af/as/eu/me): Preview.
- 1431 VOA (af/as/eu/me): World News in Depth.
- 1445 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1449 VOA (af/as/eu/me): Business and Economic News.
- 1453 VOA (af/as/eu/me): Music Feature.

Fridays

- 1400 VOA (af/as/eu/me): Preview.
- 1401 VOA (af/as/eu/me): World News.
- 1406 VOA (af/as/eu/me): World News in Depth.
- 1410 VOA (af/as/eu/me): Regional News.
- 1414 VOA (af/as/eu/me): U.S. News.
- 1418 VOA (af/as/eu/me): Sports.
- 1430 VOA (af/as/eu/me): Preview.
- 1431 VOA (af/as/eu/me): World News in Depth.
- 1445 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1449 VOA (af/as/eu/me): Business and Economic News.
- 1453 VOA (af/as/eu/me): Music Feature.

Saturdays

- 1400 VOA (af/as/eu/me): Preview.
- 1401 VOA (af/as/eu/me): World News.
- 1406 VOA (af/as/eu/me): World News in Depth.
- 1410 VOA (af/as/eu/me): Regional News.
- 1414 VOA (af/as/eu/me): U.S. News.
- 1418 VOA (af/as/eu/me): Sports.
- 1422 VOA (af/as/eu/me): U.S. Feature.
- 1430 VOA (af/as/eu/me): World News.
- 1436 VOA (af/as/eu/me): Press Conference USA.

Continued from page 39

- 1830 WRN Announcements
- 2030 Radio Austria Intl in German
- 2100 Radio Budapest in Hungarian
- 2200 Polish Radio in Polish
- 2230 Radio Finland, Religious in Finnish
- 2255 Radio Finland, News in Finnish
- 2300 Radio Finland, In-depth News in Finnish
- 2325 Radio Finland, News in Swedish
- 2330 Radio Finland, French
- 2345 Radio Finland, Music, Finnish

FREQUENCIES

1500-1600	Anguilla, Caribbean Beacon	11775am				1500-1530	S Africa, Channel Africa	9445af			
1500-1600	Australia, Radio	5995pa	6020pa	6080as	9500as	1500-1530 twtfa	Seychelles, FEBA Radio	11600as			
		9770as	11660as			1500-1545 sm	Seychelles, FEBA Radio	11600as			
1500-1600 vl	Australia, VL8A Alice Spg	2310do				1500-1600	Singapore, RCorp Singapore	6150do			
1500-1600 vl	Australia, VL8K Katherine	2485do				1500-1600	Sri Lanka, Sri Lanka BC	9730as	15425as		
1500-1600 vl	Australia, VL8T Tent Crk	2325do				1500-1600	Taiwan, Voice of Asia	7445as			
1500-1600 vl	Canada, CBC N Quebec Svc	9625do				1500-1600 vl	Tanzania, Radio	5050do			
1500-1600	Canada, CFRX Toronto	6070do				1500-1600	UK, BBC African Service	6190af	11860af	11940af	15400af
1500-1600	Canada, CFVP Calgary	6030do						15420af	17830af	21470af	21490af
1500-1600	Canada, CHNX Halifax	6130do						21660af			
1500-1600	Canada, CKZN St John's	6160do				1500-1600	UK, BBC Asian Service	5975as	5990as	6195as	9740as
1500-1600	Canada, CKZU Vancouver	6160do						11750as	15310as		
1500-1559 s	Canada, R Canada Intl	11855am	13650am			1500-1600	UK, BBC World Service	9410eu	9515na	11865na	12040eu
1500-1600	China, China Radio Intl	7160as	9785as					12095eu	15220na	15485eu	15575eu
1500-1600	Costa Rica, RF Peace Intl	7385am	15050am	21460am				17705eu	17840am		
1500-1600	Ecuador, HCJB	12005ca	15115am	21455am		1500-1600	USA, KAIJ Dallas TX	13815am	15725am		
1500-1600 as	Eq Guinea, R East Africa	15186af				1500-1600	USA, KTBN Salt Lk City UT	15590am			
1500-1530	Georgia, Voice of Hope	15715as				1500-1600	USA, KWHR Naalehu HI	7560pa	9930as		
1500-1600	Germany, Sunrise Radio	5850va				1500-1600	USA, Voice of America	6110as	6160as	7125as	7215as
1500-1600	Germany, Overcomer Ministr	13810me						9645as	9700me	9760as	15205va
1500-1600	Guam, TWR/KTWR	15330as						15255va	15395as		
1500-1600	Ireland, Unt Christian BC	6200do				1500-1600	USA, WEWN Birmingham AL	9455na	11875na	15745eu	
1500-1600 as/vl	Italy, IRRS	7120va				1500-1600	USA, WGTG McCaysville GA	9400am			
1500-1600	Japan, R Japan/NHK World	7200as	9505na	9750as	11730as	1500-1600	USA, WHRI Noblesville IN	13760am	15105am		
1500-1600	Jordan, Radio	11690eu				1500-1600	USA, WJCR Upton KY	7490na	13595na		
1500-1600	Kenya, Kenya Broadc Corp	4935do				1500-1600	USA, WRMI/R Miami Intl	9955am			
1500-1510	Liberia, LCN/R Liberia Int	5100do				1500-1600	USA, WRMI/R Miami Intl	9955am			
1500-1600	Malaysia, Radio	7295do				1500-1600	USA, WRNO New Orleans LA	15420am			
1500-1600 irreg	Malaysia, RTM KotaKinabalu	5980do				1500-1600	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1500-1530	Mexico, Radio Mexico Intl	5985na	9705na			1500-1600	USA, WYFR Okeechobee FL	11830na	17750na		
1500-1515 s	Myanmar, Voice of	5986do				1500-1502	USA, WYFR Okeechobee FL	11550as			
1500-1525	Netherlands, Radio	9890as	15585as			1500-1600	Zambia, Christian Voice	6065af			
1500-1600 occsnal	New Zealand, R NZ Intl	6100pa				1500-1600 vl	Zambia, R Zambia/ZNBC 1	4910do			
1500-1600	Nigeria, Voice of	7255af	15120af			1500-1600 vl	Zambia, R Zambia/ZNBC 2	6165do			
1500-1557	North Korea, R Pyongyang	3560ca	9640af	9975me	11735sa	1530-1600	Guam, AWR/KSDA	9385as			
		13650va				1535-1550	Vatican State, Vatican R	13765au	15500au		
1500-1530 s	Norway, Radio Norway Intl	13800va				1545-1600	Albania, R Tirana Intl	11734eu	12084eu		
1500-1530 as	Palau, KHBN/Voice of Hope	9985as				1545-1600 sh	Bangladesh, Bangla Betar	4880do			
1500-1600 vl	Papua New Guinea, NBC	4890do				1545-1600	Israel, Kol Israel	11605eu	15650na	17515na	
1500-1600	Russia, Voice of Russia WS	4730me	4940me	4975me	7325me	1550-1600 a	Vatican State, Vatican R	13765va	15500va		
		9975me	11775me	15470me	17570me						
		17580me									

SELECTED PROGRAMS

Sundays

- 1500 VOA (af/as/eu/me): Preview.
- 1501 VOA (af/as/eu/me): World News.
- 1506 VOA (af/as/eu/me): World News in Depth.
- 1510 VOA (af/as/eu/me): Regional News.
- 1514 VOA (af/as/eu/me): U.S. News.
- 1518 VOA (af/as/eu/me): Sports.
- 1522 VOA (af/as/eu/me): U.S. Feature.
- 1530 VOA (af/as/eu/me): Preview.
- 1531 VOA (af/as/eu/me): World News.
- 1536 VOA (af/as/eu/me): Issues in the News.

Mondays

- 1500 VOA (af/as/eu/me): Preview.
- 1501 VOA (af/as/eu/me): World News.
- 1506 VOA (af/as/eu/me): World News in Depth.
- 1510 VOA (af/as/eu/me): Regional News.
- 1514 VOA (af/as/eu/me): U.S. News.
- 1518 VOA (af/as/eu/me): Sports.
- 1530 VOA (af/as/eu/me): Preview.
- 1531 VOA (af/as/eu/me): World News.
- 1536 VOA (af/as/eu/me): Dateline.
- 1545 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1549 VOA (af/as/eu/me): Business and Economic News.
- 1553 VOA (af/as/eu/me): Women's Business Minute.
- 1554 VOA (af/as/eu/me): Feature.

Tuesdays

- 1500 VOA (af/as/eu/me): Preview.
- 1501 VOA (af/as/eu/me): World News.
- 1506 VOA (af/as/eu/me): World News in Depth.
- 1510 VOA (af/as/eu/me): Regional News.
- 1514 VOA (af/as/eu/me): U.S. News.
- 1518 VOA (af/as/eu/me): Sports.
- 1530 VOA (af/as/eu/me): Preview.
- 1531 VOA (af/as/eu/me): World News.
- 1536 VOA (af/as/eu/me): Dateline.
- 1545 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1549 VOA (af/as/eu/me): Business and Economic News.
- 1553 VOA (af/as/eu/me): Women's Business Minute.
- 1554 VOA (af/as/eu/me): Feature.

Wednesdays

- 1500 VOA (af/as/eu/me): Preview.
- 1501 VOA (af/as/eu/me): World News.
- 1506 VOA (af/as/eu/me): World News in Depth.
- 1510 VOA (af/as/eu/me): Regional News.
- 1514 VOA (af/as/eu/me): U.S. News.
- 1518 VOA (af/as/eu/me): Sports.
- 1530 VOA (af/as/eu/me): Preview.
- 1531 VOA (af/as/eu/me): World News.
- 1536 VOA (af/as/eu/me): Dateline.
- 1545 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1549 VOA (af/as/eu/me): Business and Economic News.
- 1553 VOA (af/as/eu/me): Women's Business Minute.
- 1554 VOA (af/as/eu/me): Feature.

Thursdays

- 1500 VOA (af/as/eu/me): Preview.
- 1501 VOA (af/as/eu/me): World News.
- 1506 VOA (af/as/eu/me): World News in Depth.
- 1510 VOA (af/as/eu/me): Regional News.
- 1514 VOA (af/as/eu/me): U.S. News.
- 1518 VOA (af/as/eu/me): Sports.
- 1530 VOA (af/as/eu/me): Preview.
- 1531 VOA (af/as/eu/me): World News.
- 1536 VOA (af/as/eu/me): Dateline.
- 1545 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1549 VOA (af/as/eu/me): Business and Economic News.
- 1553 VOA (af/as/eu/me): Women's Business Minute.
- 1554 VOA (af/as/eu/me): Feature.

Fridays

- 1500 VOA (af/as/eu/me): Preview.
- 1501 VOA (af/as/eu/me): World News.
- 1506 VOA (af/as/eu/me): World News in Depth.
- 1510 VOA (af/as/eu/me): Regional News.
- 1514 VOA (af/as/eu/me): U.S. News.
- 1518 VOA (af/as/eu/me): Sports.
- 1530 VOA (af/as/eu/me): Preview.
- 1531 VOA (af/as/eu/me): World News.
- 1536 VOA (af/as/eu/me): Dateline.
- 1545 VOA (af/as/eu/me): Science/Medicine/Environment.

- 1549 VOA (af/as/eu/me): Business and Economic News.
- 1553 VOA (af/as/eu/me): Women's Business Minute.
- 1554 VOA (af/as/eu/me): Feature.

Saturdays

- 1500 VOA (af/as/eu/me): Preview.
- 1501 VOA (af/as/eu/me): World News.
- 1506 VOA (af/as/eu/me): World News in Depth.
- 1510 VOA (af/as/eu/me): Regional News.
- 1514 VOA (af/as/eu/me): U.S. News.
- 1518 VOA (af/as/eu/me): Sports.
- 1522 VOA (af/as/eu/me): U.S. Feature.
- 1530 VOA (af/as/eu/me): Preview.
- 1531 VOA (af/as/eu/me): World News.
- 1536 VOA (af/as/eu/me): Communications World.
- 1545 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1549 VOA (af/as/eu/me): Business News.
- 1553 VOA (af/as/eu/me): Feature.

HAUSER'S HIGHLIGHTS GUAM: KTWR IN ENGLISH

UTC	To	kHz
0740-0915	As	15200
0800-0930	Au	15330
0930-1100	As	9865
1500-1630	As	15330

includes Pacific DX Report Tue 0900, Thu 0800, Fri 1030, Mon 1615 respectively.
URL: http://www.gospelcon.net/twr/t_guam.htm
(BBC Monitoring)

FREQUENCIES

1600-1700	Algeria, R Algiers Intl	11715af	15160me						
1600-1700	Anguilla, Caribbean Beacon	11775am							
1600-1700	Australia, Radio	5995pa	6020pa	6080as	9500as				
		9770as	11660as						
1600-1700 vl	Australia, VL8A Alice Spg	2310do							
1600-1700 vl	Australia, VL8K Katherine	2485do							
1600-1700 vl	Australia, VL8T Tent Crk	2325do							
1600-1610	Bangladesh, Bangla Betar	4880do	15520do						
1600-1700 vl	Canada, CBC N Quebec Svc	9625do							
1600-1700	Canada, CFRX Toronto	6070do							
1600-1700	Canada, CFVP Calgary	6030do							
1600-1700	Canada, CHNX Halifax	6130do							
1600-1700	Canada, CKZN St John's	6160do							
1600-1700	Canada, CKZU Vancouver	6160do							
1600-1700	China, China Radio Intl	9565af	9620af						
1600-1700 as	Costa Rica, Adv World R	9725na							
1600-1700	Costa Rica, RF Peace Intl	7385am	15050am	21460am					
1600-1627	Czech Rep, Radio Prague	5930eu	17485af						
1600-1700	Ethiopia, Radio	7165af							
1600-1700	France, Radio France Intl	11615af	11705af	12015af	15210af				
		15640af	17850af						
1600-1650	Germany, Deutsche Welle	6170as	7130af	7225as	9735af				
		9875as	11810af	15145as	21695af				
		5850va							
1600-1700	Germany, Sunrise Radio	6130eu	13810me	15625va					
1600-1700	Germany, Overcomer Minist	9355as							
1600-1700	Guam, AWR/KSDA	15330as							
1600-1630	GUAM, TWR/KTWR	6200do							
1600-1700	Ireland, Unt Christian BC	3985va							
1600-1700 as/vl	Italy, IRRS	11690eu							
1600-1630	Jordan, Radio	4935do							
1600-1700	Kenya, Kenya Broadc Corp	9960me							
1600-1700	Lebanon, Voice of Hope	7295do							
1600-1700	Malaysia, Radio	6100pa							
1600-1650 occsnal	New Zealand, R NZ Intl	7255af	15120af						
1600-1700	Nigeria, Voice of	13800va	15340na	18950va					
1600-1630 s	Norway, Radio Norway Intl	7230va	9650me	11570me	15170af				
1600-1630	Pakistan, Radio	15495me	17720af						
1600-1700 vl	Papua New Guinea, NBC	4890do							
1600-1700	Russia, Voice of Russia WS	11775me	11850me	15490me	15515me				
		17570me							
1600-1625	S Africa, Channel Africa	6000af							
1600-1700	Singapore, R Corp Singapore	6150do							
1600-1700	South Korea, R Korea Intl	5975am	9515af	9870af					
1600-1700 as	Sri Lanka, Sri Lanka BC	9730as	15425as						
1600-1700	Swaziland, Trans World R	9500af							
1600-1615	Switzerland, Swiss R Intl	9575as	15265as						
1600-1700 vl	Tanzania, Radio	5050do							
1600-1645	UAE, Radio Dubai	13630eu	13675eu	15395af	21605af				
1600-1700	UK, BBC African Service	3255af							
		21470af							
1600-1606	UK, BBC Asian Service	3915as							
		7160as							
1600-1700	UK, BBC World Service	9410eu							
		15575eu							
		13815am							
		17840am							
		15725am							
1600-1700	USA, KAIJ Dallas TX	15590am							
1600-1700	USA, KTBN Salt Lk City UT	7560pa	9930as						
1600-1700	USA, KWHR Naalehu HI	6035af							
1600-1700	USA, Voice of America	9645as							
		13710af							
		15395as							
		11875na							
		13615na							
		15745eu							
1600-1700	USA, WEWN Birmingham AL	9400am							
1600-1700	USA, WGTG McCaysville GA	13760am	15105am						
1600-1700	USA, WHRI Noblesville IN	7490na	13595na						
1600-1700	USA, WJCR Upton KY	9465am							
1600-1700	USA, WMLK Bethel PA	9955am							
1600-1700	USA, WRMI/R Miami Intl	15420am							
1600-1700	USA, WRNO New Orleans LA	18930af							
1600-1700	USA, WSHB Cypress Crk SC	9475am	12160am	13845am	15685am				
1600-1700	USA, WWCN Nashville TN	11830na	15695va	17555va	17705na				
1600-1700	USA, WYFR Okeechobee FL	17750na	21525va						
1600-1610 a	Vatican State, Vatican R	13765va	15500va						
1600-1630	Vietnam, Voice of	9840eu	12010eu	15010eu					
1600-1700	Zambia, Christian Voice	3330af	4965af						
1600-1700 vl	Zambia, R Zambia/ZNBC 1	4910do							
1600-1700 vl	Zambia, R Zambia/ZNBC 2	6165do							
1606-1615	UK, BBC Asian Service	3915as	5975as	7160as	9740as				
		11750as							
1606-1615 mtwhf	UK, BBC Asian Service	5990as	6195as	15310as					
1610-1615	Bangladesh, Bangla Betar	4880do							
1615-1645 as	UK, BBC African Service	11860af							
1615-1645	UK, BBC African Service	15420af							
1615-1700	UK, BBC Asian Service	3915as	5975as	7160as	9510as				
		9740as	11750as						
1615-1700 as	UK, BBC World Service	9515na							
1615-1630	Vatican State, Vatican R	4005eu	5883eu	7250eu	9645eu				
		11810eu							
1630-1700	Austria, R Austria Intl	6155eu	11855me	13710as	13730va				
1630-1655	Belgium, R Vlaanderen Int	5910eu	7290eu						
1630-1657	Canada, R Canada Intl	6140as	7150as						
1630-1700	Egypt, Radio Cairo	15255af							
1630-1700	Georgia, Voice of Hope	6285eu	12125eu						
1630-1700 a	Germany, Universal Life	12015af							
1630-1700	Slovakia, R Slovakia Intl	5920eu	6055eu	7345eu					
1645-1700	UK, BBC African Service	11860af	15420af						
1650-1700	Eqt Guinea, Radio Africa	15186af							
1650-1700 mtwhf	New Zealand, R NZ Intl	6145pa							

SELECTED PROGRAMS

Sundays

- 1600 VOA (af/as/eu/me): Preview.
- 1601 VOA (af/as/eu/me): World News.
- 1606 VOA (af/as/eu/me): World News in Depth.
- 1610 VOA (af/as/eu/me): Regional News.
- 1614 VOA (af/as/eu/me): U.S. News.
- 1618 VOA (af/as/eu/me): Sports.
- 1622 VOA (af/as/eu/me): U.S. Feature.
- 1630 VOA (af/as/eu/me): Preview.
- 1631 VOA (af/as/eu/me): World News.
- 1636 VOA (af/as/eu/me): Encounter.
- 1645 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1649 VOA (af/as/eu/me): Business News.
- 1653 VOA (af/as/eu/me): Features.

Mondays

- 1600 VOA (af/as/eu/me): Preview.
- 1601 VOA (af/as/eu/me): World News.
- 1606 VOA (af/as/eu/me): World News in Depth.
- 1610 VOA (af/as/eu/me): Regional News.
- 1614 VOA (af/as/eu/me): U.S. News.
- 1618 VOA (af/as/eu/me): Sports.
- 1630 VOA (af/as/eu/me): Preview.
- 1631 VOA (af/as/eu/me): World News in Depth.
- 1645 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1649 VOA (af/as/eu/me): Business and Economic News.
- 1653 VOA (af/as/eu/me): Music Feature.

Tuesdays

- 1600 VOA (af/as/eu/me): Preview.

- 1601 VOA (af/as/eu/me): World News.
- 1606 VOA (af/as/eu/me): World News in Depth.
- 1610 VOA (af/as/eu/me): Regional News.
- 1614 VOA (af/as/eu/me): U.S. News.
- 1618 VOA (af/as/eu/me): Sports.
- 1630 VOA (af/as/eu/me): Preview.
- 1631 VOA (af/as/eu/me): World News in Depth.
- 1645 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1649 VOA (af/as/eu/me): Business and Economic News.
- 1653 VOA (af/as/eu/me): Music Feature.

Wednesdays

- 1600 VOA (af/as/eu/me): Preview.
- 1601 VOA (af/as/eu/me): World News.
- 1606 VOA (af/as/eu/me): World News in Depth.
- 1610 VOA (af/as/eu/me): Regional News.
- 1614 VOA (af/as/eu/me): U.S. News.
- 1618 VOA (af/as/eu/me): Sports.
- 1630 VOA (af/as/eu/me): Preview.
- 1631 VOA (af/as/eu/me): World News in Depth.
- 1645 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1649 VOA (af/as/eu/me): Business and Economic News.
- 1653 VOA (af/as/eu/me): Music Feature.

Thursdays

- 1600 VOA (af/as/eu/me): Preview.
- 1601 VOA (af/as/eu/me): World News.
- 1606 VOA (af/as/eu/me): World News in Depth.
- 1610 VOA (af/as/eu/me): Regional News.
- 1614 VOA (af/as/eu/me): U.S. News.

- 1618 VOA (af/as/eu/me): Sports.
- 1630 VOA (af/as/eu/me): Preview.
- 1631 VOA (af/as/eu/me): World News in Depth.
- 1645 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1649 VOA (af/as/eu/me): Business and Economic News.
- 1653 VOA (af/as/eu/me): Music Feature.

Fridays

- 1600 VOA (af/as/eu/me): Preview.
- 1601 VOA (af/as/eu/me): World News.
- 1606 VOA (af/as/eu/me): World News in Depth.
- 1610 VOA (af/as/eu/me): Regional News.
- 1614 VOA (af/as/eu/me): U.S. News.
- 1618 VOA (af/as/eu/me): Sports.
- 1630 VOA (af/as/eu/me): Preview.
- 1631 VOA (af/as/eu/me): World News in Depth.
- 1645 VOA (af/as/eu/me): Science/Medicine/Environment.
- 1649 VOA (af/as/eu/me): Business and Economic News.
- 1653 VOA (af/as/eu/me): Music Feature.

Saturdays

- 1600 VOA (af/as/eu/me): Preview.
- 1601 VOA (af/as/eu/me): World News.
- 1606 VOA (af/as/eu/me): World News in Depth.
- 1610 VOA (af/as/eu/me): Regional News.
- 1614 VOA (af/as/eu/me): U.S. News.
- 1618 VOA (af/as/eu/me): Sports.
- 1622 VOA (af/as/eu/me): U.S. Feature.
- 1630 VOA (af/as/eu/me): World News.
- 1636 VOA (af/as/eu/me): Press Conference USA.

FREQUENCIES

1700-1800	Algeria, R Algiers Intl	11715af	15160me						
1700-1800	Anguilla,Caribbean Beacon	11775am							
1700-1800	Australia, Radio	5995pa 9770as	6020pa 11880pa	6080as	9500as				
1700-1800 vl	Australia, VL8A Alice Spg	2310do							
1700-1800 vl	Australia, VL8K Katherine	2485do							
1700-1800 vl	Australia, VL8T Tent Crk	2325do							
1700-1800 vl	Canada, CBC N Quebec Svc	9625do							
1700-1800	Canada, CFRX Toronto	6070do							
1700-1800	Canada, CFVP Calgary	6030do							
1700-1800	Canada, CHNX Halifax	6130do							
1700-1800	Canada, CKZN St John's	6160do							
1700-1800	Canada, CKZU Vancouver	6160do							
1700-1800	China, China Radio Intl	7405af	9570af	9745af	11910af				
1700-1800	Costa Rica,RF Peace Intl	7385am	15050am	21460am					
1700-1727	Czech Rep, Radio Prague	5930eu	17485af						
1700-1800	Egypt, Radio Cairo	15255af							
1700-1800	Eqt Guinea, Radio Africa	15186af							
1700-1730	France, Radio France Intl	11615af	15210af	15460af					
1700-1800	Georgia, Voice of Hope	6285eu	12125eu						
1700-1800	Germany, Sunrise Radio	5850va							
1700-1800	Germany,Overcomer Ministr	6130eu	13810me	15625va					
1700-1800	Ireland, Unt Christian BC	6200do							
1700-1800 vl	Italy, IRRS	3985va							
1700-1800	Japan, R Japan/NHK World	6090as 15355af	7110eu	9535na	9825as				
1700-1800	Kenya, Kenya Broadc Corp	4935do							
1700-1800	Lebanon, Voice of Hope	9960me							
1700-1800	Liberia, Star Radio	5880do							
1700-1800	Malaysia, Radio	7295do							
1700-1800 mtwhf	New Zealand, R NZ Intl	6145pa							
1700-1715 vl	Palau, KHBN/Voice of Hope	9965as							
1700-1800 vl	Papua New Guinea, NBC	4890do							
1700-1755	Poland, Polish R Warsaw	6095eu	7285eu						
1700-1800	Romania, R Romania Intl	9510eu	11940eu	15250eu					
1700-1800	Russia, Voice of Russia WS	9775eu 12070eu	9775eu 15350af	11655eu 17570af	11775af				
1700-1730	S Africa, Channel Africa	15240af							
1700-1800	Singapore, RCorp Singapore	6150do							
1700-1715 mtwh	Swaziland, Trans World R	3200af							
1700-1800	Swaziland, Trans World R	9500af							
1700-1800 vl	Tanzania, Radio	5050do							
1700-1800	UK, BBC African Service	3255af 11860af	6005af 15400af	6190af 17830af	9630af				
1700-1745	UK, BBC Asian Service	3915as 9740as	5975as	7160as	9510as				
1700-1800	UK, BBC World Service	6095me 12095eu	6180eu 15485eu	6195eu 15575eu	9410eu 17840na				
1700-1800 w	UK, Merlin Network One	15200eu							
1700-1800	USA, KAIJ Dallas TX	13815am							
1700-1800	USA, KTBN Salt Lk City UT	15590am							
1700-1800	USA, KWHR Naalehu HI	7560pa	9930as						
1700-1800	USA, Voice of America	6110as 9645as 15255va 17895af	6160as 9700me 15395as	7125as 9760af 15410af	7215as 15135eu 15445af				
1700-1800 mtwhf	USA, Voice of America	5990as 9770as	6045as 11870as	7150as 12005as	9550as 12050as				
1700-1800	USA, WEWN Birmingham AL	11875na	13615na	15745eu					
1700-1800	USA, WGTG McCaysville GA	9400am							
1700-1800	USA, WHRI Noblesville IN	9495am	13760am						
1700-1800	USA, WJCR Upton KY	7490na	13595na						
1700-1800	USA, WMLK Bethel PA	9465am							
1700-1800	USA, WRMI/R Miami Intl	9955am							
1700-1800	USA, WRNO New Orleans LA	15420am							
1700-1800	USA, WSHB Cypress Crk SC	18930af							
1700-1800	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am				
1700-1800	USA, WYFR Okeechobee FL	15695eu	17555af						
1700-1800	Zambia, Christian Voice	3330af	4965af						
1700-1800 vl	Zambia, R Zambia/ZNBC 1	4910do							
1700-1800 vl	Zambia, R Zambia/ZNBC 2	6165do							
1700-1800 vl	Zimbabwe, Zimbabwe BC	4828do							
1715-1745 vl	Palau, KHBN/Voice of Hope	9965as							
1715-1800	Swaziland, Trans World R	3200af	9500af						
1730-1755	Belgium, R Vlaanderen Int	11810me	17655af						
1730-1800	Guam, AWR/KSDA	9355as	13660me						
1730-1800	Netherlands, Radio	6020af	7120af	11655af					
1730-1800	Philippines, R Pilipinas	11720as	11890as	15190as					
1730-1800	S Africa, AWR Africa	12130af							
1730-1800 s	Sweden, Radio	13855va	15735va						
1730-1800 mtwhfa	Sweden, Radio	6065va	15735va						
1730-1800 s	UK, BBC Asian Service	9750as	12045as	15565as					
1730-1800	Vatican State, Vatican R	13765af	15570af	17550af					
1745-1800	Bangladesh, Bangla Betar	7190as	9570eu	15520do					
1745-1800	India, All India Radio	7410eu 11935af	9650af 13780af	9950eu 15075af	11620eu				
1745-1800	Palau, KHBN/Voice of Hope	9965as							
1745-1800	UK, BBC Asian Service	5975as	9510as	9740as					
1800-1900	Anguilla,Caribbean Beacon	11775am							
1800-1900 mtwhf	Argentina, RAE	15345eu							
1800-1900	Australia, Radio	5995pa 9770as	6080as 11880pa	9500as					
1800-1900 vl	Australia, VL8A Alice Spg	2310do							
1800-1900 vl	Australia, VL8K Katherine	2485do							
1800-1900 vl	Australia, VL8T Tent Crk	2325do							
1800-1900	Bangladesh, Bangla Betar	7190eu	9570as	15520do					
1800-1900	Brazil, Radio Bras	15265eu							
1800-1900	Canada, CFRX Toronto	6070do							
1800-1900	Canada, CFVP Calgary	6030do							
1800-1900	Canada, CHNX Halifax	6130do							
1800-1900	Canada, CKZN St John's	6160do							
1800-1900	Canada, CKZU Vancouver	6160do							
1800-1900	Costa Rica,RF Peace Intl	15050am	21460am						
1800-1830	Egypt, Radio Cairo	15255af							
1800-1900	Eqt Guinea, Radio Africa	15186af							
1800-1900	Georgia, Voice of Hope	6285eu	12125eu						
1800-1900	Germany, Sunrise Radio	5850va							
1800-1830 s	Germany, Universal Life	11785af							
1800-1900	Germany,Overcomer Ministr	11820af	15625va						
1800-1815	Greece, Voice of	7450eu	9425eu	17705sa	17765na				
1800-1900	India, All India Radio	7410eu 11935af	9650af 13770af	9950eu 15075af	11620eu				
1800-1900	Ireland, Unt Christian BC	6200do							
1800-1900 vl	Italy, IRRS	3985va							
1800-1900	Kenya, Kenya Broadc Corp	4935do							
1800-1900	Kuwait, Radio	11990na							
1800-1900	Lebanon, Voice of Hope	9960me							
1800-1900	Liberia, Star Radio	5880do							
1800-1815	Liberia,LCN/R Liberia Int	5100do							
1800-1900	Malaysia, Radio	7295do							
1800-1900 s	Morocco, RTVM Marocaine	17815af							
1800-1830	Netherlands, Radio	6020af	7120af	11655af					
1800-1850 mtwhf	New Zealand, R NZ Intl	6145pa							
1800-1857	North Korea, R Pyongyang	4404eu 13760na	6575eu	9335eu	11700na				
1800-1830 s	Norway, Radio Norway Intl	7485eu	15705am	15735va	18950af				
1800-1900 vl	Papua New Guinea, NBC	4890do							
1800-1900	Philippines, R Pilipinas	11720as	11890as	15190as					
1800-1900	Russia, Voice of Russia WS	7290eu 9775eu 12045af	7425af 11655eu 12070eu	9675eu 11675eu 15350af	9765eu 11775af 17570af				
1800-1830	S Africa, AWR Africa	3345af							
1800-1830	S Africa, Channel Africa	15240af							
1800-1900	Singapore, RCorp Singapore	6150do							
1800-1900	Sudan, Radio Omdurman	7200af	9200af						
1800-1830	Swaziland, Trans World R	3200af	9500af						
1800-1900 vl	Tanzania, Radio	5050do							
1800-1900	UK, BBC African Service	3255af 17830af	6190af 15400af	9630af					
1800-1830	UK, BBC Asian Service	5975as	9510as	9740as					
1800-1900	UK, BBC World Service	6095me 12095eu	6180eu 15485eu	6195eu 15575eu	9410eu 17840na				
1800-1900 w	UK, Merlin Network One	15200eu							
1800-1900	USA, KAIJ Dallas TX	13815am							
1800-1900	USA, KHBI N Mariana Is	9385af	11945eu						
1800-1900	USA, KJES Mesquite NM	15385am							
1800-1900	USA, KTBN Salt Lk City UT	15590am							
1800-1900	USA, KWHR Naalehu HI	7560pa	9930as						
1800-1900	USA, Voice of America	6035af 15410af	7415af 15580af	9760af 17895af	11975af				
1800-1900	USA, WEWN Birmingham AL	11875na	13615na	15745eu					
1800-1900	USA, WGTG McCaysville GA	9400am							
1800-1900	USA, WHRA Greenbush ME	17655af							
1800-1900	USA, WHRI Noblesville IN	9495am	13760am						
1800-1900	USA, WJCR Upton KY	7490na	13595na						
1800-1900	USA, WMLK Bethel PA	946							

FREQUENCIES

2100-2200	Anguilla, Caribbean Beacon	11775am			
2100-2200	Australia, Radio	9500as	9660pa	12080as	17795pa
2100-2130 vl	Australia, VL8A Alice Spg	2310do			
2100-2130 vl	Australia, VL8K Katherine	2485do			
2100-2200 vl	Australia, VL8T Katherine	5025do			
2100-2130 vl	Australia, VL8T Tent Crk	2325do			
2100-2200 vl	Australia, VL8T Tent Crk	4910do			
2100-2200	Bulgaria, Radio	9700eu	11720eu		
2100-2115 vl	Cameroon, Radio Cameroon	4850do			
2100-2200 vl	Canada, CBC N Quebec Svc	9625do			
2100-2200	Canada, CFRX Toronto	6070do			
2100-2200	Canada, CFVP Calgary	6030do			
2100-2200	Canada, CHNX Halifax	6130do			
2100-2200	Canada, CKZN St John's	6160do			
2100-2200	Canada, CKZU Vancouver	6160do			
2100-2129	Canada, R Canada Intl	7235va	11690va	11890va	13650va
		13670va	15150va	15325va	17820va
2100-2130	China, China Radio Intl	3985eu	6590eu	7170af	7180af
		9535af	9920eu		
2100-2200	Costa Rica, RF Peace Intl	15050am	21460am		
2100-2130	Cuba, Radio Havana	13715eu	13740eu		
2100-2200	Ecuador, HCJB	17735eu	21455am		
2100-2200	Egypt, Radio Cairo	15375af			
2100-2200	Eqt Guinea, Radio Africa	15186af			
2100-2200	Georgia, Voice of Hope	6285eu	12125eu		
2100-2150	Germany, Deutsche Welle	7115as	9670as	9735af	9765as
		11785as	11865af	15135va	
2100-2200	Germany, Overcomer Ministr	3945va	12050va		
2100-2130	Hungary, Radio Budapest	3975eu	11700eu		
2100-2200	India, All India Radio	7150au	7410eu	9910au	9950eu
		11620eu	11715au		
2100-2200 irreg	Iraq, Radio Iraq Intl	11785eu			
2100-2200	Ireland, Unt Christian BC	6200do			
2100-2200 as/vl	Italy, IRRS	3955va			
2100-2200	Japan, R Japan/NHK World	6035pa	9725eu	11850pa	13630na
2100-2200	Liberia, Radio Veritas	3450do			
2100-2115	Liberia, LCN/R Liberia Int	5100do			
2100-2200	Malaysia, Radio	7295do			
2100-2200 vl	Namibia, NBC	3270do	3290do		
2100-2105 smtwh	New Zealand, R NZ Intl	17675pa			
2100-2105 fa	New Zealand, R NZ Intl	11735pa			
2100-2200	Nigeria, FRCN/Radio	3326do	4770do	4990do	
2100-2157	North Korea, R Pyongyang	4405eu	6575eu	9335eu	11700na
		13760na			
2100-2200 vl	Papua New Guinea, NBC	4890do			
2100-2200	Romania, R Romania Intl	7105eu	9550eu	9690eu	
2100-2130	Serbia, Radio Yugoslavia	6100eu	6185eu		
2100-2200	Singapore, R Corp Singapore	6150do			
2100-2130	South Korea, R Korea Intl	3970eu	6480eu	15575eu	
2100-2200 s	Spain, R Exterior Espana	9855eu	11830af		
2100-2130	Switzerland, Swiss R Intl	3985eu			
2100-2200	Syria, Radio Damascus	12085na	13610na		
2100-2200 vl	Tanzania, Radio	5050do			
2100-2130	Turkey, Voice of	7210as			
2100-2110	Uganda, Radio	4976do			
2100-2200	UK, BBC African Service	3255af	6005af	6190af	11835af
2100-2200	UK, BBC Asian Service	3915as	5965as	5975pa	6195as
		9740pa	11945as		
2100-2200	UK, BBC World Service	5975am	6180eu	6195eu	7325eu
		9410eu	12095sa		
2100-2200 w	UK, Merlin Network One	11915eu	11985eu	13630va	
2100-2200	Ukraine, R Ukraine Intl	5905eu	6030eu	7240eu	7410eu
		9550na	9560eu	12040na	13590eu
2100-2200	USA, KAIJ Dallas TX	13815am			
2100-2200	USA, KTBN Salt Lk City UT	15590am			
2100-2200	USA, KWHR Naalehu HI	15405as	17555pa		
2100-2200	USA, Voice of America	6035af	6095me	7375af	7415af
		9535af	9760eu	11870pa	11975af
		15185as	15410af	15445af	15580af
		17725af	17735as		
2100-2200	USA, WEWN Birmingham AL	5825na		15745eu	
2100-2200	USA, WGTG McCaysville GA	9400am			
2100-2200	USA, WHRA Greenbush ME	15460af			
2100-2200	USA, WHRI Noblesville IN	9495am	13760am		
2100-2200	USA, WINB Red Lion PA	13790am			
2100-2200	USA, WJCR Upton KY	7490na	13595na		
2100-2200	USA, WRMI/R Miami Intl	9955am			
2100-2200	USA, WRNO New Orleans LA	15420am			
2100-2200	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
2100-2200	USA, WYFR Okeechobee FL	11855na	15215va	15695va	17845va
2100-2200	Zambia, Christian Voice	3330af	4965af		
2100-2200 vl	Zambia, R Zambia/ZNBC 1	4910do			
2100-2200 vl	Zambia, R Zambia/ZNBC 2	6165do			
2100-2200 vl	Zimbabwe, Zimbabwe BC	4828do			
2105-2200	New Zealand, R NZ Intl	17675pa			
2115-2200	Egypt, Radio Cairo	9900eu			
2115-2130 mtwhf	UK, BBC Caribbean Report	5975ca	15390ca	17715ca	
2115-2130 as	UK, BBC World Service	5975am			
2130-2200	Australia, Radio	13755pa			

2130-2200	Austria, R Austria Intl	5945eu	6155eu	13730va	
2130-2200	China, China Radio Intl	6590eu	9920eu		
2130-2157	Czech Rep, Radio Prague	11600va			
2130-2200	Ghana, Ghana Broadc Corp	3366do			
2130-2200	Guam, AWR/KSDA	15310as			
2130-2155	Moldova, R Moldova Intl	7520eu			
2130-2200	South Korea, R Korea Intl	15575eu			
2130-2200 as	Sweden, Radio	6065eu	9430af		
2130-2145 t f	UK, BBC Calling Falklands	11680sa			
2130-2200	USA, Voice of America	6040me	6095me	9535af	9760eu
		11870pa	15185as	17735as	
2130-2200 smtwhf	USA, Voice of America	6035af	7375af	7415af	11975af
		15410af	15445af	15580af	17725af
2130-2200	Uzbekistan, R Tashkent	7105eu	9540eu	9545eu	

2200 UTC

2200-2300	Anguilla, Caribbean Beacon	11775am			
2200-2300	Australia, Radio	9660pa	12080as	13755pa	15510pa
		17795pa			
2200-2300 vl	Australia, VL8K Katherine	5025do			
2200-2300 vl	Australia, VL8T Tent Crk	4910do			
2200-2300	Canada, CBC N Quebec Svc	9625do			
2200-2300	Canada, 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	5960am	9755am	11705as	13670am
		15305am			
2200-2300	China, China Radio Intl	9880eu			
2200-2300	Costa Rica, RF Peace Intl	15050am	21460am		
2200-2245	Egypt, Radio Cairo	9900eu			
2200-2300	Eqt Guinea, Radio Africa	15186af			
2200-2300	Germany, Overcomer Ministr	3945va	12050va		
2200-2215	Ghana, Ghana Broadc Corp	4915do			
2200-2230	India, All India Radio	7150au	7410eu	9910au	9950eu
		11620eu	11715au		
2200-2300 irreg	Iraq, Radio Iraq Intl	11785eu			
2200-2300	Ireland, Unt Christian BC	6200do			
2200-2225	Italy, RAI Intl	6150pa	9675pa	11900as	
2200-2215	Liberia, LCN/R Liberia Int	5100do			
2200-2300	Malaysia, Radio	7295do			
2200-2300	New Zealand, R NZ Intl	17675pa			
2200-2215	Nigeria, FRCN/Radio	3326do	4770do	4990do	
2200-2230 s	Norway, Radio Norway Intl	13830au			
2200-2300 vl	Papua New Guinea, NBC	9675do			
2200-2215	Sierra Leone, SLBS	3316do			
2200-2300	Singapore, R Corp Singapore	6150do			
2200-2205	Syria, Radio Damascus	12085na	13610na		
2200-2300	Taiwan, Radio Taipei Intl	15600eu	17750eu		
2200-2300	Turkey, Voice of	7190eu	9655na		
2200-2300	UK, BBC African Service	11835af	15400af		
2200-2300	UK, BBC Asian Service	5965as	6195as	7110as	9660as
		9890as	11955as	12080ps	
2200-2300	UK, BBC World Service	5975am	6175na	6195na	7325eu
		9410eu	9590am	9915sa	12095sa
2200-2300 w	UK, Merlin Network One	9645eu	9780na	11915eu	11985na
		13690na			
2200-2300	USA, KAIJ Dallas TX	13815am	15725am		
2200-2300	USA, KTBN Salt Lk City UT	15590am			
2200-2300	USA, KWHR Naalehu HI	17555pa			
2200-2300	USA, Voice of America	7215as	9705as	9770as	11760as
		15185as	15290as	15305as	17735as
		17820as			
2200-2230 mtwhf	USA, Voice of America	6035af	7340af	7375af	7415af
		11975af			
2200-2300	USA, WEWN Birmingham AL	5825na	9975eu	13615na	
2200-2300	USA, WGTG McCaysville GA	9400am			
2200-2300	USA, WHRA Greenbush ME	15460af			
2200-2300	USA, WHRI Noblesville IN	5745am	9495am		
2200-2300	USA, WINB Red Lion PA	13790am			
2200-2300	USA, WJCR Upton KY	7490na	13595na		
2200-2300	USA, WRMI/R Miami Intl	9955am			
2200-2300	USA, WRNO New Orleans LA	15420am			
2200-2300	USA, WSHB Cypress Crk SC	13770eu	15285sa		
2200-2300	USA, WWCR Nashville TN	5070am	7435am	9475am	13845am
2200-2300	USA, WYFR Okeechobee FL	11855na	15215va	17845va	
2200-2205 vl	Zambia, R Zambia/ZNBC 1	4910do			
2200-2210 vl	Zambia, R Zambia/ZNBC 2	6165do			
2230-2300	Canada, R Canada Intl	5960am	9755am	13670am	
2230-2300	Cuba, Radio Havana	9550am			
2230-2257	Czech Rep, Radio Prague	9435na	11600na		
2230-2300	UK, BBC World Service	5975am	6175na	9590na	9915sa
		12095sa			
2240-2250	Greece, Voice of	9420au	11645au		
2245-2300	Ghana, Ghana Broadc Corp	3366do	4915do		
2245-2300	India, All India Radio	7410as	9705as	9950as	11620as
2245-2300	Vatican State, Vatican R	7305au	9600au	11830au	

FREQUENCIES

2300-0000	Anguilla, Caribbean Beacon	6090am				2300-0000	UK, BBC World Service	5975am	6175na	9590na	9915sa
2300-0000	Australia, Radio	9660pa	12080as	13755pa	15510pa	2300-0000 w	UK, Merlin Network One	12095sa			
2300-0000 vl	Australia, VLBK Katherine	5025do				2300-0000	USA, KAIJ Dallas TX	9645eu	9780na	11985na	13690na
2300-0000 vl	Australia, VLBT Tent Crk	4910do				2300-0000	USA, KTBN Salt Lk City UT	13740am	13815am	15725am	
2300-0000	Bulgaria, Radio	9485na	11720na			2300-0000	USA, KWHR Naalehu HI	15590am			
2300-0000	Canada, CBC N Quebec Svc	9625do				2300-0000	USA, Voice of America	17510as	17555pa		
2300-0000	Canada, CFRX Toronto	6070do				2300-0000	USA, WEWN Birmingham AL	7215as	9705as	9770as	11760as
2300-0000	Canada, CFVP Calgary	6030do				2300-0000	USA, WGTG McCaysville GA	15185as	15290as	15305as	17735as
2300-0000	Canada, CHNX Halifax	6130do				2300-0000	USA, WHRA Greenbush ME	17820as			
2300-0000	Canada, CKZN St John's	6160do				2300-0000	USA, WHRI Noblesville IN	5825na	9975eu	13615na	15375na
2300-0000	Canada, CKZU Vancouver	6160do				2300-0000	USA, WINB Red Lion PA	5085am			
2300-2329	Canada, R Canada Intl	5960am 15305am	9755am	11895am	13670am	2300-0000	USA, WJCR Upton KY	15460af			
2300-0000	Costa Rica, RF Peace Intl	15050am	21460am			2300-0000	USA, WRMI/R Miami Intl	5745am	9495am		
2300-2330	Cuba, Radio Havana	9550am				2300-0000	USA, WRNO New Orleans LA	13790am			
2300-0000	Egypt, Radio Cairo	9900na				2300-0000	USA, WSHB Cypress Crk SC	7490na	13595na		
2300-2350	Germany, Deutsche Welle	5975as	6090as	7235as	9690as	2300-0000	USA, WWCR Nashville TN	9955am			
2300-0000	Germany, Overcomer Minist	3945va				2300-0000	USA, WYFR Okeechobee FL	7355am			
2300-2330 as	Guam, AWR/KSDA	11775as				2300-0000	Vatican State, Vatican R	13770af	15285sa		
2300-0000 mtwhf	Guam, AWR/KSDA	11775as				2300-0000	Kyrgyzstan, Kyrgyz Radio	5070am	7435am	9475am	13845am
2300-0000	India, All India Radio	7410as	9705as	9950as	11620as	2300-0000	Canada, R Canada Intl	11855na			
2300-0000	Ireland, Unt Christian BC	6200do				2300-2315	Ghana, Ghana Broadc Corp	7305au	9600au	11830au	
2300-2315	Liberia, LCN/R Liberia Int	5100do				2310-2315	Netherlands, Radio	4010do	4050do		
2300-0000	Malaysia, Radio	7295do				2329-2359 as	Vietnam, Voice of	11895am	15305am		
2300-0000	New Zealand, R NZ Intl	17675pa				2329-2359	Greece, Voice of	5960am	9755am	13670am	
2300-2315	Nigeria, FRCN/Radio	3326do	4770do	4990do		2330-0000 vl	Sierra Leone, SLBS	4915af			
2300-2357	North Korea, R Pyongyang	11335na	11700na	13760na	15130na	2330-0000	UK, BBC Asian Service	6020na	6165na	9845na	
2300-2330 s	Norway, Radio Norway Intl	9935as	11735sa	13805am	13830as	2335-2345		9840eu	12020eu	15010eu	
2300-0000 vl	Papua New Guinea, NBC	9675do				2335-2345		9395sa	9425sa	11595sa	11645sa
2300-0000	Romania, R Romania Intl	6130eu	7195eu	9570na	11830na	2345-0000 mtwhf		3316do			
2300-0000	Singapore, RCorp Singapore	6150do						3915as			
2300-0000	UK, BBC Asian Service	3915as 7110as	5965as 11945as	6035as 11955as	6195as 17790as						

SELECTED PROGRAMS

Sundays

2300	USA, VOA Washington DC (as): Preview.
2301	USA, VOA Washington DC (as): World News.
2306	USA, VOA Washington DC (as): World News in Depth.
2310	USA, VOA Washington DC (as): Regional News.
2314	USA, VOA Washington DC (as): U.S. News.
2318	USA, VOA Washington DC (as): Sports.
2322	USA, VOA Washington DC (as): U.S. Feature.
2330	USA, VOA Washington DC (as): Preview.
2331	USA, VOA Washington DC (as): World News.
2336	USA, VOA Washington DC (as): Issues in the News.

Mondays

2300	USA, VOA Washington DC (as): Preview.
2301	USA, VOA Washington DC (as): World News.
2306	USA, VOA Washington DC (as): World News in Depth.
2310	USA, VOA Washington DC (as): Regional News.
2314	USA, VOA Washington DC (as): U.S. News.
2318	USA, VOA Washington DC (as): Sports.
2330	USA, VOA Washington DC (as): Preview.
2331	USA, VOA Washington DC (as): World News.
2336	USA, VOA Washington DC (as): Dateline.
2345	USA, VOA Washington DC (as): Science/Medicine/Environment.
2349	USA, VOA Washington DC (as): Business and Economic News.
2353	USA, VOA Washington DC (as): Women's Business Minute.
2354	USA, VOA Washington DC (as): Feature.

Tuesdays

2300	USA, VOA Washington DC (as): Preview.
2301	USA, VOA Washington DC (as): World News.
2306	USA, VOA Washington DC (as): World News in Depth.
2310	USA, VOA Washington DC (as): Regional News.
2314	USA, VOA Washington DC (as): U.S. News.
2318	USA, VOA Washington DC (as): Sports.
2330	USA, VOA Washington DC (as): Preview.
2331	USA, VOA Washington DC (as): World News.
2336	USA, VOA Washington DC (as): Dateline.
2345	USA, VOA Washington DC (as): Science/Medicine/Environment.
2349	USA, VOA Washington DC (as): Business and Economic News.
2353	USA, VOA Washington DC (as): Women's Business Minute.
2354	USA, VOA Washington DC (as): Feature.

Wednesdays

2300	USA, VOA Washington DC (as): Preview.
2301	USA, VOA Washington DC (as): World News.

2306	USA, VOA Washington DC (as): World News in Depth.
2310	USA, VOA Washington DC (as): Regional News.
2314	USA, VOA Washington DC (as): U.S. News.
2318	USA, VOA Washington DC (as): Sports.
2330	USA, VOA Washington DC (as): Preview.
2331	USA, VOA Washington DC (as): World News.
2336	USA, VOA Washington DC (as): Dateline.
2345	USA, VOA Washington DC (as): Science/Medicine/Environment.
2349	USA, VOA Washington DC (as): Business and Economic News.
2353	USA, VOA Washington DC (as): Women's Business Minute.
2354	USA, VOA Washington DC (as): Feature.

Thursdays

2300	USA, VOA Washington DC (as): Preview.
2301	USA, VOA Washington DC (as): World News.
2306	USA, VOA Washington DC (as): World News in Depth.
2310	USA, VOA Washington DC (as): Regional News.
2314	USA, VOA Washington DC (as): U.S. News.
2318	USA, VOA Washington DC (as): Sports.
2330	USA, VOA Washington DC (as): Preview.
2331	USA, VOA Washington DC (as): World News.
2336	USA, VOA Washington DC (as): Dateline.
2345	USA, VOA Washington DC (as): Science/Medicine/Environment.
2349	USA, VOA Washington DC (as): Business and Economic News.
2353	USA, VOA Washington DC (as): Women's Business Minute.
2354	USA, VOA Washington DC (as): Feature.

Fridays

2300	USA, VOA Washington DC (as): Preview.
2301	USA, VOA Washington DC (as): World News.
2306	USA, VOA Washington DC (as): World News in Depth.
2310	USA, VOA Washington DC (as): Regional News.
2314	USA, VOA Washington DC (as): U.S. News.
2318	USA, VOA Washington DC (as): Sports.
2330	USA, VOA Washington DC (as): Preview.
2331	USA, VOA Washington DC (as): World News.
2336	USA, VOA Washington DC (as): Dateline.
2345	USA, VOA Washington DC (as): Science/Medicine/Environment.
2349	USA, VOA Washington DC (as): Business and Economic News.
2353	USA, VOA Washington DC (as): Women's Business Minute.
2354	USA, VOA Washington DC (as): Feature.

Saturdays

2300	USA, VOA Washington DC (as): Preview.
2301	USA, VOA Washington DC (as): World News.
2306	USA, VOA Washington DC (as): World News in Depth.
2310	USA, VOA Washington DC (as): Regional News.
2314	USA, VOA Washington DC (as): U.S. News.
2318	USA, VOA Washington DC (as): Sports.
2322	USA, VOA Washington DC (as): U.S. Feature.
2330	USA, VOA Washington DC (as): Preview.
2331	USA, VOA Washington DC (as): World News.
2336	USA, VOA Washington DC (as): Communications World.
2345	USA, VOA Washington DC (as): Science/Medicine/Environment.
2349	USA, VOA Washington DC (as): Business News.
2353	USA, VOA Washington DC (as): Feature.

THANK YOU...

ADDITIONAL CONTRIBUTORS TO THIS MONTH'S SHORTWAVE GUIDE:

John Babbis, Silver Spring, MD; Dan Coffey, Santa Rita, Guam; Bob Fraser, Cohasset, MA; Clyde W. Harmon, Anniston, AL; Glenn Hauser, Enid, OK; *DX Report & WOR*; Frank Hillton, Charleston, SC; Al Quaglieri, Albany, NY; Adrian Sandsbury, R NZ Intl; Donald Scherer, USA; Sam Wright, Biloxi, MS; BBCMS/World Media; *Cumbre DX*; Usenet newsgroups.

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Snow Static!

To beat the heat, let's set the stage for an evening of good winter DX listening: The weather has turned cool, the yard work is completed, and the forecast is calling for some light snow. You turn on your new receiver and the WWV/H numbers are excellent, confirming the propagation forecasts that you have seen in *MT*.

The evening listening session starts on a very positive note; the signals from overseas and from all the areas that you wish to listen to are coming in at a very reasonable level. It should be an evening to remember. But suddenly, the static starts building up and in a few minutes it becomes practically impossible to listen to any stations. What is happening? It sounds like hail on a tin roof!

You check around the house to see if any apparatus has been turned on; you walk up to the teenager's room in search of anything that could cause interference (you never know what new "toys" could have been brought home!), and after ascertaining that there is nothing new in the house you decide to look outside. No, the next door neighbor has not installed a new automatic yard light; no, the street light is not flickering, but you do notice that snow is falling and that the wind is picking up and blowing the snow across the bare antenna wire. As you are looking you realize that as the wind picks up so does the level of the static in your radio. What is happening?

Very simply, the snow — dried, or entrained, by evaporation in the wind — is causing electrostatic electricity to be produced on your antenna, charging it with a fairly high voltage. Crash! The static subsides and starts building up again. The electric charge has dissipated like a condenser discharging, but the snow blowing across the antenna keeps rebuilding the electrical charge. After a while, the snow no longer causes any problems and you can go back to DXing.

The same scenario can occur in a sand-storm, but that's not a problem for most of us!

The snow being blown across the bare wire and producing a charge is a phenomena very similar to walking across a carpet while dragging your feet. When you touch a metal object you discharge the electrical charge, but if you continue to drag your feet across the carpet you keep repeating the process.

Flying a propeller-driven aircraft at a low altitude produces a very similar phenomena called "St. Elmo's fire." The dry snow or just heavy, dry, air pollution rubbing on the skin of

OPTIMUM WORKING FREQUENCIES (MHz)
For the Period 15 July to 14 August 1998 Flux=132 SSN=91
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	20	19	19	18	16	15	14	14	13	13	11	11	13	14	16	17	18	19	20	20	21	21	20	20
WESTERN EUROPE	14	13	12	11	11	10	11	11	10						14	16	17	17	16	16	16	17	16	15
EASTERN EUROPE (P)	12	12	13	13	14	15	14								14	15	15	16	16	16	16	15	14	13
MEDITERRANEAN	17	16	15	15	14	15	13	13							15	17	17	18	19	19	18	17	17	17
MIDDLE EAST (P)	13	13	15	17	17	16	14								14	16	18	19	18	16	15	15		
CENTRAL AFRICA	17	16	14	12	11	11	13	12							16	18	19	20	21	21	21	20	19	18
SOUTH AFRICA	12	11	10	9	9	8	12	13	13						15	16	18	20	20	21	19	17	15	14
SOUTH EAST ASIA (P)	19	18	18	18	18	18	17	15			12	11	11	11	12	14	16	18	18	17	17	16	16	18
FAR EAST	18	16	16	16	17	16	15	13	12	11	11	10	10	10	11	13	13	13	13	13	15	16	17	18
AUSTRALIA	21	22	22	22	21	19	17	16	16	15	15	14	14	13	13	13	13					21	21	21
TO/FROM US MIDWEST																								
SOUTH AMERICA	18	17	17	15	14	13	13	12	12	11	10	11	13	14	16	17	19	19	20	19	19	19	19	19
WESTERN EUROPE	16	14	14	13	12	12	12	11	11				14	15	16	17	17	17	16	16	16	17	17	18
EASTERN EUROPE	12	12	12	13	14	13	11								14	15	15	15	16	16	16	15	14	13
MEDITERRANEAN	16	16	15	15	14	13	12								15	16	17	18	18	18	17	17	17	17
MIDDLE EAST (P)	13	13	14	17	15	13									15	17	18	19	19	18	16	15	14	13
CENTRAL AFRICA	18	16	14	12	11	10	13	13							16	18	20	20	21	21	21	20	19	18
SOUTH AFRICA	12	11	10	10	9	9	13	13	13						15	16	18	20	21	21	21	19	17	15
SOUTH EAST ASIA (P)	17	17	18	18	17	15									10	11	12	15	17	18	17	17	16	16
FAR EAST	17	17	17	17	15	14	12	11	11	10	10	11	12	13	14	14	13	13	14	15	16	17	18	18
AUSTRALIA	20	20	20	20	18	16	15	14	14	13	13	13	13	13	13							21	21	20
TO/FROM US EAST COAST																								
SOUTH AMERICA	16	15	14	13	12	12	12	11	11	10	9	10	14	15	16	17	18	18	18	18	17	17	17	17
WESTERN EUROPE	14	13	12	12	11	11	11	10	9			11	13	15	17	18	18	18	17	16	16	17	16	16
EASTERN EUROPE	12	11	11	12	12	11	10						13	15	17	17	16	16	17	18	18	17	15	14
MEDITERRANEAN	15	15	14	14	13	13	12						14	15	16	17	17	18	18	17	17	17	16	15
MIDDLE EAST (P)	14	14	14	15	13								15	16	17	18	18	18	18	17	17	16	15	14
CENTRAL AFRICA	18	17	14	13	11	11	14	14	13			15	17	18	19	20	21	21	21	21	20	20	19	19
SOUTH AFRICA	12	11	10	10	9	9	13	14	13	13	14	16	18	19	20	21	21	21	21	21	20	17	16	14
SOUTH EAST ASIA (P)	17	17	17	15									12	15	17	18	18	17	17	17	17	16	16	15
FAR EAST	17	18	18	17	15				11	10	11	12	13	15	15	15	15				15	16	17	17
AUSTRALIA	19	19	18	16	15	14	13	13	13	13	13	12	14	13	13							20	19	19

*Unfavorable conditions: Search around the last listed frequency for activity.

the aircraft will charge the aircraft with a high electrostatic voltage. The phenomenon is especially breathtaking at night when the propeller turns into a disk of blue fire and the wings take on an eerie bluish tinge! If your cargo happens to be explosive material, you feel a small electric current going up your spine... (I know: I've been there!)

The snow static problem normally occurs early in the winter during the first snowfalls and sometimes when the snow is dry in mid-winter where temperature is very low. The voltage produced on your antenna is quite large, but I

have never heard of any problems being caused by this buildup. As a safety measure I know that many DX listeners install a resistor of large value, like 1 megohm, between their antenna lead-in and ground to drain any electrostatic charge that might build up on the antenna. Using insulated wire for the antenna can also alleviate this problem.

I hope we've helped you cool down. Remember: if the summer weather forecast is calling for thunderstorms, ground your antenna. Enjoy the summer and hope for the DX season to start soon!

◀ Which Way VOA? ▶

By now, Voice of America (VOA) listeners are aware that the station implemented a reorganization of its English language program schedule on May 29. The change was swift and sharp. The first public announcement of the changes came on April 28 and even VOA staffers were largely taken by surprise.

VOA News Now, the umbrella title of the new format, consists of a rotating two hour block containing a number of short news and information segments (see adjoining chart). Under the new format, much of the VOA block programming that was part of VOA Worldwide English has been discontinued. The programs retained have been refitted to the new format. (Special English programs have been retimed and placed on separate frequencies.)

My first reaction was predictable for a long-time shortwave listener in the throes of middle age angst. I hated it. But a less emotional analysis of the VOA's move suggests a more sympathetic (but not uncritical) listener response might be more appropriate: Keep in mind that VOA programming is not intended for domestic US listeners.

First of all, the change is not all that radical or unwelcome. VOA News Now looks curiously similar to the popular but discontinued Monitoradio format used by the defunct World Service of the Christian Science Monitor. VOA News Now also resembles a longer version of the successful magazine-style formats in use for a number of years by several stations like Swiss Radio International, Radio Austria International and Radio Sweden.

Dr. Kim Elliott, producer of VOA's excellent *Communications World* program, previously served as the station's audience research officer. Dr. Elliott points out that analyses going back to the early '90s consistently indicate shrinking audiences for the VOA's traditional full-length programs with a corresponding change in habits that show people are listening in shorter time segments and looking primarily for news and information not available to them via domestic media sources. The News Now approach is a direct result of these findings. In fact, in 1993 Dr. Elliott proposed a revised program grid for the VOA that in many respects closely resembles the format now adopted some five years later.

From inside, the VOA has itself been pressured on a number of fronts. It is not well understood by any level within the government that sponsors it. An alphabet soup of alternative services which largely overlap its mission are

being proposed and implemented usually with resources that used to belong to the VOA alone. Therefore, to survive, the VOA must both distinguish itself from these interloping services and demonstrate that it is serving its audience, however the latter is defined.

In a more general sense, any critique of the changes implemented by a broadcaster must take note of the fact that almost all of the assumptions that served as the philosophical underpinnings for international broadcasting for the past half century are gone. Lacking the old Cold War imperatives and the revenues for international broadcasting they generated, the entire field of international broadcasting is being forced away from its long-standing commitment to public service broadcasting values (however that might have been defined by individual stations) and toward a model that is governed more by market-oriented, commercial values. Stations are forced to come up with new justifications for their existence.

We are, for better or worse, in uncharted territory where tradition is no longer inviolate and any sense of stability or permanency is elusive. Everything that touches our lives today is a "beta test," it seems, and international broadcasting is no exception.

Yet, one cannot help but note that, as we embark in this new era, there has often been a yawning contradiction between the results intended and the changes implemented. Something must distinguish one station from the others if listeners are to be enticed to tune in. Yet, attempts to pursue new and larger audiences usually result in services that have little to distinguish them from their competitors, if the results produced by the domestic US commercial model are any guide. The experience of the cable television industry might argue that it's preferable to cultivate and maintain a loyal but smaller audience than to pursue a larger but much less committed one.

Changes like these can be difficult to accept. A loyal listener cannot help but feel abandoned when favorite programs are dropped. One key attraction to shortwave programming has been that it offers something unavailable from other media. It's why one puts up with the medium's obvious technical shortcomings. But if what's on shortwave increasingly apes what is already available elsewhere, there's less reason to listen.

In the final analysis, then, VOA News Now will not be the last word. More changes will undoubtedly evolve within the News Now format. And, if these changes don't produce the

desired results, more changes will be forthcoming. Welcome to the 21st century!

John Figliozzi is editor of Radio Shack's *The Worldwide Shortwave Listening Guide*.

VOA ENGLISH SCHEDULE

UTC Daily Every Hour

:00 Preview
:01 World News
:06 World News in Depth
:10 Regional News
:14 U.S. News
:18 Sports
:22 U.S. Features

UTC Monday Through Friday

Even UTC Hours

:30 Preview
:31 World News in Depth
:45 Science/Medicine/Environment
:49 Business and Economic News
:53 Music Feature

Odd UTC Hours

:30 Preview
:31 World News
:36 Dateline
:45 Science/Medicine/Environment
:49 Business and Economic News
:53 Women's Business Minute
:54 Feature

UTC Saturday

Even UTC Hours

:30 World News
:36 Press Conference USA

Odd UTC Hours

:30 Preview
:31 World News
:36 Communications World*
:45 Science/Medicine/Environment
:49 Business News
:53 Feature

UTC Sunday

Even UTC Hours

:30 Preview
:31 World News
:36 Encounter
:45 Science/Medicine/Environment
:49 Business News
:53 Features

Odd UTC Hours

:30 Preview
:31 World News
:36 Issues in the News

*In three segments rotated around the clock. Segment A: 0136, 1336, 1936. Segment B: 0336, 1536, 2136. Segment C: 0536, 1136, 1736, 2336.

Exceptions: "Talk to America" M-F 1706. VOA English to Africa programs (see May's Programming Spotlight column) preempt News Now on VOA frequencies targeted to Africa. "Daybreak Africa" M-F 0300, 0430, 0600; "Africa World Tonight" M-F 1630, 1800, 2000; "The World of Music" M-F 1930; "Nightline Africa" T/S 1600, 2000; "Voices of Africa" T 1910, S 1710; "Music Time in Africa" S 1730, 1930.

(Times and days are in UTC. For frequencies and selected programming, refer to the "Shortwave Guide" section.)

Mobile Emergency Preparedness

In line with this month's theme of emergency preparedness, let's take a practical look at keeping ready to face emergencies while in the mobile mode. This can cover a lot of interesting ground. For example, I am routinely mobile in my car when operating as part of many Amateur Radio Emergency Service (ARES) and Radio Amateur Emergency Service (RACES) activities. Likewise, I have come upon accident scenes and been able to render communications assistance to get authorities involved with good speed.

Further, having spent a chunk of my life in hurricane country, I've known the need to use my vehicle (and its several radios) to "get the heck out of Dodge" as the winds and waters came up the beach. I've also had to dig a car out and keep it moving during the worst snow storm of the century in the Northeast because I was considered "essential personnel" at the hospital I was working at during that amazing time.

In all cases and places, I was very happy that my vehicle was well equipped with the tools of the radio trade, both for listening and for receiving.

I have always maintained that knowledge is power. In a real emergency, the only source of true, up to the minute knowledge will be radio communications. So if you plan to go mobile — either to help in an emergency or to get away from an emergency situation in the safest way possible — you need to be prepared.

■ Maintain a mean machine

Let's start with the obvious. Take all necessary steps to assure your car/truck/van or whatever is in good working order. You're not going to get a whole lot of mobile emergency radio operations done if your vehicle isn't running right. Get in the habit of checking the fluid levels, tire pressure and condition, hoses and belts at least weekly. Follow your vehicle's manual for all scheduled maintenance. Most new cars list a light duty and heavy duty service schedule. Go with the heavy duty just to make sure your rig will always be ready to take you either to or from that emergency scene as the need requires.

Good mobile emergency practice includes keeping your fuel tank topped off. When things start to get exciting, you never know

when you'll get a shot at a service station, so keep the needle on "F". A side effect of this practice is you will generally cut down on residual moisture forming in your fuel tank that can cause fuel line freeze-up during winter conditions.

■ Power to the Radio!

Before you start thinking you're reading *Popular Mechanics* instead of *Monitoring Times*, let's move closer to the subject of radio. You need to take steps

to make sure that your vehicle's electrical system is always operating in peak condition. Again, look at the belts. Your car's alternator system depends on a good belt set at the proper tension. Check your electrical system out according to the service manual.

If your vehicle is equipped with meters instead of "idiot" lights, learn how to read them to assure you don't run your battery down while operating a few radios. If you don't have adequate electrical system monitoring in the form of voltage and amperage meters, consider installing them. Adding meters from your local auto supply store can be done for under twenty-five dollars. It should only take a few hours and anybody with a little electronic aptitude (such as a dedicated radio monitor) can do it by following the directions.

Speaking of auto electronics: Many modern cars have more computer gear in them than my radio shack does. This has raised some new problems because of either interference from the car's electronic systems or, even worse, interference from your radio gear to your car's system! I know of more than one ham who was driving down the interstate, keyed down their microphone, and their car stalled.



Fortunately, all major car manufacturers have had experience with getting mobile radios and motor vehicles to work together. Check with a local repair department for your vehicle's brand and see if any service bulletins exist for your make and model that address the use of add-on radio gear. You will find the most common problems can be resolved by good grounding and keeping cables away from each other.

Most mobile radios operate best hooked directly to the vehicle's battery by the shortest route safely possible. This goes a long way toward cutting down interference. There are a couple of things you need to remember if you're planning to do this. First, make sure the cable you choose to route the power is heavy enough for the load. Many moderate-powered VHF transceivers draw in excess of 15 amps in key down mode, so when in doubt go heavier.

Next, make sure you install adequate fuses in both the hot and ground leads coming and going from the battery. This helps ensure that a short circuit will not turn into a bigger problem if a connection goes bad under the hood. It's also good practice to keep the fuses as close to the battery as possible.

Finally, take extra care when routing the power wires through the firewall into the driver's compartment. Make sure that the wires are run along a route that won't put them in danger of fraying or wearing against any surface, and that the hole you find or drill through the firewall has a sound rubber grommet to protect the wires. I know this is a bit more work than plugging an adapter into a cigarette lighter, but it is the only way to go for a safe, interference-free radio installation. Again, when in doubt, check your service manual or consult a professional mechanic, preferably one with extensive experience in automotive electronic systems.

■ Get the Signal

Now let's move to the other end of the car — the most likely place to install any auxiliary antennas. Generally, the ideal place to install an antenna is to drill a hard mount hole in the dead center of your roof. However, few folks want to modify their car in this way as it cuts down on resale value significantly.

The standard compromise is a choice between magnetic mount antennas, trunk lip mount antennas and thru-the-glass inductively coupled antennas. Over the years I've used all three (and I've drilled a few roof holes, too). For use day in and day out, the trunk lip style of antenna mounting has seemed to serve me best. An added benefit: in emergency operations, you may be a bit too busy to hop out of your truck to reset a fallen over mag mount antenna.

Inductively coupled antennas do work, but those I have tried never seemed to compare favorably in performance to other types. If you are using a leased vehicle or just don't want to scratch the paint, they are a reasonable compromise.

If you're a ham into HF (High Frequency) mobile operation, you are likely to use a longer radiator, usually mounted on the car's bumper. If this is the case, you need to remember that some newer car's federally mandated "five-mile-an-hour-crash" bumpers are not mechanically well grounded to the vehicle's frame. A bit of poking around under your car will confirm if a length of heavy gauge wire is needed from the ground base side of the HF antenna directly to hard metal.

In your search for metal, be aware that most modern cars have quite a bit of corrosion protection built into their design. You may have to dig through a bit of undercoating to get to good metal. The results will be worthwhile, especially during those times when radio is more than just a hobby.

Remember those trunk lip antennas? Well,

just how well are they electrically bonded through those trunk hinges? Not good enough for me. I ran a few short pieces of wire to bond the trunk lid to the frame.

Running the antenna feedline from the antenna to any mobile mounted radio is always an adventure. You want to run it safely, you want to make sure it doesn't kink, or to run it across any surfaces that will cause cuts or abrasions to the outer jacket. Often you will discover you have no choice but to cut that nice factory-installed connector off just to route the cable in from the trunk area. Such is life.

In most modern cars it is fairly easy to route radio antenna cables around door trim. If you use RG-58 or RG-8X style coax, it is thin enough to just squeeze into the cracks. I route most of my cables along under the lower door entry guards. These are hard plastic or metal in most cars and I've never had any cable problems in these areas. The good news is that most cable runs in the length of a car or truck are not going to result in any excessive signal losses over the twenty or so feet they are likely to travel.

Take your time and do a little planning. Take a piece of spare cable a couple of feet long and poke around and see what routes might work best. If you can, take both the front and rear seats out of your car. This will open up dozens of prospective cable routes you may not otherwise consider. Just remember that you have to be able to put the seats *back* when you're done. As silly as that may sound I once routed a bundle of cables in a Honda Civic that seemed to make sense at the time *until* I went to try to put the back seat back in. Cars are normally very forgiving with their tolerances, but in this case a quarter of an inch was just too much.

■ We Reach the Radio

We've got the signal and the power to your radio, but we haven't talked about the actual radios yet. Mobile radio installation preferences seem to come in essentially two flavors: "Locked in the trunk" and "I don't care if they try to steal it." The most practical application is usually somewhere in between.

I went through my paranoid phase a number of years ago. I insisted on installing my radios in the glove compartment. This created two problems: I kept swerving down the road when I reached over to change channels, and I kept getting lost because I could never find my maps.

The radio (or radios) need to *always* be installed in a place where they can be safely operated while driving. Ergonomically, that

means within easy reach and where peeking at the display will not distract your view of the road. Still, you should always make a point of pulling off the road when you're intending to do some serious fiddling with the dials. Driving is hard enough without trying to catch that rare one on twenty meters. I've known of more than one radio operator whose enthusiasm for the hobby has landed them in a ditch.

Lately, I've taken to mounting my main transceiver under the dash on the left side of the driver's position close to the driver's side door. If your vehicle allows for this without interference to driving position or easy egress, give it some consideration. It's convenient, and it's a location where would-be thieves aren't likely to look.

My car has a black interior. With the rig in this position I just toss a piece of an old black T-shirt over it and from the outside you have no idea that the car has an auxiliary radio in it. (Okay, I know there's this big antenna hanging off the bumper but I'm working on it!)

Anyway, a little forethought can keep you mobile in an emergency and still let you have a lot of fun in between those times of crisis.

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Q. Is it true that older TV sets could listen to cordless telephone frequencies? (D.S. McCormick, Jr., Macon, NC)

A. No, but they could listen to cellular frequencies. Cordless phones operate several megahertz below TV channel 2 (54-60 MHz), but cell phones are in the 824-849/869-894 MHz spectrum, well within the tuning range of the old 83-channel sets which tuned to at least 890 MHz.

Q. I often see ads for certain receivers saying "triple conversion" or "triple-up conversion" What does this mean? (Steve, e-mail inquiry)

A. When signals in the radio frequency bands (typically 100-1000 MHz or so) are received, they must be converted down to lower frequencies (typically 1-10 MHz) before the audio is

extracted from them for you to hear through the speaker. This is done in steps, rather than all at once. For example, a radio signal at 155 MHz might be converted first down to 45 MHz, then down to 10.7 MHz, and finally 455 kHz before the audio is extracted from it to be heard. These three steps make it "triple conversion."

It is often an advantage to convert it higher first, then lower. This is done to reduce spurious image signals which give erroneous, multiple reception frequencies. That higher-frequency step is called "up-conversion."

Q. Who uses the frequencies between 512 and 760 MHz missing from low-price scanners? (Numerous inquiries)

A. UHF television broadcasters. A recent ruling, however, will turn over some of this spectrum to public safety in the next few years, making it a desirable scanning range in the future.

Q. Are the new Family Radio Service (FRS) transceivers legal for use in Canada? (Wm. Mewes, Oakville, Ont).

A. No. Radio Shack successfully petitioned the Federal Communications Commission (FCC) for authorization, and the FCC has jurisdiction only in the U.S. and possessions.

Q. How can I connect a random wire antenna to an AM/FM radio that has only an internal ferrite rod antenna? (D.S. McCormick, Jr., Macon, NC)

A. You can't, at least not directly. Have you tried an inductive loop like the popular Select-A-Tenna? Simply setting that alongside the radio can bring barely audible signals up to full room listening.

Another trick—which may or may not

Bob's Tip of the Month

Listening to Your Remote Control

One of the most frequent questions we receive concerns the nature of the signal given off by infrared (IR) remote controls used with home entertainment equipment. Tom Marquardt, a long time *MT* subscriber, provided an interesting and preeminently simple way to listen to them talking to your accessories.

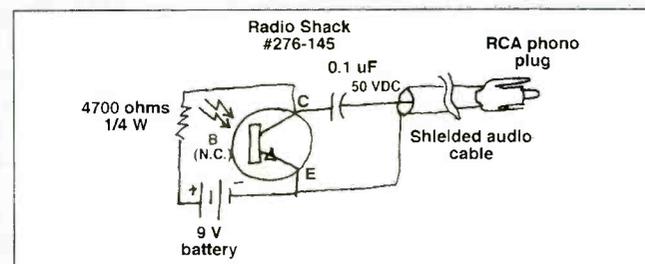
Tom points out that although all of the different keys may sound alike to the ear, they differ in the relative spacing of the pulses that make up the digital sequence. For example, while there might be a possible 1000 pulses per second (a fictitious example) from each of them, one key could be firing pulses at 1, 6, 7, 12, 56, 78, etc. milliseconds for a total of 300 pulses in one second, while the next key might be emitting pulses at 3, 7, 11, 15, 92, etc. milliseconds for another 300 per second.

According to Tom, older remotes make a coarse, buzzing sound, while newer models are more musical ("Boop-boop").

So how can you hear these noises (and why would you want to)? By assembling one phototransistor, a resistor (4700 ohms, 1/

4 watt or so, although anything in the several thousand ohms range will work), a DC decoupling capacitor, and a battery, as shown below, into a detector circuit, fed into an unused audio input jack on your stereo amplifier. Be sure to start with the volume control at minimum!

Tom suggests that the next generation of hackers may be remote control phreaks, intent upon causing mischief with neighbors' TV sets. Happy buzzing!



work—is to wrap several turns of the close end of the random wire antenna around the radio (top to bottom, not side to side), finally connecting the end to ground, or even a metal radio part like an earphone jack. This should improve signal levels.

Or you could buy a better radio.

Q. *Since it only takes a few milliamperes of current to stop the human heart, why do electric executions use such high voltage (1000-2000 volts in two or three surges of up to 30 seconds each) and high current, and is it AC or DC? (Mark Burns, Terre Haute, IN)*

A. Although originally demonstrated by Thomas Edison using direct current (DC), George Westinghouse proved that lower voltages and smaller-gauge wires worked even better with alternating current (AC), even for electrocutions.

Volt for volt, AC is more destructive to the nervous system, causing disorganization of the delicate electrochemical balance of the anatomy, while DC disrupts the normal electrochemical action, and its polarized pulse clamps the muscles. This is the reason that DC is used to defibrillate heart patients, and the clamping causes the characteristic “kick.”

Static electricity produced by rubbing your

feet on a carpet can produce more than 30,000 volts DC, but at very low current, so no damage is caused to the biological system.

Generally speaking, most of us can feel the current forced through the body by the applications of a couple dozen volts or so, resulting in a current flow of a few milliamperes, and many have been accidentally electrocuted by household appliances and wiring (120 VAC). Keep in mind, too, that different people have different resistances to electron flow.

But this doesn't mean that this voltage will prove lethal, only that it *might*, and then it is extremely painful and can prove damaging. Obviously, from a legal, medical, and humane standpoint, the amount of voltage applied for execution must be more than marginally adequate, it must be certain and instantaneous. And it must be nonrecoverable. These are the reasons for the high voltage and current, and for the duration.

Q. *I have tried unsuccessfully to record programs on a tape recorder from two different portable shortwave radios. I patch the earphone jack from the radio to the mike jack of the recorder with no response. What gives? (Mel Friedman, Suffolk, VA)*

A. Chances are you are mismatching the plugs and jacks. The tape recorder mike jack is undoubtedly monaural (two wire) while the radios might be equipped with stereo earphone jacks (three wire). It is also possible that you are using an interconnect cable with the wrong end for either—or both—plugs.

In any case, it's easily solvable: Look at the manual (or the earphones) that came with the radio, that should tell you what is needed there, and simply be sure that is the plug that you are using in the jack. If it's not, either replace the cable or use a stereo/mono adaptor plug on the existing cable.

If in doubt, take the radio, tape recorder, and cable to a local Radio Shack. Their motto is: “You've got questions. We've got answers.” Make them live up to it.

Q. *What would be a good two-way system to use at a lake resort? I've tried FRS walkie-talkies, but the terrain and trees limit the range. (LeRoy Long, Edmond, OK)*

A. Sounds like CB is your best bet. The lower frequency range for terrain-following (27 vs. 462 MHz), higher power (5 watts vs. 0.5 watts), and longer antennas (11 feet vs. 6 inches) make a very big difference!

Questions or tips sent to “Ask Bob,” c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bgrove@grove.net. (Please include your name and address.) The current “Ask Bob” is now online at our WWW site:
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One Step Closer to Getting on Air

Last month we described the construction of a simple transmitter designed by Lyle Koehler (K0LR) for use on the license-free Lowfer band (low frequency experimenter's band, 160-190 kHz). This month, we'll discuss powering the transmitter and a suitable transmitting antenna.

The transmitter requires two voltages for operation. First, a reasonably stable source of 5 VDC is required at Pin 16 of the transmitter's divider chip. This supplies power to the chip and the crystal oscillator circuit. The current requirement for this input is very low, and most any power supply intended for 5 volt logic circuitry will do.

Powering the final amplifier stage is slightly more complicated. To meet Federal Communications Commission (FCC) regulations, the DC input power to the stage must not exceed one watt. Power is determined using the standard formula: $P = I \times E$, where P = Power, I = Current (in amperes), and E = Voltage. In last month's example, our circuit drew .077 amperes at 13 VDC. These were the figures that Lyle found gave the best efficiency with his transmitter when it was connected to properly matched 50 ohm load. Using these figures we get an input power of one watt — the maximum allowable power.

These figures will vary somewhat from one transmitter to the next and the input voltage and current draw should be measured to ensure FCC compliance. When running this test, the transmitter will need to be connected to a proper load. If you don't have a tuned antenna ready to connect to your transmitter, a 47 or 50 ohm carbon resistor (1 watt or higher power rating) can be placed across the radio frequency (RF) output to act as a suitable dummy load.

To ensure a constant output from the transmitter under varying antenna loads (when it rains or snows, for example), Lyle uses a clever approach to

power his transmitter. He uses a 26 volt power supply—double the voltage needed by the transmitter—with a 169 ohm series resistor to limit the current flow to the transmitter. (Again, the exact value of resistance will need to be worked out for a given installation— $R = E/I$.)

■ Antenna Basics

For transmitting on low frequency (LF), you should abandon any thoughts of using a horizontal "longwire" type antenna. While these antennas can sometimes work well for receiving, experience has shown that they are far too lossy for transmitting (at least at the power levels we're talking about). Today's most successful operators agree that a tuned vertical antenna with a top hat and ground radial system is the best way to go.

What, then, is required for an effective longwave antenna? First, there is the legal issue. To comply with FCC regulations, the radiating part of the antenna must not exceed 15 meters/50 feet in height. As it turns out, that's about the practical limit for most home builders anyway—speaking from a construction safety standpoint. In fact, many lowfers

have reported good success with antennas less than 30 feet tall, provided they are properly tuned, with a good ground system and top hat.

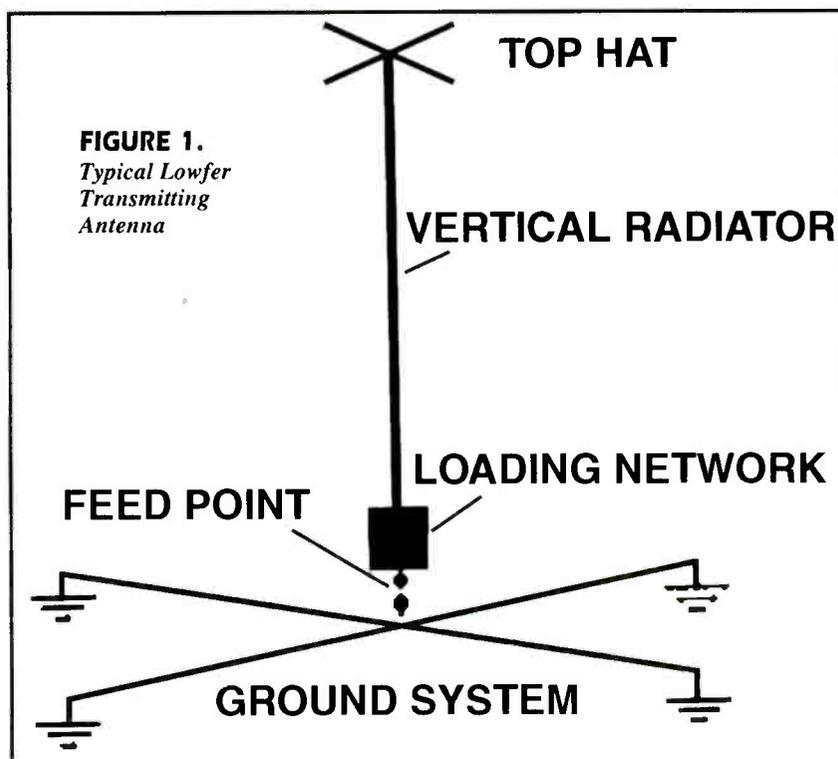
Figure 1 shows a typical Lowfer station antenna. The top hat is simply a series of conductors that extend outward from the antenna mast like the spokes of a wheel. Its purpose is to "pull" the RF current higher into the antenna and reduce the amount of inductance required in the loading coil. (More on coils later). The top hat should have as many "spokes" as possible, and should have as large a radius as is practical. A radius of 10 feet is a decent starting point for a first antenna. The top hat's performance can be further improved by connecting the ends of each spoke together with a wire to form a circle around all elements.

The antenna mast can be made from large diameter copper pipe, electrical conduit, or even a telescoping TV antenna mast. The key is to make it as long as possible (within allowable limits) but to stay clear of power lines! Not only is this dangerous, but it will also reduce the performance of the antenna. In any installation, be sure to properly guy the antenna at several points using a non-metallic material such as UV-resistant Dacron rope.

■ The Loading Coil—an Essential Ingredient

Even if you're fortunate enough to have a full length (50 foot) antenna, it will be much too short to act as a self-resonant quarter wave on 175 kHz. Such an antenna would need to be over 1330 feet tall! To compensate for this lack of length, we must insert a loading coil at the base of the antenna, or at some other point on the mast.

While a coil is essential for tuning, it is also a major source of system loss. It must be carefully designed and be protected from the elements so that



Continued on page 94

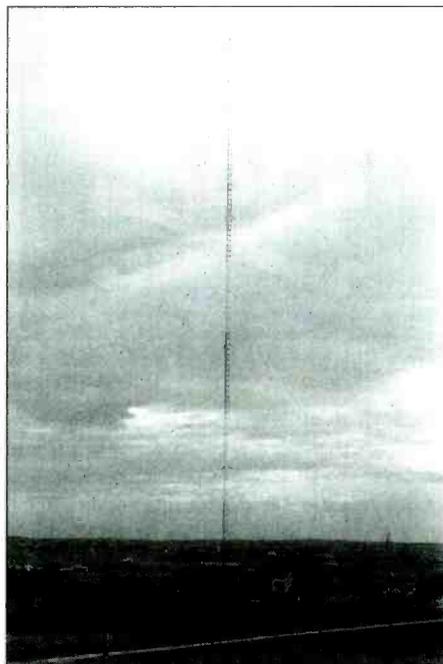
DX Safety

We usually don't think of domestic-band DXing as a dangerous hobby. And in fact, when you compare it to hobbies like mountain climbing, black-powder shooting, and ultralight flying, there isn't much to worry about. But there are a few steps you should take to protect your health, your home, and your equipment.

The most likely threat to you and your DX shack is lightning. A bolt of lightning is an electric current of almost unimaginable strength — thousands of amperes. There are a variety of lightning arresters and surge suppressors on the market; these devices are designed to shunt lightning currents around your equipment and safely to ground. They're a good idea to protect against the random unexpected surge.

But none of these devices can fully protect your equipment against a direct hit. Any outdoor antennas you use should be wired in such a way that you can completely disconnect them when you aren't DXing. If you have expensive receiving equipment, you should unplug it when you're away. Just turning it off isn't enough. Lightning has traveled several miles to reach the ground; the terminals of a switch, 1/4 inch apart, won't stop it!

Even without lightning in the area, outdoor antennas can be dangerous. Before you lift an antenna into place, take a good long look at where you're putting it. Are you about to pull it into a power line? Does it run under a power line? (What happens if a utility pole fails and the power line falls onto your antenna?) Is the antenna high enough that people won't walk into it? Is the lead-in wire low (or high) enough



Pat Griffith sent this shot of KOA-850's tower near Parker, Colorado.

that people won't trip over it?

High voltage isn't a problem in a receiving station *unless* something is broken. You should regularly inspect the power cords on all your equipment, and replace any that appear to be worn. If you succumb to the urge to take the covers off your receiver to see what's inside, unplug it first. And remember that capacitors can store a dangerous charge for a long time (that is, several weeks!). Don't touch any internal connections unless you're certain you know what you're doing!

I know some of you are using "hollow state" (tube) receivers. These can generate quite a bit of heat. Allow plenty of time for tubes to cool down before you touch them. (I still have a scar on my left wrist from when I failed to take this advice and touched a very hot 5U4GB...) Be sure to leave plenty of space for a tube receiver to "breathe."

Bits and Pieces

• John Alter of Toledo wrote with an AM DX problem: "In trying to reach stations in one direction, I tend to receive stations on the same frequency in the reciprocal direction. In trying for KKOB in Albuquerque on 770, I get overpowered by WABC in New York on 770. Can

you recommend an antenna that is really directional, and in only one direction?"

This is a tough problem. The most common directional antenna for AM reception is a loop. Loop antennas can be quite small and very directional — but they're directional in two directions, admitting interference from the back side of the antenna. Parasitic (and driven) array antennas are highly directional in only one direction — but they're *very* large. (If you see an AM station using several towers, that's a driven array.)

The 1996 *ARRL Handbook for Radio Amateurs* (and possibly subsequent editions) shows a design for a 4 MHz loopstick antenna with sense whip. This antenna could potentially be modified for use in the AM band. To be honest, I haven't the time to try it; if one of our listeners does, please let us know how it works.

• FM DXer Sheldon Remington on the Big Island of Hawaii has totally shattered all records for tropospheric reception of VHF signals. Tropo ducting between Hawaii and the West Coast — a 2,500 mile path — is an annual event. But it's rare for the opening to extend north of San Francisco or south of Tijuana. On the evening of February 13, it did. Sheldon logged two FM stations in Puerto Vallarta, Mexico, and one in Manzanillo. These cities are along the "bulge" in Mexico's west coast, about 300 miles west of Mexico City, and over 3,000 miles from Hawaii. The previous record for tropospheric reception, and for FM broadcast reception, was just short of 2,700 miles.

• Speaking of FM DX, the Worldwide TV-FM DX Association has moved. If you're interested in a club for FM and TV DXers, write P.O. Box 501, Somersville, CT, 06072.

Your DX doesn't have to be a California-to-Hawaii duct to be newsworthy. Let us know about it! Write P.O. Box 98, Brasstown NC 28901, or via the Internet to w9wi@bellsouth.net. Good DX!

CALLSIGN CHANGES

The following AM stations have changed callsigns in the last month:

Old call:	New call:	Location:
KBUL-970	KANM	Modesto, CA
KNSE-1510	KMSL	Ontario, CA
WNLC-1510	WWJY	New London, CT
WJPY-1280	WJWK	Seaford, DE
WCFY-1410	WAZY	Lafayette, IN
WARA-1320	WJYT	Attleboro, MA
KDWG-970	KBUL	Billings, MT
WLAS-910	WSTK	Jacksonville, NC
WOFR-1250	WBUB	Washington Court House, OH
KFXX-1520	KKSN	Oregon City, OR
WMMZ-1400	WKDY	Spartanburg, SC
WMPS-1380	WOOM	Millington, TN
KYLR-1400	KHCH	Huntsville, TX
KKSN-910	KFXX	Vancouver, WA

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New Clandestine Internet News Service

Clandestine DX experts Nick Grace of Washington, DC, and Martin Schoech of Germany have started *Clandestine Radio Watch (CRW)*, a detailed biweekly newsletter covering the latest developments in clandestine radio broadcasting. This new information source is chock-full of breaking data including clandestine radio news, station addresses, program formats, groups sponsoring the covert political broadcasts, and many other subjects that are valuable to shortwave clandestine chasers.

Recent issues can be accessed via the internet using <http://www.geocities.com/CapeCanaveral/2594/geo-cla.htm> as the target. Nick Grace's amazing Clandestine Radio Intel web site at <http://www.qsl.net/yb0rmi/clang.htm> mirrors the *CRW* newsletter content. Regular contributors receive the newsletter free via e-mail upon request.

■ Radio 510 Offers Relays

D. J. Stevie, station manager at the Swiss pirate **Radio 510**, has announced that the station is offering two one hour relays of North American pirates over transmitters of the **Italian Radio Relay Service**. Airtime is available for \$20, which works out to \$10 per hour. If you're interested in this service, the station's e-mail contact point can be found on their internet site, which uses the <http://www.radio510.org> URL.

■ FM Pirates Protest

Thousands of FM micropirate operations continue operations in the USA, despite a flurry of more than a dozen 1998 FCC busts. Various pirates picketed the Las Vegas conference of the National Association of Broadcasters in April. Other pickets marched in downtown Tampa on April 17 in protest of some Florida FCC busts. A mid-April rally by supporters of lower Manhattan pirate **Steal This Radio** publicized a lawsuit filed against the FCC's alleged violation of the station's first amendment rights.

There has never been as much pirate activity in the North American FM broadcasting band as we have seen in 1998. If you tune through the band in your own local area, you could hear one of these fascinating low power stations.

■ Shortwave Pirates Active

Dozens of our readers report that the North



Jerry Rigged Radio uses a traditional pirate logo.

American shortwave pirate bands remain extremely active, particularly on weekends and holidays. Given summer propagation, station operations are less evident during midday hours, but are increasingly audible from a couple hours before sunset to about three hours after the sun goes down. Here's a sample of stations heard during the past month, *all of which were noted within 500 kHz of 6955 kHz* just below the 40 meter amateur radio band. The station format and its contact maildrop (when known) are listed.

- Anteater Radio**- Rock music from an 18 wheeler truck. (Belfast)
- Area 51**- The Gatekeeper with pirate advocacy. (None)
- Deliverance Radio**- Dueling banjos music. (None)
- Earl Pitts Station**- Funny commentaries by Earl Pitts. (None)
- Free Hope Experience**- Major Spook with rock and comedy. (BRS)
- Howling At the Moon Radio**- H. M. Murdoch with pirate advocacy. (None)
- Jerry Rigged Radio**- Rock music; their QSL is here this month. (Providence)
- KBLK**- The Voice of Black Repression with rap music. (Providence)
- KNBS**- Phil Muzik with marijuana advocacy. (Belfast)
- Mystery Radio**- The Shadow with complex rock compositions. (Stoneham)
- One Voice Radio**- Joe with health tips. (now Belfast)
- Radio Azteca**- Bram Stoker with elaborate DX parodies. (Belfast)
- Radio Beaver**- Bucky Beaver with Canadian rock and comedy. (Merlin)
- Radio Four**- Hard rock with Mon Ami. (logs to *The ACE*)
- Radio Kenny**- Rock and falsetto-voiced pirate commentary. (None)
- Radio Metallica Worldwide**- Dr. Tornado, a powerful 10 kW, and rock music. (BRS)
- Radio Nonsense**- Joe Mama with rock and comedy. (Belfast)
- Radio Three**- Rock oldies with Sal Amoniac. (logs to *The ACE*)
- Radio Tornado Worldwide**- A Radio Metallica parody. (None)
- Stereo Sound Radio**- Colonel Billy Bob with rock. (e-mail to stereosound@hotmail.com)
- Voice of Juliet**- Sometimes risqué feminism. (Merlin)

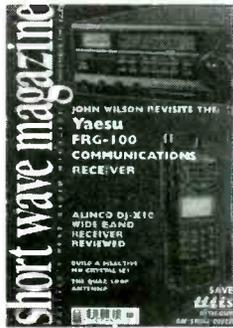
- Voice of Radio Free Indiana**- Rock music and parody ads. (Merlin)
- WBNY**- Commander Bunny with a clever clandestine parody from the Rodent Freedom Fighters. (None)
- WKND**- Radio Animal with rock and pirate advocacy. (BRS)
- WLIQ**- Rockabilly; "Your Low IQ Station." (BRS)
- WLIS**- Jack Boggan with shortwave broadcaster interval signals. (BRS)
- WMPR**- Techno dance music with good signals. (None)
- WPAT**- A new one with pop music and discussions of beer. (e-mail to j_spencer@mailexcite.com)
- WREC**- P. J. Sparx with rock music, comedy sketches, and elaborate productions. (Belfast)
- WSRR**- Their Solid Rock Radio slogan describes the format. (Belfast)
- WUNH**- A new one with rock oldies about cars. (Providence)

3 first class stamps go to USA maildrops, with \$2 US required for mail forwarding outside the USA. 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 146, Stoneham, MA 02180; and PO Box 293, Merlin, Ontario N0P 1W0.

■ Thanks!

Reader input is always welcome via PO Box 98, Brasstown, NC 28902, or via the e-mail address atop the column. We thank the following radio hobbyists for material used this month: John Arendt, Oswego, IL; John T. Arthur, Belfast, NY; Shawn Axelrod, Winnipeg, Manitoba; Ranier Brandt, Hofer, Germany; Jerry Coatsworth, Merlin, Ontario; Ross Comeau, Andover, MA; Joe Filipkowski, Providence, RI; Harold Frogde, Midland, MI; Nick Grace, Washington, DC; Paul Griffin, San Francisco, CA; Paul Hampton, San Antonio, TX; William Hassig, Mt. Prospect, IL; Rich and Tarea Jurrens, Katy, TX; Harald Kuhl; Hofer, Germany; David Krause, Eastlake, OH; Michael Kuentz, Waverford, MI; Michael Lenane, Lakeland, FL; Robert Lewis, Greenville, NC; Zacharias Liangas, Italy; Chris Lobdell, Stoneham, MA; Greg Majewski, Oakdale, CT; Bill McClintock, Minneapolis, MN; Anita McCormack, Parkersburg, WV; A. J. Michaels, Pittsburgh, PA; Don Moore, Davenport, IA; Kevin Nauta, Grand Rapids, MI; Gary Neal, Sugar Land, TX; Patrick Nobel, Eugene, OR; Dick Pearce, Brattleboro, VT; Michael Prindle, New Suffolk, NY; Al Quaglieri, Albany, NY; David Roberts, Brook Park, Ohio; Robert Ross, London, Ontario; Martin Schoech, Merseburg, Germany; Lee Silvi, Mentor, OH; Keith Stein, Brasstown, NC; Cleve Svetlik, Pepper Pike, OH; Robert Thomas, Bridgeport, CT; Niel Wolfish, Toronto, Ontario; and Andrew Yoder, Blue Ridge Summit, PA.

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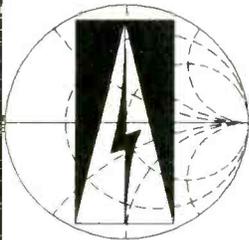
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Contesting 101

We received a nice letter from Ray Burnison KA8GLS, pictured here with his wife, Alvena KB8HJR. Ray is concerned about his knowledge of ham radio and wants help understanding some basic operating principals. Ray has been a ham 17 years, has built a Heath 301 transceiver and all of the accessories, but feels he lacks adequate understanding of electronics. Ray would like to see a series of articles on basic ham radio in *MT*.

I do try to cover a wide range in this column, and to explain as much as possible on a given subject. Unfortunately there is only so much that can be covered on one page per month. There are several excellent books available that can take you further; the first I would suggest to anyone is the *ARRL Operating Manual*. This book outlines operating procedures from A to Z and is very easy to understand.

In addition, the ARRL publishes several excellent theory manuals; I suggest dropping them a card or letter to ask for a list of the books they publish and prices. In fact, if you explain what level you are at, they will make suggestions as to which manual might be of most help. The address for the ARRL is 225 Main St. Newington, CT 06111.

And, of course, contacting your local ham club might yield help in the form of your own personal tutor, or an invitation to join their theory classes.

■ Contesting 101

KA8GLS also mentioned contesting as an area he would like to know more about, so here's an introduction. But be warned: Contesting is addictive and can be very competitive! Contesters are a varied lot, from the "gotta win" types to the curious or those who just want participate for fun or personal satisfaction.

Each month *CQ* and *QST* magazines announce the date, time and name of each contest. In addition the announcement will tell you what the exchange should be, how to score, where to send your logs and what



awards are to be given. If you are interested in participating in a contest, write to the address given in the announcement and request rules and log sheets (if available).

Date, time and contest name are self explanatory, but the exchange rules can get a little confusing. For example, many contests simply want you to give a signal report and your location. For some contests the exchange may include your state — for example, "59 PA" on phone or "599 PA" on CW; other contests may require your grid locator, county, country, or zone as part of the exchange.

The grid locator is normally used in VHF contests, but some HF contests are now requiring the grid locator as well (a Grid Locator map of the US is available from the ARRL; contact them for pricing at the address above). Other exchanges may require information about your station, or number of years licensed. Read the rules.

Scoring is usually the number of contacts times the multipliers worked. Points for contacts may vary; for example, a contact on your own continent may be worth 1 point while contacts on other continents may be 2 or 3 points. So if you work 400 stations each worth 2 points in 20 countries, you would calculate your score by multiplying $400 \times 2 = 800 \times 20 = 16000$ points. Very often power is also included as a multiplier. Go over this part of the rules carefully.

In addition, most contests have divisions: only stations in the same division compete against one another. For example, if you run 100 watts you might be in the low power division and compete only against

other 100 watt stations. Awards are made within each division.

It is important to log each contact with all information; include date, time and exchange and note if the contact is a multiplier. Along with logging comes the terrible task of dupe checking — logs with duplicate contacts will incur penalties and possible disqualification. Using a computer is the best way to keep a log and dupe check sheet. Logging by hand requires keeping a special dupe sheet for each band you work. I suggest you write the ARRL and request their dupe sheet; copy it and use it in all of your contesting.

Before jumping into a contest, listen for awhile to get the feel of what is going on, then go for it. Don't worry if you are not a hot shot operator, or your CW speed is slow; testers want to work you and will be glad to slow down. Some will even lend advice (yes, there are a few jerks who don't have time, but that is their problem not yours). Contesting is an acquired skill like learning the code: the more you do it the easier it becomes.

It is important to remember a few things: First of all, this is a hobby, so keep the competition friendly. Although Joe Big Ham makes the whole thing sound easy, even he had to start somewhere. You do not need a kilowatt and giant antenna to contest; QRP and a dipole will get you into the game.

This only scratches the surface of the contesting story, but I hope it encourages some of you to try your hand at the game.

■ Six Meter Activity

N8UVQ, Mark Phillips, wrote to advise that the Triple States Radio Amateur Club (TSRAC) has an all mode net on 50.150 MHz that meets on Sunday nights at 9pm Eastern time. Check in on SSB AM or CW on 50.150 or FM at 51.150.

TSRAC is located near Wheeling, WV. Additional information can be obtained from K8AN by mail at 2011 State Highway 250 Adena, OH 43901-9736 or via e-mail at K8AN@AOL.COM.

Cherokee's Innovative CB Sideband Handi-Talkie

If you'd like the ultimate in legal, license-free portable communications, the inventive folks at Wireless Marketing have come up with it. Called the Cherokee AH-100, it's an AM/Single Side Band (SSB) Citizens Band handi-talkie. I've tested a pair of these radios, and they pack more wallop for communications between handi-talkies than anything else you can buy and operate without a license.

But first, some basics: an AM CB signal consists of two sidebands, which carry the actual voice transmission, and a carrier. The carrier contains no information and exists only to give the receiving CB something to lock onto. In addition, both the upper and lower sidebands contain exactly the same information (the sound of your voice, for example). As a result, well over half the transmitted power in an AM signal is wasted on the carrier and the redundant sideband.

If you eliminated the carrier and transmitted only one sideband, you'd get a whole lot more oomph in your signal. That's why, in head-to-head comparisons, a sideband signal (which transmits just one sideband) delivers nearly twice the range of an AM-only transmission. The only rub is that, to communicate using sideband mode, both sender and receiver must use the same (either upper or lower) sideband.

Before we get into the specific performance of the AH-100, let's take a guided tour. The fit and finish on this radio is exceptional: the moment you pick it up, you know you are holding a quality piece of gear. The AH-100 is just 6.5 inches tall (excluding antenna), and nearly half of that height is taken up by the standard NickelCadmium (NiCd) battery pack. On the front of the radio are six buttons for various control functions, a grill for the speaker and microphone, and a liquid crystal display (LCD) that gives you all the information needed to see exactly what's going on with the radio, including channel



The Cherokee AH-100 packs as much punch as you can get in a handi-talkie without a license.

and frequency readout and receive/transmit signal strength. On the left side of the case are buttons for toggling up and down through 40 channels, a sliding-release for the battery pack (more about that in a moment), a button for activating backlighting on the LCD, and a push-to-talk switch. On the right side of the case is an attachment for a wrist strap (included) and, under a rubber dust plug, a port for plugging in the NiCd charger that comes standard with the AH-100. On the top of the case is a rubber duck antenna with a BNC connector, an on/off/volume knob, and a pair of concentric knobs, which control the squelch and the clarifier. The clarifier is used when the transceiver is in SSB mode to fine-tune the receiving frequency. Otherwise, incoming signals can sound like Baby Huey or Donald Duck. Also on top of the case are jacks, under a dust cover, for connecting a speaker microphone. On the back of the case is a metal belt clip.

Operation of the AH-100 can be as simple as can be. Just pick it up, turn it on, set the channel and talk. Instant channel 9 access is

available at the touch of a button. Push the mode button to choose upper or lower sideband, use the clarifier to fine-tune the incoming signal, and suddenly you've nearly doubled your range. For more sophisticated operation, press the function button, and now you can access "Dual Watch" for monitoring two channels at the same time, 40-channel scanning, adjustable high/low power output, and five memory presets for your favorite channels.

Now, I like features and nifty high-tech goodies as much as anybody, but they don't mean shucks if they aren't accompanied by sparkling performance. And, that's where the AH-100 really shines. Under relatively crummy conditions (the skip was running), I found it was easy to communicate nearly two miles between a pair of AH-100s in sideband mode. The clear, powerful audio was impressive. In my experience, it's rare to find handi-talkies that can communicate much more than a mile or so without the aid of a mobile antenna or a repeater, and the AH-100 did it with ease.

For the person who needs better than normal, license-free handi-talkie communications, the AH-100 is clearly a winner. But here's a surprise: the AH-100 also comes with a "docking station" that turns it into an instant all-in-the-hand mobile rig. Just remove the rubber-ducky antenna and slide off the battery pack. Now slide on the docking station where the battery pack was. Connect one "pigtail" to your rooftop CB antenna and plug the other pigtail into the cigarette lighter. Voila! You've got a mobile CB AM/SSB rig that's barely bigger than an ordinary CB mobile microphone. It runs off your vehicle power, requires no mounting and can be turned back into a handi-talkie in just seconds.

The suggested retail price for the AH-100 is \$349.95 (discounters may have them for considerably less). For additional information, contact Wireless Marketing at 1-800-259-0959.

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Time-Domain Reflectometry on a Budget

One technology useful for evaluating some aspects of antenna feedline is known as "time-domain reflectometry," or "TDR." And, as an added bonus, cable runs on non-antenna systems, such as computer networks, can also be checked out with this device.

The Basic TDR System

An inexpensive, triggered oscilloscope is adequate for the basic TDR system described here in fig. 1A. The pulse generator (fig. 1B) generates a periodic (repetitive) direct current (DC) pulse (fig. 1C) which is fed to the input end of the cable under test. I built a similar generator some time back, but I don't recall the source of the construction article. However, it is not unlike the one in the 17th edition of the *ARRL Antenna Book*.

The transistor called for is a general-purpose NPN (negative-positive-negative); any you have handy is likely to work OK.

It's good to mount the generator in a small metal case; connect all the ground connections together, and connect this common

ground to the case. It's also best if the resistance of R1 is the same value as the impedance of the cable under test (usually 50 ohms). There are two outputs from the generator: one for the scope, and one for the cable under test. Check your scope and cable to see which connector types you will need.

The vertical input of a triggered oscilloscope is also connected to the input end of the cable. The scope will display a stationary pulse pattern (fig. 1C). As a pulse travels down the tested line, electrical irregularities in the line will cause a portion of the forward-traveling pulse to be reflected back toward the input end of the line. These reflected portions of the pulse appear on the oscilloscope pattern along with the pulse.

In other words, the scope continuously monitors the pulse throughout its duration as it enters the line, and simultaneously monitors any returning reflections of that pulse returning from the line. The scope trace therefore is a pattern whose shape is determined by the combining of the original pulse and the reflections of that pulse caused by irregularities (shorts, open circuits, etc.) on the line.

Interpreting the TDR Trace

If the far end of the cable is shorted, or terminated with a resistance less than the value of the line's impedance, the trace will appear depressed as in fig. 1D. If the far end of the line is open circuited, or is terminated with a resistance higher than the value of impedance of the line, the reflection caused will show up on the trace as an elevated portion (fig. 1E). Don't be surprised if your traces don't look as neat as these figures, but the sketches show the general shapes to look for. You may even see multiple reflections combining with the pulse.

There are only two conditions where there is no reflection returning from the line to the input. One is when the load connected to the far end of the line is a resistive load perfectly matched to the line's characteristic impedance (i.e., a 50-ohm resistor terminating a 50-ohm line, a 72-ohm resistor terminating a 72-ohm line, etc.). In this case the pulse remains unchanged as in fig. 1C. This matched condition represents the value of resistance or impedance at which the SWR on the line is

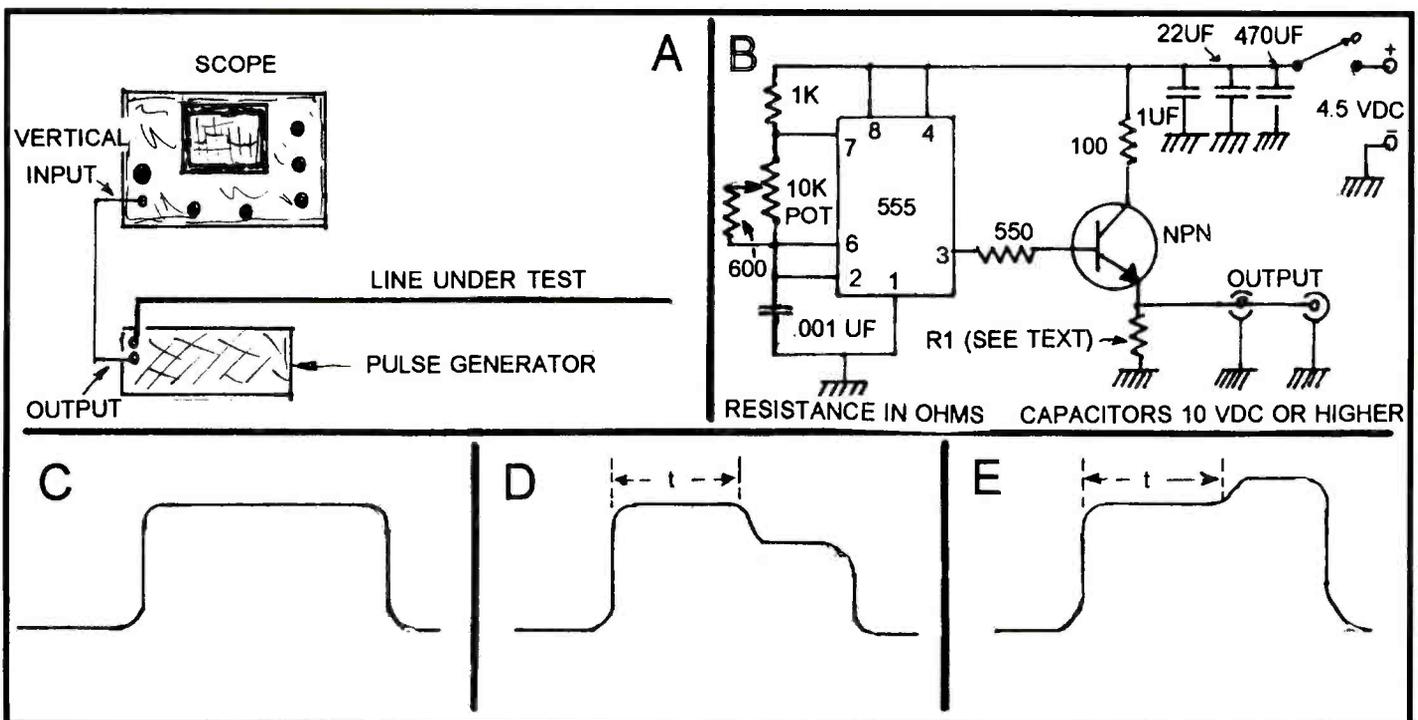


FIGURE 1. A basic TDR system (A), pulse generator diagram (B), typical pulse shape (C), shape of pulse combined with reflections from short-circuited cable (D), shape of pulse combined with reflections from open-ended cable (E)

optimum (minimum).

The other case of no reflection is when the cable under test is so lossy that it attenuates the signal so much that there is essentially no signal to reflect back!

Shorts, open-circuits and other abnormalities on the tested line show up on the trace, and their distance from the input can thus be computed. Measuring this distance along the cable will tell you where along the cable's length to look for the cause of the problem. With the simple system described here the accuracy is not great, but with care you can get reasonably close.

The distance to an abnormality can be determined by first reading the travel time from the oscilloscope. This is the number of microseconds between the start of the pulse and the start of the return blip (shown as "t" on figs. 1D and 1E). Then compute the distance along the line from the input to the abnormality using the formula below. C is the speed of electrical waves in space (984 for feet/microsec, 300 for meters/microsec); VF is the line velocity factor, which is the fraction of C that the pulse travels in the cable. (This is usually .66 for ordinary coaxial cable, .78 to .80 for foam coaxial cable, .86 for ordinary RG-62 computer cable and .79 for foam RG-62).

$$\text{Distance to reflecting condition} = (VF \times C) (t/2)$$

Limitations of TDR

As discussed above, TDR operates by sending pulses of DC down the tested line. This means that we must use resistors, open circuits, or short circuits as loads for the tested line. An antenna at the load end of the line, even if it is a perfect match for the line at its radio frequency (RF) of operation, will not present its RF impedance to the DC pulse. An antenna's input impedance is not DC resistance and can only be measured using an RF signal of the appropriate frequency. TDR is not designed to use RF.

There is a technology which can test lines terminated with antennas. That technology is called "Frequency Domain Reflectometry" or "FDR." FDR, instead of sending a DC pulse down the tested line, actually sends an RF signal which is swept across the frequency range of interest.

Unfortunately, although commercial systems for both TDR and FDR are now much less expensive than they once were, their cost is still beyond the means of almost all experimenters, SWLs and hams. Although homebrewing an FDR system would be fairly difficult, TDR is a different story. As we have

seen, it is possible to put together a TDR system such as the one we have described for cable testing at a modest investment of time and money.

RADIO RIDDLES

Last Month:

I said that "we've been talking about the standing wave ratio (SWR) at the junction of an antenna feedpoint and the feedline. In practice we usually measure SWR at the end of the feedline near the receiver or transmitter. Does this give us the value of the SWR at the antenna feedpoint-feedline, or is it a different thing? Why or why not?"

The answer is that it is a different thing. SWR is measured by sending an RF signal into a system and then comparing the amount of signal originally fed to the system to the amount of returned signal. When we do this by connecting directly to the antenna we get an accurate measurement of antenna-line SWR.

When we first connect a length of feedline to the antenna and then input the test signal to that feedline, the signal must travel through the feedline to the antenna-feedline junction and back through the feedline to the SWR testing device. Thus, any loss of signal caused by the feedline reduces the amount of signal that reaches the antenna and also reduces the value of the returned signal as that signal travels back from the antenna-feedline junction to the input end of the line.

This means that the value of returned signal has a weaker value than when testing directly at the antenna, and the SWR will be deceptively low as compared to the SWR obtained by connecting directly to the antenna. In fact, using very lossy line, it is possible to measure a 1:1 SWR at the end of the line when actually the SWR at the antenna-feedline junction is very high!

Next Month:

What is the relationship between a matched line with low SWR values and the uni-directional Beverage antenna?

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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New Trunk
Tracker Scanners

Digital Data Decoder Interface Revisited

In May 97 we discussed a basic "Radio-to-Computer Data Interface" circuit and a handful of programs for receiving and decoding digital data including RTTY, fax, packet, MDT, and Morse code. I've since learned that the circuit in my May-97 column not only had an error (reversed polarity of C2), but it isn't effective for all digital signals, including some popular trunked and pager control signals.

This month we offer an improved decoder interface, some neat ways to build and install it, and more references to new and improved software. You don't absolutely need the May-97 article, but it is recommended for the background material it offers. Contact *MT* directly for a reprint (\$3 plus SASE).

How to Access Data Signals

The usual method of conveying data by radio is FSK (frequency shift keying). This month's decoder interface is eminently capable of converting analog FSK signals to digital so a computer and software can decode them.

Digital radio data is sent at various speeds, depending on the type of signal, with slow packet at 300-1200 baud per second (bps) and trunked control data at a much faster 9600 bps. If you're only interested in slower data, you can pipe the signals straight from the receiver headphone or external speaker jack to the decoder interface. Unfortunately, to decode data faster than 2400-bps with fewer errors, you must tap the signal at the point of

detection, in most cases the narrow band FM (NFM) discriminator output, also called "baseband audio." For AM data signals, you'd tap the output of the "detector"; for SSB, the output of the "product detector"; and the WFM discriminator output for wide FM signals.

The predominant share of data sent by radio, however, is FSK via NFM. Table 1 is a list of all known NFM discriminator chips with the requisite baseband audio pin for each chip. There are too many receivers to list here, but rest assured that yours uses one of the chips in Table 1. Any suffix letters in Table 1 or on your particular chip usually can be disregarded when determining the baseband audio pin.

You can download a list of scanners and NFM chips with baseband audio pin numbers from my FTP site at: <ftp://204.210.11.204/montimes/Nfmchips.txt> I also regularly post this list on the Usenet rec.radio.scanner and alt.radio.scanner newsgroups.

Figure 1 shows how to tap the baseband audio for decoding NFM. Solder the (+) leg of a 1.0- μ F to 4.7- μ F tantalum capacitor to the baseband audio pin. Route a shielded cable from the (-) leg of the capacitor to a jack mounted on the receiver (exact type of jack depends on your receiver). You can use regular hookup wire instead of shielded cable if the distance from the baseband audio tap to the output jack is a couple of inches or so.

See Figures 2 and 3 for how to make a jack and plug for receivers (handhelds) that have no space! Pinline sockets are available from DigiKey (800) 344-4539 p/n A-208-ND; Mouser (800) 346-6873 p/n 151-5530, or Hosfelt (800) 524-6464 p/n 21-274.

The Decoder Interface

Figure 4 is a schematic of the decoder interface. This circuit, in various versions, is also known as the "Hamcom Interface" and the "data slicer." I call it the decoder interface because it changes analog FSK signals to square waves for the computer and software. The receiver's baseband audio is fed to the

TABLE 1

NFM CHIP	Discr Pin
KA3361	9
MC13371	9
MC3357P	9
MC3359P	10
MC3361N	9
MC3372D	9
MPS5071	9
NJM3359D	10
TA7640AP	9
TA7761P	9
TA7787AF	9
TA7792F	8
TK10420	9
TK10421D	9
TK10421M	11
TK10427	9
TK10485M	11
TK10487	11
TK10489M	11
TK10930V	12

input of the decoder interface, the output of which is fed to the computer's serial port (comport). The circuit is powered directly from the computer, so it doesn't get much simpler.

You can build the decoder interface inside a DB25 connector shell as depicted in Figs 5-6, or, with some ingenuity and microsurgical techniques, inside a DB-9 shell. I'd advise the DB25 shell for all but the experts, and if you need to connect to a 9-pin serial port, get a DB25-male/DB9-female adapter, Radio Shack #26-209.

Construction of the decoder interface isn't critical, but there is no room for error, especially with re-

FIG-1: SCANNER'S INTERNAL WIRING

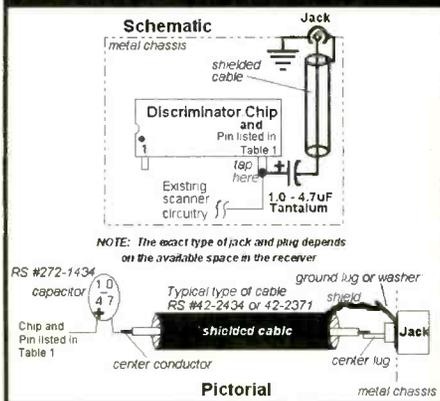


FIG-2: EMBEDDED SOCKETS

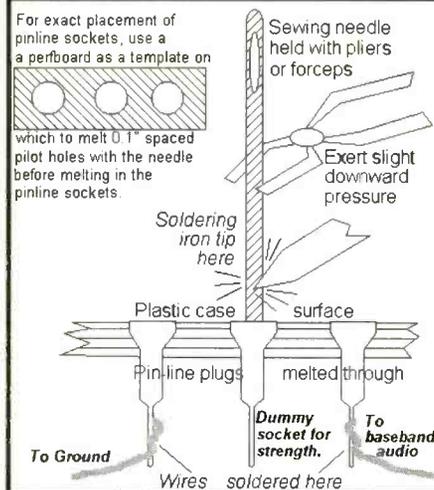
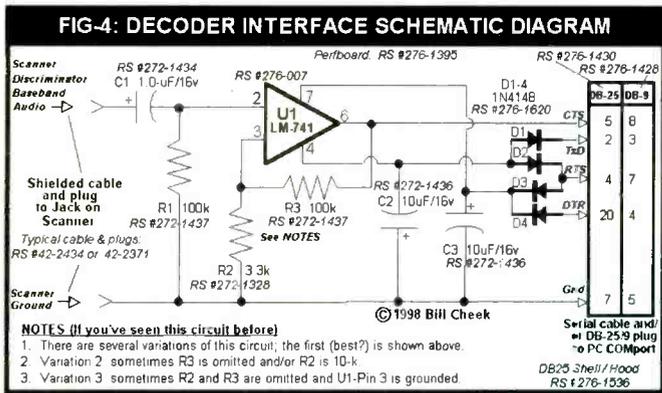


FIG-3: CRAMPED SPACE





spect to the polarity of the capacitors and diodes. The decoder interface should be as close to the PC as possible to minimize stray RF emissions from the serial port. (That's why putting the interface inside a DB25 connector shell is best.) The cable from the interface to the scanner's baseband audio jack must be shielded. The shield connects to ground of the decoder interface at the one end and to scanner ground at the other end.

If you go by Figs 5-6, the perfboard is easily cut and trimmed to size with a hacksaw or a coping saw—or diagonal cutting pliers in a pinch. Just make the board equal to or smaller than shown. You will have to “clean” out the curved plastic cable retainers in the DB25 shell halves. Just slice them in several places with a sharp knife; then break them out. Don't tamper with or alter any other part of the DB25 shell.

The perfboard should be wedged and centered between the two pin rows of the DB25 connector. Do a dry run to fit the perfboard into the connector and shell before building the circuit so you can spot the obstacles to a perfect fit. Use a rubber or vinyl grommet in the hole at the back end of the shell as a cable guide.

■ Connect and Operate

Double check your soldering and parts placement and then load up your favorite data decoding software and run a test. First, plug the DB25 into the PC's comport of your choice, consistent with whatever is supported by the software. (Some software may only support COM1 and/or COM2; others may support COM1-4, so check first.) Then plug the other end of the cable into the baseband audio jack that was installed in the receiver. Fire up the software and follow the instructions that come with it. Piece of cake!

■ The Software

...is anything but a piece of cake, due to all the choices now. Make it easy on yourself: get it all! Some are shareware/expireware/

crippleware; some are commercial; and some are free. The old standbys include JVFAX, HamCom, PKTMON, MSCAN, but there are a lot more now.

One you'll want to check out is Trunker, available from: <http://www.geocities.com/CapeCanaveral/Lab/1060/beta.htm> Trunker decodes the control data of Motorola Type I, II, and III

trunked radio systems. If you don't have a TrunkTracker™ scanner, Trunker can control certain scanners in a “trunk follower” fashion. In any event, Trunker is hot stuff and it's free from the above source. It works perfectly with the decoder interface.

You might also want to try your hand at decoding MDT, POCSAG, GOLAY, MobiTex, fax, packet, ACARS, and other digital data from the airwaves. This month's decoder interface and the dozens of software choices now available may open a new window to the wonderful world of radio for you. You'll find a handful of this software at my

FTP site: <ftp://204.210.11.204/intrface/> and references to a lot more at: <http://w5gb.nmsu.edu/kc5kto/> and at <http://www.geocities.com/CapeCanaveral/Lab/1060/hdwsftw.htm>

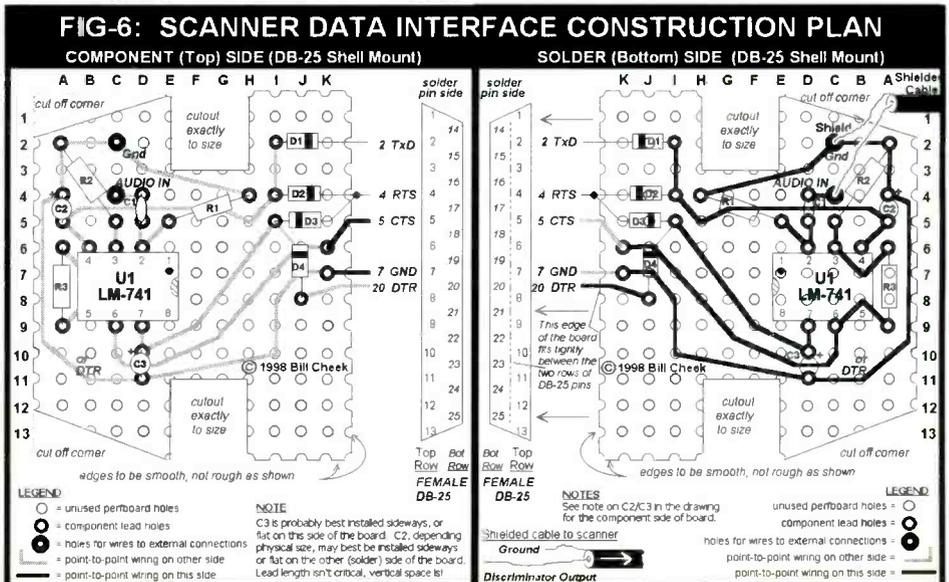
■ What Else?

I've said it before: there is less and less to hear out there on the airwaves, thanks to emerging new technologies, new media, and encryption. As usual with a loss, there is also a gain: in this case, much more to decode! No, we can't decode encrypted signals and probably never will, but most data is still sent “in the clear” under common ASCII protocols. You need only a receiver, a computer, a decoder interface, and the right software to find more to monitor than ever!

Federal law is still being made regarding decoding data signals, so I must caution you to familiarize yourself with the statutes regarding protected communications before launching this adventure.

Support for this and all my columns is freely available by e-mail. Programs and files can be downloaded from my Web and FTP sites. If you're not computerized, please include a SASE with your postal request. I also invite you to tell me about your data decoding experiences, including the type of interfaces and the software you use. I'll do a follow-up on this fascinating subject if folks indicate an interest.

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Survival Communications

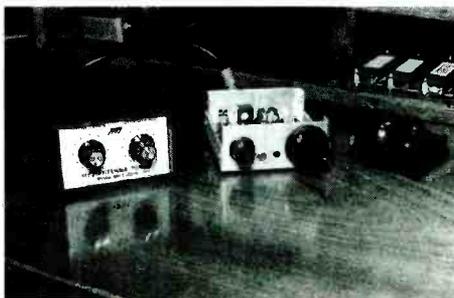
I started shortwave listening and DXing at age 10; at 17, I obtained my ham radio license. This changed my life forever, for within that hobby is a mandate to lend your talents and amateur radio equipment to help out during emergencies. Until recently, I thought I was well prepared to do just that.

Throughout my adult life I have been thrust into emergency communications scenarios. Literally hundreds of tornadoes ravaged the Oklahoma City area when I was stationed at Tinker AFB in mid-1974. We hams provided eyes and ears for the National Weather Service, helping track cyclonic cloud movements in the massive weather fronts that blasted through "Tornado Alley." I experienced three typhoons while stationed in Japan (not to mention numerous earthquakes!), four hurricanes when stationed in Mississippi and Virginia, and two major floods while living in northeastern Pennsylvania.

My involvement with the Luzerne County Emergency Management Agency has also provided me with training for nuclear power plant and aircraft disasters. I currently hold an ARRL appointment as an Official Emergency Station (OES)². In short, I am no stranger to emergency communications.

However, reading *Survival Communications* by Dave Ingram, K4TWJ¹, brought me face to face with some serious deficiencies in my communications plans. I realized that my emphasis had been focused on very short term scenarios. Amateur Radio Emergency Service (ARES) guidelines for participants are to be self-sufficient for a maximum of 72 hours. What if a natural or man-made disaster occurs which requires us to provide emergency comms for two weeks, a month, or longer? Suddenly, emergency communications become survival communications.

Survival communications take the radio hobbyist to the next level. In our global society we face unbelievable threats to our existence. Whether from El Niño-induced weather systems, nuclear plant meltdown, volcanic eruptions, earthquakes, or biological warfare, situations which could benefit from such planning are not so farfetched. Just ask those who lived through last winter's ice storm! Planning for survival communications brings together all the major facets of the radio hobby and can involve everyone in your family.



A very compact 40 meter CW station for emergency use is the Wilderness Radio SST, flanked by a White Rook CW key and an MFJ 16010 antenna tuner. An 8-pack of AA alkaline cells or a small gel-cell will power this rig for a week or more.

■ Equipment for the long haul

We begin with standardization, which is the key to selecting survival communications hardware. **Power:** long ago I decided to standardize on "AA" alkaline batteries for all my portable comm gear. Rechargeable ni-cad packs are notorious for failing just when you need them most, but there are very few places on this planet where you cannot find AA alkaline batteries.

There are **two ham bands** on which you must be able to communicate or at least monitor: two meters (144-148 MHz) and 70 cms (440-450 MHz). This is where the majority of emergency tactical and morale and welfare traffic will originate and be handled.

My Icom IC-24AT dual band VHF/UHF ham handie-talkie (HT) has several AA size battery packs that I can refill as necessary. This radio has been "broadbanded" and covers a lot more spectrum than Icom had originally intended. It serves as my primary 2 meter and 70 cm FM transceiver and doubles as a hand-held VHF/UHF scanner.

In considering **antennas** beyond what was furnished with the Icom HT, I opted for a Lakeview dualband 2mtr/70cms antenna and a Outbacker Outrunner mobile HF whip. The whip is the most rugged HF mobile antenna I have ever used. Made in Perth, Australia and imported by Alpha-Delta Communications³, these antennas are engineered to survive the rigors of the Australian Outback. They offer great HF performance in an extremely rugged package that can be used on the vehicle or remounted as a vertical whip with radial coun-

terpoise for fixed station use.

For shortwave broadcast and utility listening I have a Sony ICF-7600W portable receiver. It receives AM, SSB and CW and uses AA batteries and works very well on the short whip antenna mounted on the back of the radio.

Over the years I have built and used many small, low power (QRP) HF transceivers. One of the best is the SST by Wilderness Radio⁴. The SST is available for 40, 30 and 20 meters. These tiny single-banders offer superheterodyne receiver performance in a package that is slightly larger than a pack of cigarettes. Transmitter power output is about 2 watts using a 12 volt (8 AA cell) power pack. Ear buds, a small hand key or paddle set, and 33 feet of wire for an end-fed 40 meter antenna complete the tiny HF ham station. The SST can be coupled to the Outbacker Outrunner HF mobile whip on the car to provide mobile HF CW communications.

I chose the 40 meter model for three reasons: propagation on 40 meters covers most of the US at various times of the day, a large number of hams operate on 40, and QRP power levels (5 watts or less output) work well on this band.

My Garmin 38 GPS receiver also works on AA cells. This unit gives me standard long/lat bearings and the Maidenhead grid square information needed when working VHF contests as a roving station. The Garmin's compass readout, the ability to enter waypoints, along with a super accurate clock makes navigation a snap.

We have covered ham radio, VHF/UHF scanner, GPS and SW communications frequencies. What else is there that we need to be concerned with? How about National Oceanographic and Atmospheric Administration (NOAA) Weather Radio? The National Weather Service (NWS) operates hundreds of VHF weather transmitters in the 162 MHz range. According to NWS approximately 90% of the US is within 40 miles of a NOAA Weather Radio transmitting facility. To tune these stations you need either a scanner or a low cost "weather receiver." The weather transmissions are on NBFM and consist of localized weather conditions, forecasts, climatological data and severe weather bulletins.

Another often overlooked group of frequencies is the air band from 108 to 136 MHz, AM mode. These frequencies are going to be busy with commercial and private air traffic communications during any disaster. Air traffic con-



My GO BAG: Equipment includes microcassette recorder, GPS, air band and various other VHF/UHF scanners, shortwave receiver, several ham radios, spare battery packs, VOM, antenna tuner, dipole antenna, wire antenna with slingshot to launch it, CW key, tool kit, flashlight, calculator. Then add change of clothes, battery powered lamp, clipboard with frequency lists, maps, official IDs, first aid kit, and more!

trol is spread over 118-128 MHz. Arrival and departure communications are centered on 123.5-123.7 MHz with 121.5 MHz designated as the common emergency frequency.

The Citizens Band frequencies should not be overlooked, either. CB radios come in all shapes and sizes. I would opt for a compact 40 channel walkie-talkie (about \$50) that uses AA cells and has a BNC antenna connector on the top allowing the use of an external antenna. Many of today's CB sets also have weather receivers built in.

Combine a laptop computer, a small Terminal Node Controller (TNC) and add a VHF/UHF HT, and you have a portable packet radio terminal. When the local dial central office (DCO) is down, normal Internet access, e-mail, and phone communication disappear. Packet radio is wireless and is unaffected by problems with the local telco, and it is error free. ARES chapters all over the US rely heavily on portable packet terminals during emergencies. A 6-7 amp hour gel cell battery and small 5 or 10 watt solar panel will provide power for your packet station for weeks.

A spin-off from packet radio is APRS, Automated Packet Reporting System, which allows users to actually track and "see" who is on the air at any given time. APRS takes your location (provided by GPS data) and transmits this data over 2 meters. Anyone with APRS software running on their computer that is listening on frequency will see your callsign displayed along with a small logo superimposed on a map! Search and Rescue (SAR) operations, parades, walk-a-thons, triatholons, etc. can really benefit from this type of tracking. Skywarn information is also passed along

with APRS data, making this system highly desirable during storm emergencies.

Information for the long haul

All this gear does you no good unless you know where and when to listen. Research SW, VHF/UHF public service, aircraft, and ham radio repeater frequencies in your area. Compile lists of the most often used frequencies and laminate them in plastic. Keep copies with your survival communications gear in your car and in the shack.

If you elect or are forced to leave your home, plan ahead. Tap the American Automobile Association and obtain maps of the area where you want to go and map out your route. Coordinate your route with VHF/UHF frequency information and annotate these on your maps. Travel the route (staying off the interstates and using secondary roads) several times before you actually need to evacuate.

If possible, don't forget to network with people in the area where you are planning to relocate. Become an expert in survival communications. That way you have a bargaining chip when it comes to a question of why they should accept you and your family into already overcrowded facilities!

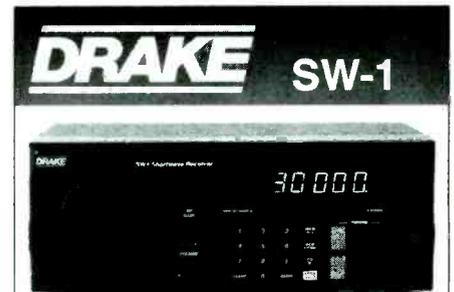
Prioritize

I realize that this column is filled with lots of information and only scratches the surface of survival communications. If you are like me, you cannot go out and buy everything you need to complete your survival communications setup. Therefore, you need to make a list, prioritize it and plan to acquire items as soon as possible. Follow the established **Kiss Radio** principles: know your subject, shop around for the best price and don't spend money unless you absolutely have to.

Survival communications planning (footnotes 5-9) can be a great exercise involving your entire family in a very important project — their survival during a large scale disaster. And remember: under emergency conditions, the only solutions that are successful are the ones that **Keep It Simple**.

FOOTNOTES:

- ¹ *Guide to Survival Communications* by Dave Ingram, K4TWJ, published by Universal Electronics and available from Grove Enterprises.
- ² American Radio Relay League, ATTN: Rick Palm, K1CE, Field Services Manager, 225 Main St., Newington, CT 06111-1494; (860) 594-0200 or e-mail: rpalm@arrl.org
- ³ Alpha-Delta Communications, Inc., P.O. Box 620, Manchester, KY 40962; (606) 598-2029 (-4413 fax)
- ⁴ Wilderness Radio, P.O. Box 734 Los Altos, CA 94023-0734; (415) 494-3806
- ⁵ *Pulling Through* by Dean Ing, ISBN: 0-441-069050-5, Published by Ace Books. Available at used book stores.
- ⁶ *Military Monitoring* by Steve Douglass, published by Universal Electronics and available through Grove Enterprises.
- ⁷ House of Generators, 16610 - Unit D, Gothard St, Huntington Beach, CA 92647; (800) 987-4484
- ⁸ Alternative Energy Engineering, Inc., P.O. Box 339C, Redway, CA 95560; (800) 777-6609
- ⁹ Major Surplus and Survival, 435C Alondra Blvd, Gardena, CA 90248; (800) 441-885522



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Executive Branch Travels

As I put this column together, CNN News formed the background commentary as our Chief Executive and the Vice President conduct the business of the people. Where those two go, so do federal communications.

The Vice President was headed for Naval Air Station (NAS) Ft. Worth, Texas, to visit the Lockheed plant in regard to a seven billion dollar contract for the sale of F-16 fighter planes to a foreign nation. The Fort Worth Police Department came alive with a force of about twenty motorcycles and twenty cars in the protection details. The following information comes to you via Brian Scott of Ft. Worth giving the communications details for that visit.

Ft. Worth Police uses a trunked system: you can find the frequencies on the Trunkcom internet newsgroup. The trunked identifiers of interest in the VP Detail are:

- 3536 Traffic Detail
- 4496 Traffic Talk 2
- 4464 Traffic Talk 1
- 4528 Traffic Supervisors
- 3952 Traffic Special Detail
- 3504 Air Support
- 4400 Air Support Talk 1
- 4432 Air Support Talk 2

The federal channels noted in use during this event were:

- 162.6125 NAS Ft. Worth—Military Police channel 3
- 163.4635 Lockheed Security
- 163.4875 Lockheed Security
- 163.5125 NAS Ft. Worth—Military Police channel 2
- 163.5875 NAS Ft. Worth—Military Police channel 1
- 165.375 Secret Service: EOD teams 1 and 4 were also heard on this frequency.

Brian was at a restaurant prior to the VP's arrival where about 10 Ft. Worth PD motorcycle officers were also present. Brian apparently asked them a few questions regarding the communications being used. He was told to forget trying to monitor—they were using *scrambled* channels and no one could listen to them. (Guess what—they weren't...!)

While the VP visited Ft. Worth, the President was in London for the G8 Conference. My London correspondents inform me that the White House Communications Agency

brought along a *trunked* 400 MHz system for Presidential protection. (The normal 165 MHz frequencies are rarely used over there—they are part of the commercial business band.)

The Scotland Yard motorcycle escorts were on 147.9125 MHz. The 400 MHz trunked system was using the frequencies of 407.075, 407.125, and 407.175 MHz. No other channels were confirmed, but a possible frequency configuration of this system is presented in Table 1. The Scotland Yard units were paired off with our Secret Service detail using frequencies of 150.150, 450.050, and 450.125 MHz.

TABLE 1: WHITE HOUSE COMMUNICATIONS AGENCY 400 MHZ TRUNK SYSTEM

406.450/418.375
407.125/418.275
408.850/418.400
408.875/418.500
408.925/418.525

Each participating country in an international conference hopefully coordinates its communications with the host country. At one conference here in the United States several years ago, one of the Eastern Block countries did not want to coordinate with the FCC/NTIA. As a result they brought walkie talkies and mobiles which operated in the 88-108 MHz FM commercial broadcast band. The units were totally unusable over here. (In their country the FM broadcast band is in the 66 MHz region.)

Andrews Air Force Base always has its air show when the President returns to town. William Withers made a fine contribution to the Scan-DC list, which was echoed onto the FedCom list. Washington D.C. area frequencies in use were:

406.250	406.950	407.150	407.425
408.025	408.200	408.750	408.7625
408.950	409.350	409.725	409.7375
413.275	413.300	413.375	414.6375
414.9625	415.825	415.950	

You will recognize some of these frequencies as being part of the trunked system at Andrews. The other ones are discrete operations on the base and at other locations in the District area.

■ A Mystery in North Carolina

For those of you that live in or near Chatham County, North Carolina, there is a big mystery brewing surrounding the "Big Hole" located off Mt. Gilead Road.

The following information comes from the January, 1998, *Chatham Journal*. It may be viewed on the web at: <http://www.chathamjournal.com/0198discussgroup.html>

It seems that one of the local townspeople was traveling down Mt. Gilead Church road when he came into contact with signs that had the meaning of "Turn back or we will shoot." Being a cautious person, our visitor immediately left the area. Upon arriving back in town, he inquired what others knew about the area. It seems that there is a mystery surrounding a "big hole" in the area, that is operated by the U.S. Government.

One of the people to whom he spoke was an old friend, who advised that it was a government facility. It seems his father did some of the construction work there when the big hole was constructed. This father was never allowed to say where he worked. If asked, he was to say he ran a vending route. The most he ever told his son, which was relayed to our observer, was there were a lot of computers and communications equipment there.

Another person told our visitor that the big hole was indeed a U.S. Government communications facility. This person worked for a local oil company. This oil company had a contract to provide approximately 100,000 gallons of kerosine to be stored there in underground tanks. This kerosine was to run the backup generators if the need ever arose.

Two other people came forward to provide information to our friend. The first agreed that it was a government communications facility. It seems the facility is buried underground and is thirteen stories deep; apparently it has been there for over twenty years.

The other informant told our visitor that the U.S. Government and AT&T operate this communications facility for defense purposes. It seems that this facility is completely underground and has total worldwide communications capabilities. Apparently no one in the Chatham County government knows exactly what the facility is. They have all been assured that there are no missiles or weapons

stored there. The road into the facility has an anti-tank barricade at its entrance.

The one person who might shed some information on the site, but probably isn't talking, is the mayor of Pittsboro, North Carolina. It seems His Honor just retired from working at the site.

Visit the above web site for details.



■ More Strange Sites?

In a widely distributed posting to the "Spooks" and "Fedcom" list servers, John Maky reported a rather sinister monitoring site in California at Black Mountain. He sent a photo showing the top of the mountain, looking toward Mexico, which is approximately 30 miles away through the haze. It shows a typical private/government repeater site: Some of the users are AT&T, State of California, Federal government and some private repeater sites, including three television transmitters. The mysterious monitoring site is located along the road which leads up to these repeater sites.

He took a photo of the monitoring site itself (not shown). John advises that seconds after he took the photo, he was approached and told in no uncertain terms to quit taking pictures and leave the area immediately. John says this property is owned by the Bureau of Land Management and is by definition, public property. (So is the land around Area 51 — but I would not try to argue the finer points of the trespass law with the armed patrols there!)

John notes that behind the monitoring site is an area which contains several rented portable toilets and portable living facilities. There are multiple high frequency antennas

erected which can be seen in the picture. From outward appearances, this base had the looks of a forward air control base with the radar. John notes that the people he saw there definitely were not military. Any guesses, anybody?

Just as a footnote, the Department of State ran a high frequency monitoring location on Old Carde Sound Road south of Miami many years ago. The Department of State Telecommunications Division has always provided cover for the CIA communications facilities. You might remember that the old KKN50 and other KKNxx stations operated under Department of State cover for many years—and some still do. These stations have been tied back to the boys at Langley many times.

■ An Update on Nextel

We have frequently speculated as to where the Feds have gone. We finally have determined that a majority of the individual agents and agencies are going over to the new digital trunked system operated by Nextel.

In the past couple of months, I have begun to understand how this system works. Let's look at this system and what it holds for all of us. This information is provided from press releases of Motorola, Inc., manufacturer of the units which are sold to Nextel and a few others.

The system is called the Motorola iDEN i-600 series. The iDEN stands for Integrated Digital Enhanced Network. This is a high capacity digital trunking radio system which provides integrated voice and data services to the end user. The iDEN system uses M16-QAM digital modulation and VSLEP (Vector Sum Excited Linear Predictor) speech coding techniques coupled with Time Domain Multiple Access (TDMA) methods to enhance channel capacity and system services.

Conventional trunking systems define a control channel by specifying a set of inbound

and outbound frequencies to the user. In the iDEN system, which operates in the normal 800 MHz trunking channels, the use of a single frequency pair (separated by 45 MHz) is shared among six users by dividing the frequency into time slots. Each time slot is 15 milliseconds in length.

In the case of the iDEN voice traffic channel, each mobile unit transmits and receives on one of the six slots assigned to each user frequency. Therefore, the mobile radio transmission is a pulsed RF signal with a 1/6 duty cycle. The base transmits and receives on all slots from six different mobiles using the same frequency.

The iDEN system uses M16-QAM which is a digital modulation format containing 16 QAM modulation on four subcarriers. This proprietary Motorola modulation contains both amplitude and phase modulation. The audio must be digitized and then compressed using a VSLEP vocoder prior to transmission for efficient use of the channel.

The iDEN system uses an approach similar to cellular telephone networks. Each radio is assigned a unique identifier. When the radio transmits, the system checks to see if the radio is registered to the system. There is also a dispatch identifier assigned to the radio. A radio that has not been placed in service or which has been reset remotely does not contain any of this information. For this reason, cloning from an existing radio is regarded as practically impossible at this time.

The scanners which hear the output signal from the tower will hear a channel containing six individual users on each frequency. This will make monitoring a little more interesting. The people at Motorola have also come up with a couple of additional security tricks which will not be discussed here. But be aware that just purchasing a radio at the local flea market or from Nextel will not allow you to monitor someone else's conversations.

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The Role of a Flight Service Station

Welcome aboard! Today we'll take you on a tour of Flight Service Stations (FSS). Whereas Air Traffic Control Centers serve mostly instrument flight rules (IFR) aircraft, Flight Service Stations primarily serve general aviation aircraft operating under visual flight rules (VFR). General aviation pilots, as well as some military flights, also use these stations to obtain information that is pertinent to operating along their routes or within 200 miles of the station. However, commercial aviation pilots can and do use flight service stations when necessary.

The pilot in command (PIC) of an aircraft is responsible for obtaining all pertinent information affecting his or her flight before taking off. The flight service station is a primary source for such information which will include factual data pertaining to terrain or weather peculiarities, pre-flight and in-flight weather information, suggested routes, altitudes, pireps (pilot reports) radioed by pilots reporting significant conditions encountered in-flight (such as turbulence or potential icing), any unusual conditions at the destination airport, and other information important to flight safety.

The FSS is a direct descendant of the original communications stations established in the 1920s. They also serve as terminals for one of the FAA's teletype communications networks. This network carries several types of messages, including notices to airmen (NOTAMs). NOTAMs advise pilots of navigational aids that are out of operation, any unusual airport conditions, and other necessary safety information.

General aviation pilots also use the FSS to file their flight plans. The flight plan is just what the name implies: the pilot's plan for a particular flight. "Filing" a flight plan means entering the information into the air traffic control system computers. Although pilots flying under visual flight rules are not legally required to file flight plans, prudent pilots do so.

A flight plan is like a free insurance policy. If something goes wrong during the flight, or if the flight does not arrive at the planned destination within a reasonable time after the pilot's intended arrival, the air traffic control system will be alerted. In an emergency, the

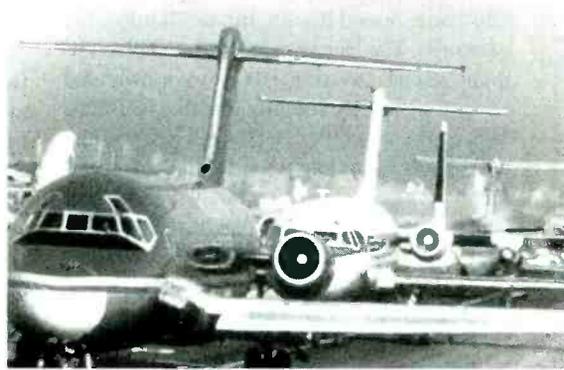


Photo courtesy FAA

Clearance maintains a safe distance between aircraft.

information in the flight plan will be used for search and rescue operations.

Just as air traffic controllers do, flight service specialists also train at the academy in Oklahoma City. The specialist on duty at the Flight Service Station is also a trained preflight briefer, who provides pilots with pertinent facts necessary for a particular flight. A specialist cannot prevent a VFR pilot from taking off. However, if weather conditions dictate, a pilot will be advised that VFR flight is not recommended. A prudent pilot will always heed this advice.

In the past, FSSs were found at airports. However, because of improvements in technology, this is no longer always the case nor is it necessary. Most existing FSSs have been replaced with fully automated flight services stations (AFSSs). The automated flight service stations are equipped with the most modern data processing and communications equipment.

These new stations can be expected to serve larger areas than they did previously, and at the same time require fewer control specialists. It also means that pilots must place a greater reliance on long-distance telephone calls and computers to obtain the information from the AFSS network. The project to automate flight service stations is expected to be completed in this decade.

■ Clearances

Controllers issue air traffic control clearances to provide separation between aircraft. An air traffic clearance is defined as "an authorization by air traffic control, for the purpose of preventing collision between known aircraft";

for convenience, the term is shortened to "clearance."

Controllers issue clearances based on known traffic and known physical airport conditions. An air traffic control clearance, authorized by air traffic control for the purpose of preventing collision between aircraft, allows an aircraft to proceed under specified conditions within controlled airspace.

The separation of responsibility that exists between the pilot and the controller is one that on the surface seems almost unworkable, but in operation has functioned well for many years.

Federal Air Regulations 91.3(a) states: "The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft." In other words, if the controller issues a clearance that would cause a pilot to deviate from a rule or regulation or, in the pilot's opinion, would place the aircraft in danger, it is the pilot's responsibility to request an amended clearance.

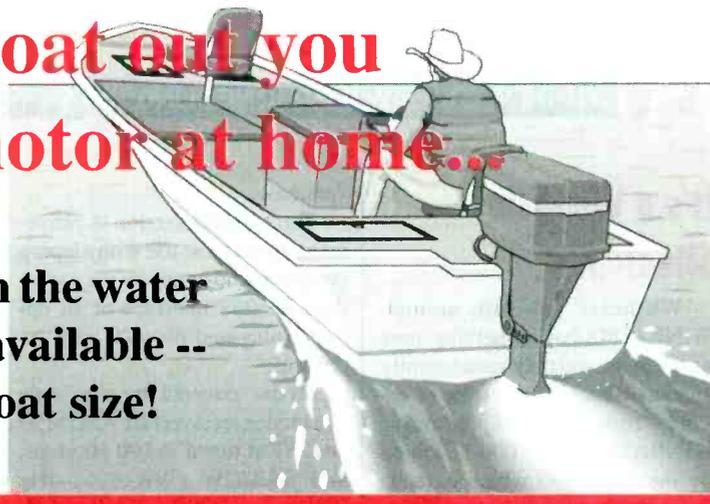
Pilots may not deviate from an air traffic control clearance or instruction without first notifying the controller. If the situation is such that the pilot has to act immediately, he has to notify the controller as soon as possible.

In practice, air traffic controllers are in charge of the movement of all IFR aircraft. Their decisions are guided by an understanding of the physical limitations of the aircraft, the Federal Air Regulations, and operational procedures that have been developed throughout many years. The controller has the total picture of the traffic situation under his jurisdiction; the pilot does not.

Only since the development of traffic collision avoidance systems (TCAS), does the pilot have any idea of what other aircraft may be in his immediate vicinity. The pilot knows what the aircraft can do, and acts accordingly.

If either the pilot or the controller deviates from this working framework, there had better be a good reason! Usually, the division of responsibility is not a problem. If a clearance is relayed by a third party — for example, by a flight service station — the instruction is preceded by "ATC clears."

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Whenever you turn around, WinRADIO has something new on the plate, and they have recently announced some delectable offerings indeed. The popular WinRADIO WR-1000 is joined by the WR-1500 which extends frequency coverage from the 0.5-1300 MHz threshold to 0.15-1500 MHz (minus prohibited frequencies), and both models are now available in internal or external



versions.

The external version is convenient for portable use with a laptop computer and connects via a standard RS-232 interface or an optional plug-and-play PC card interface.

Modes covered by the triple conversion receivers are AM, NFM and WFM tuned in 100 Hz steps; and SSB/CW (WR1000: 5Hz BFO) or USB, LSB, CW (WR1500: 1Hz steps). The new models are awaiting FCC type acceptance. Call Grove Enterprises for pricing and availability at 800-438-8155 or www.grove-ent.com, or visit www.winradio.com for distributors outside the U.S.

Opto's Little Black Box

In a collaboration between Optoelectronics and GRE, the



OptoCom is another entry into the world of computerized scanning. Like Opto's recently-announced OptoTrakker, this triple-conversion receiver can also scan conventional analog channels and trunked channels simultaneously.

Modes covered are WFM, NFM, FM, AM, plus it will decode CTCSS, DCS, LTR, DTMF and Motorola Type I and II trunked systems. Spectrum coverage includes 25-520, 760-823.995, 849.005-868.995, 894.005-1300 MHz.

Trunk tracking utilizes ScanStar software; all necessary cables and software are included in the \$459 price. Contact Optoelectronics at 800-327-5912 or

www.optoelectronics.com for more information.

July Fireworks: AR8200

The newest offering from AOR is the AR8200 wide range handheld receiver which is anticipated in July, pending FCC type acceptance. Much of the redesign seems to be in external features and the changes are significant. The unit is small and slim, very easy to hold; the finish has been changed from gunmetal gray to a scratch-resistant rubberized case in dark army-green. The keys, which on the '8000 were soft rubber with lettering that eventually wore off, are now rounded, reduced-profile buttons with a clear coating over the lettering. The display has been moved from the middle to the top of the '8200.

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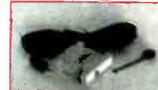
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Last, but definitely not least, the earphone jack has been moved from the top to the side and the tuning knob changed to a side-mounted rotary thumbwheel—definitely clearing up some real estate on top of the '8200 for easy operation of the volume and squelch knobs! The other factor that necessitated this shift is the fact that the ferrite bar antenna for AM reception below 2 MHz is now removable, plugging firmly into a slot behind the knobs.

Internal operations are similar to the 1000-channel AR8000, with programmable steps down to 50 Hz, and an RS232 port for computer control (although it is now easily accessible from the side instead of under the battery). The AR8200 has extended its wide frequency coverage even further to cover 500 kHz to 2040 MHz, and search speed has been increased to 37 channels per second. An optional card—which plugs easily into a slot on the bottom of the receiver—enables extended memory to 4000

channels, CTCSS, tone eliminator and the ability to record on a sound chip (IC).

Several other features are rumored to be included, such as variable memory bank size and PL tone decoding; check with Grove Enterprises at 800-438-8155 or go to www.grove-ent.com for more details on specifications, availability and pricing (anticipated to remain around \$600).

Be Alert!

Your scanner may have access to the NOAA National Weather Service channels, but that does you no good when the radio's turned off. For peace of mind the inexpensive Weather Alert Monitor—available from Grove Enterprises for just \$39.95—is always on duty. Even if you turn off the 24-hour broadcasts, a flashing light or siren will notify you when a severe weather



alert has been issued for your area.

An AC adapter is included for normal operation, but keep the unit supplied with a 9-volt battery and it will remain on guard during a power outage when you need it most. The unit comes with a telescoping whip antenna, but folks in fringe listening areas can plug in an external antenna for better reception. Contact Grove Enterprises at 800-438-8155 for more information.

Early Warning System

The best protection against lightning isn't an arrestor—it's to completely disconnect your radios from antennas and power outlets. By the time you hear the thunder, it may already be too late!

SkyScan gives you the early warning you need, detecting lightning as far as 40 miles away and informing you of its approach by

both an audible tone and by four LED's which are ranged in miles (20-40, 8-20, 3-8, 0-3). This feature tells you if the storm is moving towards, away, or parallel to your position. You can select the range at which detected lightning strokes will sound an audible warning tone (or the tone can be turned off).

SkyScan also alerts the user of especially strong thunderstorms or squall lines, which might produce especially strong winds, heavy rains or even tornadoes. SkyScan will sound a continuous alarm for fifteen seconds and repeats the process every fifteen minutes until the severe weather activity has cleared. Its use is approved by Little League Baseball Inc. The Washington County Soccer Club says, "It has been accurate for the storms we have monitored."

SkyScan can be powered by two 9V batteries,



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- TDM342/ARQ-M2/4
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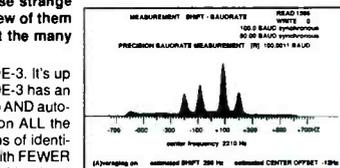
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120VAC adapter (optional), or by a 12V cigarette lighter (optional). Battery-save operation and low battery indicators are built in. SkyScan will notify you if it detects background noise levels (such as TVs, computer displays, or other appliances) high enough to interfere with accurate detection. It comes in a rugged, weather resistant plastic case; an optional soft case is available for attachment to your golf bag, back pack, etc.

SkyScan is \$99.50 from Equity Industries in Virginia Beach, VA (800-972-0292) or www.eicsafety.com. Readers in Australia can pick it up for \$299(AUD) from Sphere Innovative Technologies in Darlinghurst (+61 2 9344 9111) or www.sphere.mpx.com.au.

They're Solar Powered!

The sun came out with a vengeance following hurricane Andrew, but without power, many victims couldn't hear the information bulletins broadcast on the radio. Now American Technology Corporation has a solution to this kind of situation: a line of solar-powered radios and flashlights, all compact and light weight.



All models have a built-in rechargeable NiCd battery, charged by direct sunlight. Power for the SolarSounds Model 220 (\$23.49) can be backed up by one AA alkaline battery, extending its 3-hour operation to 12 hours; Models 230 (stereo, at \$34.99) and 250 (\$26.99) operate on the NiCd for 6-8 hours and can also be recharged with an optional AC

adapter. The radios are AM (no expanded band)/FM with impressive sound quality using ear-buds. The '250 also features one-touch digital tuning and external speaker.

The SolarLights flashlight Model 260 will last for about two hours of continuous use and requires 6-8 hours sunlight for full recharge. It can also be recharged with an optional AC adapter.

ATC combines the SolarLights 260 flashlight with the SolarSounds 220AM/FM radio in their Model 210 Emergency Kit (\$39.99) to keep in your car or home, or take on camping or hunting trips. For more information contact ATC at 13114 Evening Creek Drive South, San Diego, CA 92128, 1-800-417-2346 or visit their website at www.atcsd.com.

Get the Power

Cutting Edge Enterprises has a number of solutions for emergency power supplies and accessories such as solar cells, lights, DC extension cords, and more. For example, the PowerPort PowerSafe series provide 75 to 200 amp uninterrupted power supply in price range from \$66 to \$168. All models come with a heavy duty, vented battery enclosure suitable for use in the home, triple port automotive cigarette outlets for DC use, and fully automatic chargers. The Deluxe model (\$230) also provides AC power (300 watts continuous or 500 W peak).

For further information and pricing contact Roger Hall at Cutting Edge Enterprises (1803 Mission St. Suite #546, Santa Cruz, CA 95060) 800-206-0115 or cutedgent@aol.com.

HT to Base Station Conversion!

Even while in the field you can boost the power of your handheld transceiver to the power of a mobile or a base station (up to 50 watts) with the Docking Booster from Mirage. Simply slide your



handheld into the secure holder and select the correct voltage. The Docking Booster will work with most radios, whether old or new.

Mirage has two models, the B-24-G for 2 meter handhelds (\$114.95), or BD-25 for dual band HTs (\$164.95). Adapters to connect your radio(s) are \$9.95 each. Call 800-647-1800 for the nearest dealer or visit www.mirageamp.com

RF Exposure and You



Perhaps because of its controversy, exposure to radio frequency energy is very much in the limelight these days. The amateur radio fraternity is now

charged with the responsibility of determining what power levels its licensees are generating, and the impact this might have on family and neighbors.

The American Radio Relay League (ARRL) has just published *RF Exposure and You* by Ed Hare, W1RFI — a comprehensive, 300 page guide for the ham, which explains how to compute these suspicious levels for various frequencies, antennas, and environments.

Starting with a historical perspective on the issue, including a course in brief on antenna radiation, and continuing with several reprints from the Federal Communications Commission, the book includes math, theory, and work sheets, along with easy-to-follow tables for the less experienced ham to determine his level of compliance.

RF Exposure and You is \$15

plus shipping from the ARRL, 225 Main St., Newington, CT 06111-1494.

Have You Heard the Latest?

During an emergency is no time to begin the search for an up-to-date, easy-to-access source for frequencies. The Grove FCC Database ver. 6.1 is now shipping, and it's a remarkably fast, flexible, and comprehensive database of virtually everything licensed by the Federal Communications Commission.

Listings include police, fire, medical emergency, business, industrial, railroad, broadcasting (AM, FM, TV, SW) coastal marine, experimental/developmental, and more.

Fields include frequency, callsign, licensee name, city, county, state, service, emission mode, latitude and longitude, and your own comment field. You can sort by or rearrange fields, add and delete entries, and otherwise customize the list to suit your preferences. Assembled under contract with Rosetta Laboratories, the Grove FCC Database — at \$39.95 — is even better than ever. Give Grove a call at 800-438-8155 or visit www.grove-ent.com



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BayGen - A radio headed for disaster

By Hans Johnson

BayGen radios are no strangers to disaster, whether here or abroad. Humanitarian organizations are able to purchase radios from BayGen at cost for use in relief projects. The British Red Cross, for instance, purchased over 5,000 BayGen radios for use in the former Yugoslavia. Here in the United States, BayGen, in conjunction with General Electric, donated over 250 radios through the Red Cross to victims of last winter's crippling ice storm in the Northeast.

Projects such as these bring information and entertainment to people who desperately need both. BayGen also receives valuable feedback on how the radios have performed. There is probably not a commercial set that has been "tested" under so many different types of environments. BayGen uses this feedback to improve its sets and develop new products.

With all that experience in the field, the BayGen line of Freeplay radios are the ultimate in emergency radios. These radios operate completely independent of conventional power supplies, whether mains or batteries. The secret is a powerful spring made of carbon steel. A handle on the side of the radio allows the listener to wind up the spring just like a watch. Energy slowly released from the spring turns a direct current generator that in turn powers the radio. So as



A relief team in the former Yugoslavia instructs a BayGen radio recipient on how to wind up the radio (courtesy British Red Cross)



The AM/FM/SW BayGen Freeplay 1 radio

long as you can keep winding, you've got a radio!

■ An interactive evolution

BayGen's first radio, the Freeplay 1 (FPR 1) hit the street in 1995. Winding the radio for 30 seconds powered the radio for 30 minutes. This is an analog set whose coverage includes AM (520-1700 kHz), FM (88-108 MHz), and SW ("A" model 3.3-12 MHz, "B" model, 5.8 to 18 MHz). Buyers can specify which model they want. The radio weighs almost 7 pounds and its dimensions are 14 inches wide, 10 inches high, and 5.5 deep.

Users are pleased with the number of stations this set is able to pull in and the 4-watt sound delivered through the large (3.5 inch), front-mounted speaker. The case of the set is made of ABS plastic and has a very robust feel to it. This is BayGen's workhorse and it has been used all over the world. The FPR 1 is available through BayGen directly or from a number of radio specialty outlets.

BayGen introduced the Freeplay 2 (FPR 2) in 1997. It is lighter than the FPR 1 at 5.5 lbs. BayGen also made improvements to the spring mechanism. Wind up the FPR 2 and it can play for nearly an hour. The FPR 2 is also smaller at 10 inches wide, 8 inches tall, and 8 inches deep. It is AM/FM only—no shortwave coverage. The tuning on this set is also analog.

The FPR 2 is a bit cheaper than the FPR 1, though, and it is more widely distributed. It is available not only through specialty outlets, but through a number of sporting goods stores as well. The FPR 2 maintains the style of the FPR 1 in its front-mounted speaker. Both sets are

finished in black. They each stand up easily on their base.

An improvement to the FPR 2 is slated for later this year: The FPR 2 will incorporate a solar cell. Located next to the winding handle, the solar cell can power the radio if it is exposed to direct sunlight. A combination of solar and spring power are used in lesser light. This will extend the life of the radio by saving on wear and tear on the spring.

For those non-emergency times, an optional AC adapter is available. Depending on where you live, reception may be improved with an optional external antenna. One end plugs into the radio and up to 20 ft of wire can be reeled out. Another handy option is headphones. Listening through headphones, rather than a speaker, will extend the playing time of the radio.



The AM/FM BayGen Freeplay 2 radio

BayGen will also introduce an entirely new product this year that those interested in emergency preparedness should consider. This product is a digital weather radio. It will cover AM/FM and will be able to receive emergency alerts from the weather band. While this radio will usually be plugged into the wall like conventional radios, the wind up generator can be used for those times when power is not available.

There is a lot to choose from, but the time to buy this products is *before* disaster strikes. BayGen radios are good value for the money. They will keep your family informed and entertained when you need it most. If you would like to learn more about BayGen, give them a call at 1-800-WIND-234. Email them at freeplay@pair.com. Or visit their website at: <http://www.Freeplay.pair.com>

Coax Stub and PAR Electronics Filters

Intermodulation interference is like the weather. Everyone talks about it but few do much about it. Intermod is caused when two or more signals mix together and generate signals on other frequencies. The mixing can occur in many places, e.g., in rusty rain gutter joints, in one of the transmitters, or in a neighboring transmitter located in close proximity.

More often, however, the mixing takes place within our own receivers. Most of us are using consumer grade, wide band radios whose front ends are easily overloaded by strong signals from paging transmitters in the 152, 158, and 454 MHz ranges.

One weapon to combat intermod is a notch filter which attenuates signals transmitted in the paging band. In this column, I describe the simple, but overrated 1/4 wave stub filter and why it is a poor filter for rejecting paging intermod. Later, you will see how well a \$60 commercial notch filter performs compared to the stub filter.

The 1/4 Wave Stub Filter

Old timers have constructed 1/4 wave coax or twin lead stub filters for years to reject amateur or commercial FM broadcast signals which interfere with TV reception. A few people on the Internet suggest a simple coax stub filter will solve scanning intermod problems caused by paging transmitters. Is that good advice? In brief — no. It's a poor choice for modern day scanning.

You can make a 1/4 wave stub filter by connecting a short length of coax cable, or stub, to a T-connector placed at the antenna jack of your receiver. The far end of the stub is left unconnected. The length of the stub is

critical and it is determined by both the frequency you want to reject and something called the "velocity factor" of the coax cable.

I built the 1/4 wave stub filter shown in figure 1 by cutting one end from a RG-58C/U BNC jumper cable. I started with about 20 inches of coax and trimmed off little pieces while watching the frequency response on a Hewlett-Packard digital spectrum analyzer and tracking generator. I stopped cutting at about 12 inches, when the filter notch was centered on 158 MHz (figure 2).

As figure 2 shows, the 1/4 wave stub filter is broad. Sure, my filter attenuates 158 MHz pagers by 38 dB, but it attenuates all VHF high band signals, too. Police and fire signals near 155 MHz are zapped by 24 dB, for instance. The 158 MHz stub filter attenuates 474 MHz signals, too. Figure 3 illustrates how the 1/4 wave stub filter repeats its performance at odd multiples of its design frequency.

PAR Electronics Intermod Filters

Ok, so the \$3 stub filter isn't very good, but you can pay more and do much better. You can buy a commercial cavity notch filter for several hundred dollars or a PAR filter for about \$60. PAR Electronics (6869 Bayshore Dr., Lantana, Florida 33462, telephone 561-586-8278), manufactures a new series of intermod filters designed for scanner enthusiasts. (Despite my last name, I am not related to PAR Electronics!)

PAR can furnish intermod notch filters custom tuned to your frequency. I ordered two filters for testing: 158 and 454 MHz filters, models VHF DN158HT and UHF DN454HT (figure 4). PAR claims the VHF model attenu-

158 MHz, 1/4 WAVE RG-58C/U STUB FILTER
Measured Signal Loss

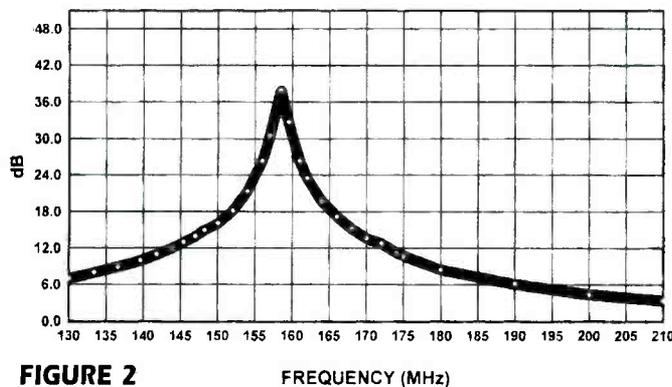


FIGURE 2 FREQUENCY (MHz)

Note: Measurements made in 50 ohm system.

158 MHz, 1/4 WAVE RG-58C/U STUB FILTER
Approximate Signal Loss

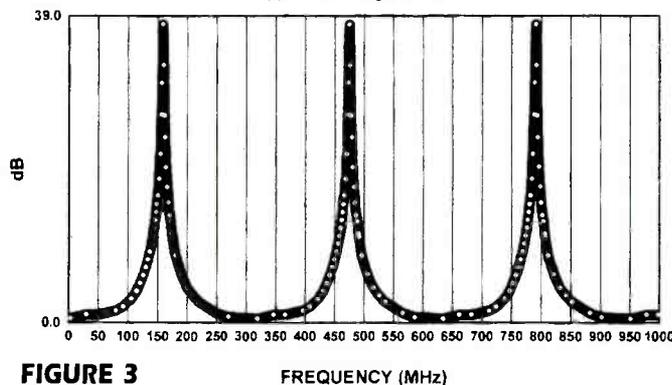


FIGURE 3 FREQUENCY (MHz)

ates 157.5 - 158.5 MHz signals by 35 dB and the UHF model attenuates 454 - 455 MHz signals by 25 dB.

They are made in USA of rugged, all metal construction and are fitted with high quality male and female BNC connectors. They are intended to be placed inline between your

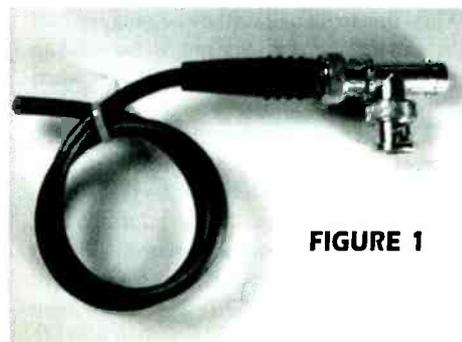


FIGURE 1

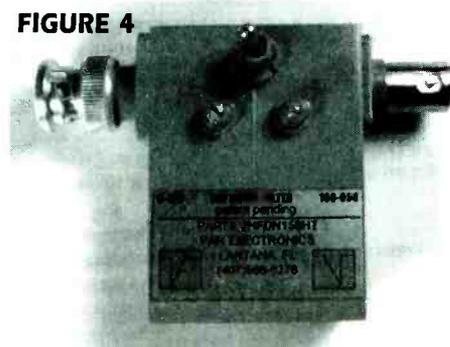
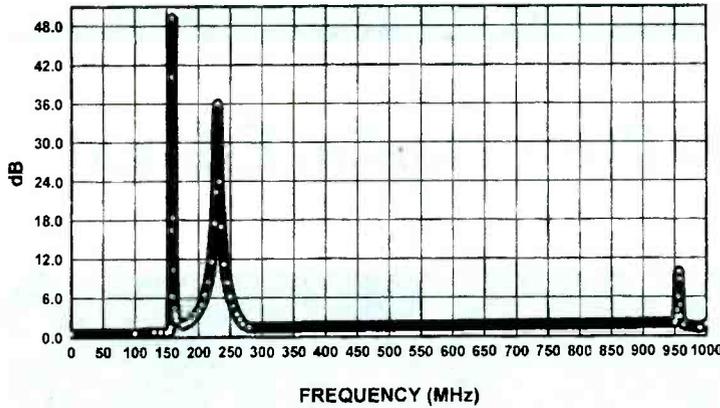


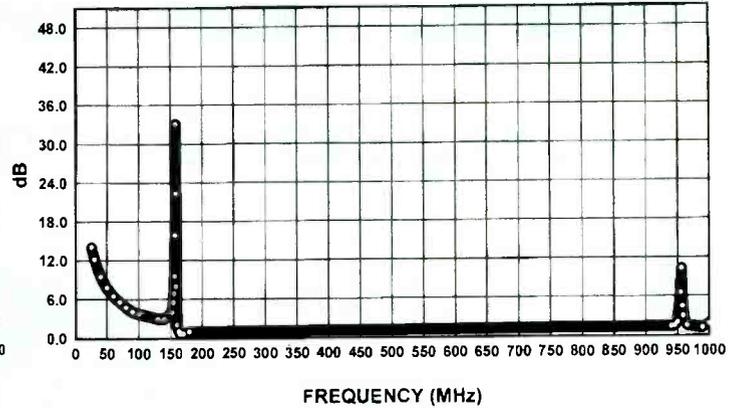
FIGURE 4

PAR VHFDN158HT INTERMOD FILTER
Low Frequency Setting - Measured Signal Loss



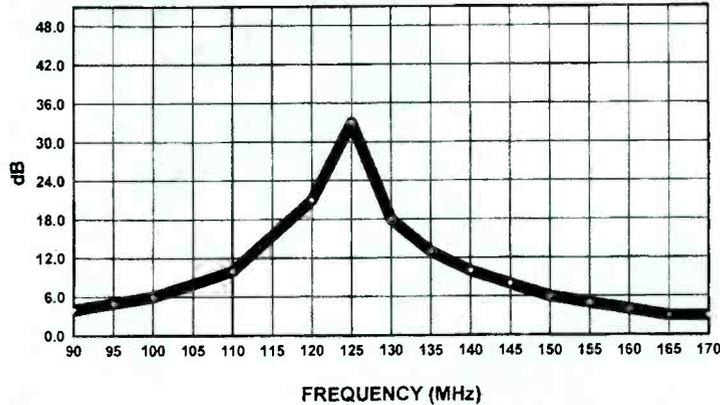
Notes:
Switch in 0 - 156 MHz position
Measurements made in 50 ohm system.

PAR VHFDN158HT INTERMOD FILTER
High Frequency Setting - Measured Signal Loss



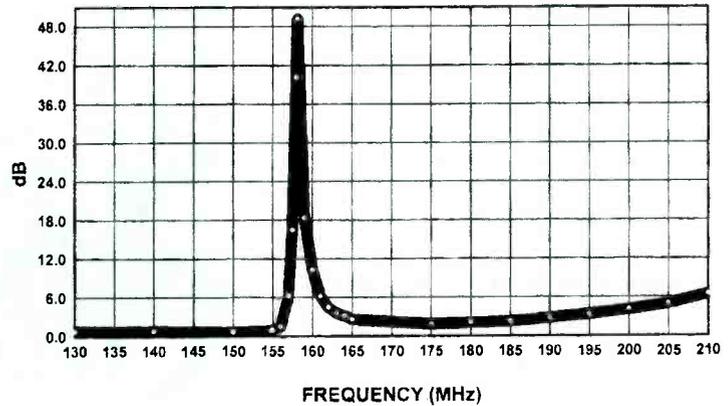
Notes:
Switch in 160 - 950 MHz position
Measurements made in 50 ohm system.

125 MHz, 1/4 WAVE RG-58C/U STUB FILTER
Measured Signal Loss



Note:
Measurements made in 50 ohm system.

PAR VHFDN158HT INTERMOD FILTER
Expanded View, Low Frequency Setting - Measured Signal Loss



Notes:
Switch in 0 - 156 MHz position
Measurements made in 50 ohm system.

scanner and 50 ohm coax feedline. Each filter has a small toggle switch which allows you to choose between two frequency ranges for best performance. For instance, the 158 MHz filter switch settings are: 0 - 156 and 160 - 950 MHz.

The two screws on the front are factory adjustments and appear to be glued. Tinkers, heed this warning: Don't adjust these screws!

PAR vs. Stub Filter

I measured the performance of both the 158 and 454 MHz PAR filters using a spectrum analyzer and tracking generator, but we will discuss the 158 MHz filter in depth. The close-in performance of the 158 MHz PAR filter is much better than my homebrew 1/4 wave coax stub. The PAR filter is deeper (49 vs. 38 dB) and sharper, attenuating 155 MHz signals by a mere 1 dB, for instance. The PAR filter's wide spectrum performance is much better, too.

It would be nice if one didn't have to throw the switch when listening on different bands.

I measured the wide band performance in both switch positions to see if I could leave the switch in one position at all times and still get good performance. The VHF PAR filter had an unexpected 10 dB notch near 956 MHz, regardless of switch position. Except for that, and an odd 35 dB notch at 200 - 240 MHz, it passed signals outside the 156 - 161 MHz range well if the switch is kept in the 0 - 156 MHz setting.

Military air buffs might use the 160 - 950 MHz setting which affords uniform performance across their favorite band.

I performed all tests using 50 ohm imped-

ance equipment. I don't know how the PAR filters would perform if using RG-59/U or RG-6/U 75 ohm coax instead, though I suspect the differences would be small.

Note to U.S. consumers only: It is unlawful to import, manufacture, or market cellular-capable or cellular-restorable scanners into the U.S.

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Grundig Yacht Boy 400 Professional Edition

About a year ago, Grundig decided it was time to close the door on its popular Yacht Boy 400 portable, which it had introduced in 1993. After all, the reasoning went, they had a number of new digital models coming out in the under-\$200 category. Why have similar models that are competing with each other?

But none of these models performed anything like the 400, which for years *Passport to World Band Radio* has tied with the Sony ICF-SW7600G for first place among compact portables. We grumbled, as others surely did, so Grundig relented. The result is the new Yacht Boy 400 Professional Edition, or "PE" for short. It's priced the same as the old 400: under \$200, street.

■ Improvements include AC adaptor

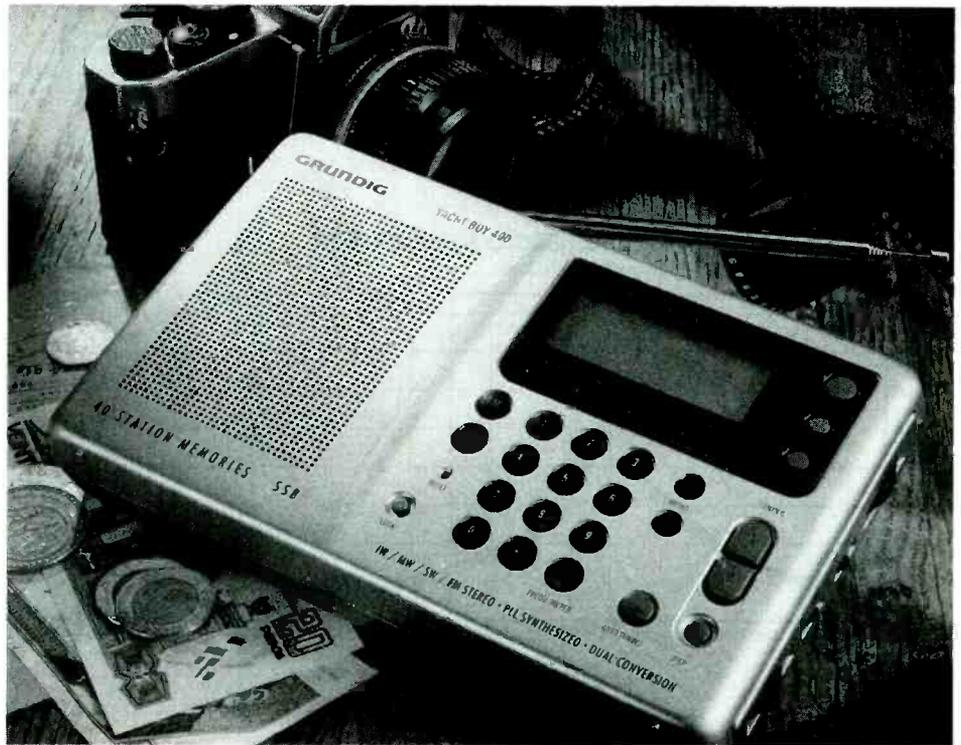
The 400PE stands out as another example of Grundig trying to make their products more attractive as a way to entice newcomers to world band radio. It is the same radio cabinet as before in all respects but one: color. Whereas the old 400 was sheathed in dark plastic, the 400PE has a light plastic cabinet with an aluminum-colored finish. It looks great, although it remains to be seen how well that finish will hold up over years of use.

The other obvious improvement is that the 400PE comes standard with a 120 VAC power supply. This is not just a money issue—it's usually better to use an adaptor made for a radio by the same manufacturer than to pick one up from someplace like Radio Shack. However, given how much world band radios are used by travelers, a multivoltage AC adaptor would have made more sense.

The last obvious improvement is in the owner's manual. It's utterly un-Teutonic, being to-the-point and written in everyday English that's comfortable for newcomers.

■ Flexible tuning alternatives, but no tuning knob

Beyond that, this is the same excellent 400 that we've come to know over the



years. It covers longwave, the AM band to 1710 kHz, and the usual FM band—in stereo through headphones (not supplied). Shortwave is completely covered, continuously from 1.72-30.0 MHz. There are the same two major drawbacks, as before: no main tuning knob and no synchronous selectable sideband.

Tuning is accomplished by up/down slewing buttons which can change frequency in 1 kHz or 5 kHz increments, as the operator prefers. There is the usual keypad to allow for direct access of station frequencies. It works easily enough, although the "0" isn't centered under the "8" as on telephones. There are also 40 channel presets, which can be accessed by the keypad, along with two separate slewing buttons to sequentially scan or manually chug through the memory bank. Add to that the presence of "signal-seek" scanning and meter-band selection, and it's a solid roster of tuning choices.

■ Superior LCD is "Information Central"

The LCD shows useful information without being confusing, as it can be on some of the newer models from other manufacturers. There's the digital frequency readout, of course, plus a dual-zone 24-hour clock that shows the time even when the radio is on. Additionally, the '400's clock also displays seconds numerically when the radio is off. This is handy if you're trying to catch the news headlines or a station ID at exactly the top of the hour.

More good news is that the LCD is illuminated. That light goes out automatically after 10 seconds, but you can switch it off earlier by pressing the light button a second time.

There's a signal-strength indicator that shows many increments, but in reality it is only a simple, but adequate, five-step readout. And if the batteries are low, "Battery Check" is displayed. About the only shortcomings are that the 24-hour time lacks leading zeroes—0500, say, shows merely



as five hundred—and there is no station-name display for the presets.

■ Worthy overall performance

Single sideband reception isn't normally used for hearing world band stations, but it is needed for listening to specialized radio signals. On the '400PE, single-sideband lacks an LSB/USB switch. So to tune upper or lower sideband separately, you have to tune the radio down—or up—frequency 1 kHz, then adjust the fine-tuning knob for zero beat. That knob, by the way, has a center detent; although it's barely perceptible, it is a real convenience.

Selectivity, or adjacent-channel rejection, is quite good, in part because there are two bandwidths. "Wide" provides enough audio fidelity to make for pleasant listening, yet is narrow enough to keep most adjacent-channel interference at bay. If interference is more extreme, or if you're listening to single-sideband signals, the narrow position does the job nicely. Both bandwidths are well chosen, more so than those on many other receivers.

Sensitivity to weak signals is quite good, especially for a radio of this size. Another help is that the radio comes standard with a tape-measure-type reel-in outboard aerial to supplement the usual telescopic antenna. Image rejection is more than adequate, too. However, there is the occasional "birdie," and depending on your local FM situation you may find some distorted FM signals breaking through into the shortwave spectrum.

■ Superior audio quality

All too often, a shortwave portable that performs well sounds mediocre because of pedestrian audio quality. Here, even though there is only a high-low tone switch, the '400 sounds at least as good as any other compact portable we have come across. For best results, place the tone control on low for FM, high for everything else.

Another nice thing about the '400 is that FM is a pleasure to listen to. It has a superior capture ratio, adjacent-channel rejection and adjacent-channel selectivity. The audio through the speaker is pretty good, but it really shines through stereo headphones.

Bottom line is that the Yacht Boy 400 has always been a top-notch compact portable. The 400PE is just as good now, but for the same money you get an AC power supply thrown in.

Japan Radio Making Fix to NRD-545

As we indicated in the May *MT*, initial effusive writeups on the Japan Radio NRD-545 were limited to certain sources, mainly in the United Kingdom, and didn't conform to our initial observations of this rig at a Japanese exhibition awhile back.

Now, we have laid hands on a unit, and unfortunately our concerns have been confirmed. Although in many respects this is an excellent fully digital tabletop receiver, we have found in the lab and during initial hands-on testing that there are certain characteristics which are clearly not appropriate to a receiver in this price range—indeed, in some respects not even a good portable.

For example, ultimate selectivity almost never reaches even -60 dB, and the audio quality in the AM mode is significantly degraded by the action of the AGC, which cannot be adjusted in the AM mode. There's no IF output, either—not even a way for one to be installed—so certain performance-enhancing accessories cannot be used.

When we find a new receiver that tests "off the curve" in this manner, we try to contact the manufacturer to see whether this is a production anomaly or, if not, a design flaw which they will be fixing in short order. After all, there's no point in reporting on a product's characteristics if they will have been changed by the time the consuming public reads about it.

Japan Radio's engineering department, however, has been most cooperative, and after running its own checks has confirmed our findings. So, as we go to press, we are air shipping the unit back to the '545's engineer for a design modification which JRC feels should help resolve matters.

One positive note is that we did not find the 545's dynamic range to be substandard. Best guess is that reports surfacing from Europe concerning "overloading" actually relate to the receiver's exceptionally poor ultimate selectivity, which allows powerful

signals on nearby frequencies to "slip in under the skirts." If JRC's fix works, this problem should be remedied.

Stay tuned—we'll keep you abreast of how this interesting saga unfolds.

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How Do You Spell Relief? - Fixing Win95 System Problems

A topic which has been in the news lately is Microsoft's introduction of Windows 98. Whether you use computers for work, radio monitoring or happen to work for the U.S. Department of Justice, you may be interested in Win98. Heck, many of us are still trying to tame Windows 3.1 and/or 95!

Well, this month we'll look at two programs, First Aid 97 and Nuts&Bolts, which just could be what the doctor ordered when it comes to frustrating Windows problems. Maybe if I had one of these programs I'd have more hair on my head and Bill Gates would be thought of more kindly.

■ Opening Windows

After all the joking and jibing, Windows 95 is a pretty powerful program. Remember back to the first time you saw Windows operate and I'm sure you'll agree. But there is a big difference between a demo and daily use. In the rapidly changing computer industry hardware and software, lives are measured in months and weeks. We are constantly upgrading and adding to our systems.

In this non-demo environment Windows can be a real problem. Windows 3.1 was (and still is) less of a problem than the newer Windows 95. It seems Win95 decides on new hardware configurations every time you turn on your computer...and in some cases the configurations are not valid or even real. That's when problems can start. For those of you who never change your hardware or software perhaps you are thinking, "Just what is John babbling about now?!" All I can say is give it time. For those of you who "feel my (Win95) pain" ...

■ ... First Aid may be on the way

CyberMedia has been in the business of fixing Windows problems for a few years. Their First Aid 95 program made quite a stir in the industry a few years ago when it became the first "fix-it" Windows program available by retail.

First Aid 95 could be used for both Windows 3.1 and 95. Their current product, First Aid 97, is for Win95 only, runs on a 386 or

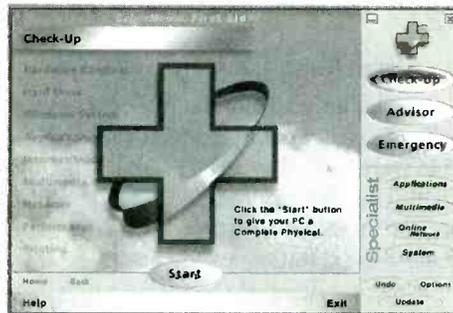


FIG 1 - First Aid 97 Main Screen

higher, requires a minimum of 17 megabytes of hard drive space and 8 Meg of RAM.

We'll use the CD ROM version which loads the installation program automatically. The complete installation takes about 40 Meg of hard drive space, a minimum installation is possible. But then you will need the CD loaded to run the program.

■ Say "Aaah"

First Aid 97's main screen, see Figure 1, has three sections: Selection Panel (right), Workspace (center/left) and System Status (bottom). To start, we'll click on the Check-Up button in the Selection Panel and then click the Start button which appears at the bottom of the Workspace.

We are now on autopilot and the program is checking our system automatically. It will display the part of the system that it is checking and its details in the Status section. The program continues until it has completed all checks. If it has found no problems you'll see a Passed report card on the screen. But if it has found any problems they will be displayed on a Problems Found screen.

■ Got Problems? Now What?

If we now select a problem line and click on Fix Problems we are presented with a number of fix methods: AutoFix, Manual and Ignore. Also a list of possible solutions is displayed in order of probability. In the spirit of ease-of-use we will try the AutoFix. If it can fix the problem all by itself you're home free — in theory. Some problems require the user to perform some actions. In that case, the

program will give you explicit instructions.

In some cases Solution 1 will not solve the problem. For this situation you must highlight Solution 2 and repeat the procedure. First Aid 97's manual gives you an interactive resource, called Advisor, if the AutoFix does not solve the problem and you have to dig deeper.

Now let's check out the other Windows "fixer" program, Nuts&Volts.

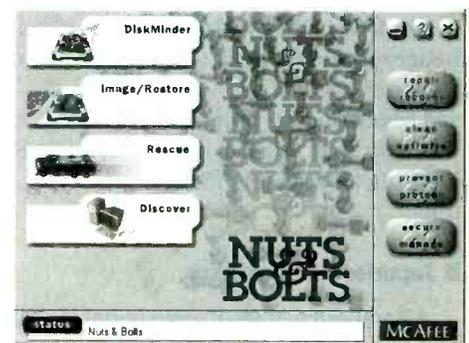
■ And in Lane Two ...

Nuts&Volts is manufactured by McAfee, the well known virus killer company. It has similar system requirements to First Aid 97, but Nuts&Volts can be used in both Windows 3.1 and 95; a definite benefit if you run machines with both. The Discover Pro feature evaluates hardware and software via diagnostic and bench mark tests.

The main screen, Figure 2, has three main areas. (Sound familiar?) The utilities are broken into four groups: Repair and Recovery, Clean and Optimize, Prevent and Protect, and Secure and Manage. For this comparison we will be in the Discover Pro's Repair and Recover group and Registry Wizard in Clean and Optimize.

I can hear you thinking "This one sounds more complicated." Don't jump to conclusions until we see the results ...

FIG 2 - Nuts&Bolts Main Screen



■ What Me Worry?!

Everybody's computer system is perfect — at least that's what we think until it crashes. Computer systems are like cars. No matter how well you treat them, if you use them they will develop problems. The question is not

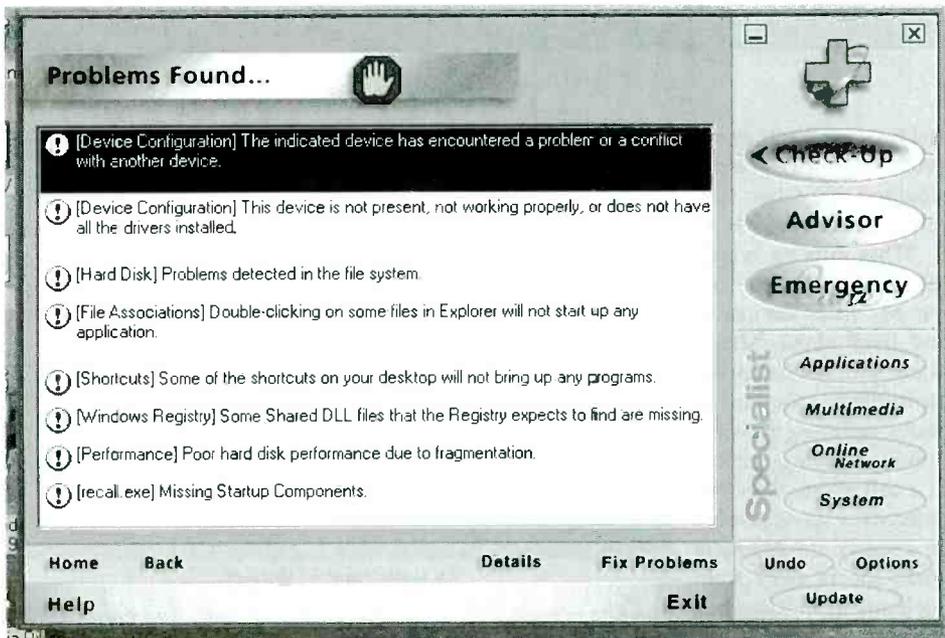


FIG 3 - Summary of Problem Uncovered By First Aid 97

“if,” it’s “when.”

For example, constant writing and erasing files of various size (exactly what happens when you use a web browser) causes your hard drive to become fragmented. This means that pieces of data are not physically contiguous; they are not next to each other. This affects the time it takes the magnetic head in the drive to read the data since it has to do a read, search, move, read group of operations. Let’s just run the two programs on a Pentium 133 system and see what they find.

■ Rogaine by a Hair

Figure 3 is the resulting First Aid 97 problem screen which lists eight problems. Let me remind you that all we had to do to get this list is click on the Check-Up Start button. Using Nuts&Bolts Discover command in the Repair and Recover section, indicated hard drive fragmentation problems, as did First Aid 97. But Nuts&Bolts required additional screens to be accessed in order to get details and start a repair procedure.

Similarly, Short Cut, Windows Registry, and File Association problems, as listed by First Aid 97 in a simple summary screen, were also uncovered by Nuts&Bolts. However, this was only after searching an additional one to two screens. See Figure 4. The Windows Registry problems, which were uncovered by both programs, could lead to some serious Gates cursing if not re-

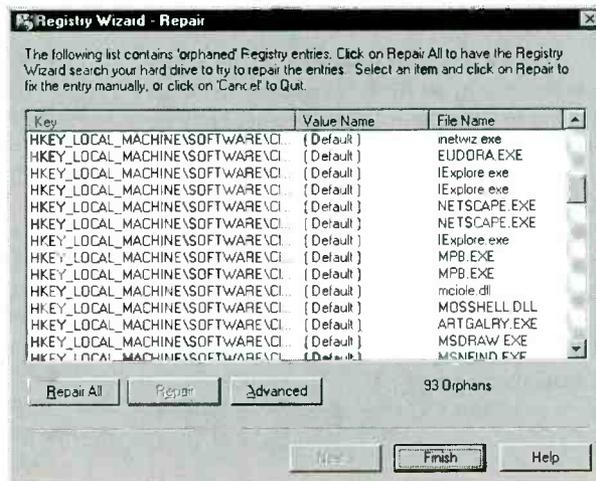
paired. Auto repair by either of these programs will surely save a clump of hair.

The two Device Configuration problems that First Aid 97 uncovered were not mentioned anywhere in the Nuts&Bolts results. But quite frankly, on this one, I’m not sure which program’s result is correct! One so-called problem was caused by not having my external Zip drive connected. This borders on a problem since it is a user’s operating choice.

■ The Winner by a Knows

First Aid 97’s ease of use is a very big factor. One summary screen, from which problems are tested, displayed, detailed and fixed, is a winning combination that’s hard to beat. Nuts&Volts is a close second, losing only due to its lack of summary screen methodology.

FIG 4 - ShortCut Problems: One of a Few Nuts&Volts Problem Screens



However, for the big-time computer maven Nuts&Volts provides the very comprehensive and detailed system hardware testing and reporting usually only found in expensive professional PC diagnostic suites. Although too detailed and complex for most, it’s there for those who know what to do with it. Also, keep in mind, Nut&Bolts can be used in a limited, but very useful form with Windows 3.1 as well as Win95.

Nuts&Volts also has a few added modules with novel functions. *WinGauge* give a real-time graphical representation of system hardware utilization; for example CPU activity. It’s a marvel to watch your system’s “vital signs” as you ask it to perform print and save tasks. *Bomb Shelter* catches your system before it crashes and allows you to continue without a reboot. *Zip Manager* does exactly what it says for Zipping/Unzipping files and whole folders. These, plus a few more like *Stronghold* which we will be talking about when we are together next, can be accessed via the Launchpad menu.

The powerful features that both of these programs contain are truly impressive. But the clincher is the fact that First Aid 97 and Nuts&Bolts can be purchased for around twenty dollars each! If you have Windows 95 you should not be without one of these. They are available at Computer City, CompUSA and even clubs such as Sam’s and BJ’s. First Aid 97’s web site is www.cybermedia.com. You can find Nut&Bolts at www.mcafee.com.

■ emiT txEN

Next time we’ll look at programs which make your files and e-mails unreadable to “prying eyes” — file encryption programs. I hope these “fixer” programs help you stay sane. At least I may have saved Bill from a few undeserved expletives and hexes. Now perhaps, the next Windows 98 demo he does will go better than the last COMDEX disaster. Bubble, bubble, toil and Windows...

Expecting the Unexpected

In this issue of *Monitoring Times* we have focused on monitoring in times of natural or manmade crises. Whether it's a pile-up on the interstate, a tornado warning, or a satellite failure, there is no foolproof way to be entirely prepared. But we must think ahead if we are to be of help to our family and neighbors.

A basic understanding of the world around us is a good place to begin. When Galaxy 4 lost its attitude control, *Satellite Times* columnist Steve Handler called his paging company to find out why it was out of service. The explanation he was given goes something like this: "Lightning struck the satellite. They're trying to get the parts to repair it and it should be back up by Friday."

Finally, Some Respect!

From Les Butler, author of this month's story on the AMR ambulance service:

"Last July a bad tornado hit Oakland County Michigan. The county went to work right away and helped rescue the residents and organize a recovery plan. At the next ARPSC (Amateur Radio Public Service Corp.) meeting the main topic of discussion was that incident.

"The hams missed the boat partially by not calling all the members for help, but the few that were at the weather station manning the Skywarn post proved to be invaluable. We were told that the phone company donated a few dozen cell phones but they were useless. You could never get a line — everybody in the world was using them — so 99.5 percent of the communication was handled by the hams. The county is *very pro amateur radio* now. Actually they were always pretty supportive but really understand the value now.

"Also, the county tried to get video footage of the storm damage from a local TV station to use for training and were turned down. I used a few media contacts gained from our paging notification network and they are getting a video. Nice to see the media give something back after all the help we provide them."

Cellphone 911

"I want to express to you my appreciation for a brief news item that was carried in the Communications' column. Under the heading of 'FCC Seal of Approval,' it stated that cellular telephone companies must accept

and forward all 911 emergency calls, regardless of whether the caller subscribes to any service.

"This directly relates to a personal note with me. My sister has cancer and lives alone. She is doing well but her bones are brittle and she can fall easily suffering possible injuries. Having access to a cell phone with 911 emergency service would be a safety enhancement when she is away from her house as well as when driving.

"But cellular phones when purchased without an activation contract can be expensive. However, checking around the internet, I came across a company that is selling reconditioned cellphones for \$40. Phones come with a 30-day money-back guarantee and a six-month warranty. This sounds like an attractive deal.

"I am very appreciative of the news item in your magazine which initially alerted me to this FCC regulation. I would not have heard of it otherwise."

—Paul Cristy

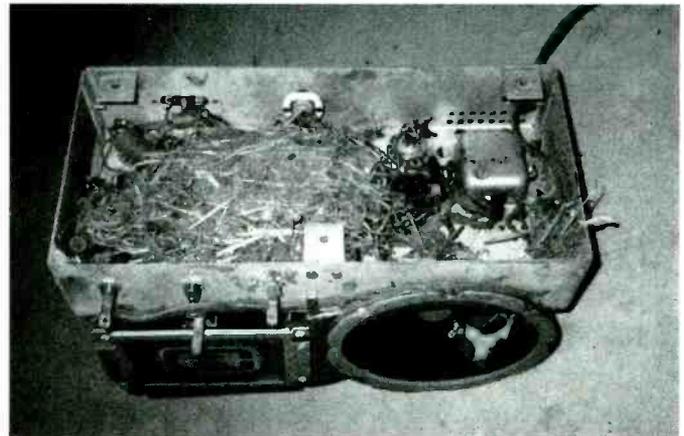
Mind you—I'm not saying it's going to be automatic or easy—just that the FCC intends to require it. The requirement may not be universally accepted yet, but I don't think the cell companies are going to have a choice. They are also being required to establish the location of the 911 cellphone caller, but they have a couple of years yet before that becomes mandatory - ed.

Great Emergency Antenna!

Here's a reminder about one of the antennas featured in the April '98 issue, suitable for storing in your glove compartment or in your back pocket: the VHF/UHF Twinlead J-Pole:

"Thank James A. Williams for his very easy-to-follow instructions on building the dual-band twinlead J-Pole antenna. I built it for my scanner listening post, and it worked so smoothly, I built another one to give to a friend. I had so much fun that I think I'll build a few more just to have around. 3 to 4 dB gain? I think much more!"

—Gary J. Cohen, Registered Monitor
KMA1KG



A Rat's Nest of Wires?

Bob Grove opened this late 1930s table top radio and found a real disaster!

Blue Angels Blues

Our apologies for not catching some obvious typos in the May Blue Angels article; a serious illness in the family may excuse the author but not us for the oversight!

Steve Douglass says the frequency given as 42.35 should have read 142.35. "We monitored several low-powered BA walkie talkies using this frequency for parts request and servicing on the C-130. The correct Kansas City frequency is 125.200 (instead of 125 given in the sidebar). Opposing solo should have been 391.100." And the Boss frequency is 307.7 as in the text, not 307.0 as in the sidebar.

Thanks to John Coker of Peoria, Illinois, and Mike Agner of Glen Burnie, Maryland, who wrote in about these discrepancies. We also owe an apology to Frank Murphy, the Amarillo photographer Douglass accompanied, who shot the pictures on pages 9 and 10 but was not credited.

If there's one thing a sudden opportunity for once-in-a-lifetime listening will teach a radio monitor, it's the value of accurate and well-organized records. Examples abound: When a strange aircraft flew low overhead and woke up everyone in two states (as one did here recently) a lot of us saw the lights, but only Bob Grove tuned in the right frequency fast enough to determine that a B-1 had just flown over Clay County. Is that the time to say, "hey, what's one megahertz more or less?!"

Here's hoping your summer proves more uneventful than the spring has been, but even so—be prepared!

—Rachel Baughn, mteditor@grove.net

GLOSSARY OF TERMS USED IN MT

// Indicates a parallel frequency
 73 Best Regards
 μF Microfarad
 μH Microhenry
 ABU Asia Broadcast Union
 AC Alternating Current
 ACARS Aircraft Communications Addressing and Reporting System
 ACE Association of Clandestine Enthusiasts
 AWR Adventist World Radio
 AIR All India Radio
 AM Amplitude Modulation
 AP Associated Press
 APRS Automatic Packet Reporting System
 ARRL American Radio Relay League
 ASCII American Standard Code for Information Interchange
 ATC Air Traffic Control
 AT&T American Telephone and Telegraph
 BBC British Broadcasting Corporation
 BBCM British Broadcasting Corporation Monitoring Service
 BNC Coax connector commonly used with VHF/UHF equipment
 CB Citizen Band
 CBC Canadian Broadcasting Company
 CBS Columbia Broadcasting Company
 CD Compact Disc
 CD-ROM Compact Disc, Read Only Memory
 CE Chief Engineer
 CIA Central Intelligence Agency
 CLA Cuban Coastal Radio Station
 CNN Cable Network News
 CPU Central Processing Unit
 CR Croatia Radio
 CTCSS Continuous Tone Controlled Squelch System
 CW Continuous Wave (Morse code)
 DC Direct Current
 dB Decibels
 DEA Drug Enforcement Administration
 DJ Disc Jockey
 DPS Department of Public Safety
 DSS Digital Satellite System
 DSWCI Danish Shortwave Clubs International
 DW Deutsche Welle
 DX Distant reception of radio or television signals
 DXer A person who engages in the hobby of distant radio/television reception
 DXing The hobby of listening to distant radio or television signals
 EMS Emergency Medical Service
 EOD Explosive Ordnance Disposal
 FAA Federal Aviation Administration
 Fax Facsimile
 FCC Federal Communications Commission
 FEMA Federal Emergency Management Agency
 FM Frequency Modulation
 FTP File Transfer Protocol
 Golan Golay Sequential Pager Signaling System
 GHz Gigahertz
 GPS Global Positioning System
 HF High Frequency
 HQ Headquarters
 Hz Hertz
 ID Identification
 IRC International Reply Coupon
 KBC Kenya Broadcast Corporation
 KBS Korean Broadcasting System
 kHz kiloHertz
 km Kilometer
 kW kilowatt
 LCD Liquid Crystal Display
 LSB Lower Sideband
 M Meter
 mb meter band

MDT Mobile Data Terminal
 Med Medical
 MHz Megahertz
 MNO Merlin Network One
 MT Monitoring Times
 MW Medium Wave
 NAS Naval Air Station
 NATO North Atlantic Treaty Organization
 Nexrad Next Generation Doppler Radar
 NFM Narrowband Frequency Modulation
 NiCd Nickel Cadmium Battery
 NPR National Public Radio
 NOAA National Oceanographic and Atmospheric Administration
 NSW New South Wales
 NU Numero Uno
 NWS National Weather Service
 PC Personal Computer
 PD Police Department
 POCSAG Digital Pager Code
 QRA The name of my station is ...
 QRM Man-made interference
 QRP Low power transmit operation
 QSL A card or letter confirming reception of a radio station
 R. Radio
 RAM Random Access Memory
 RDP Radiodifusao Portuguesa EP
 REP Republic
 RF Radio Frequency
 RFE Radio Free Europe
 RFI Radio France International
 RFPFI Radio For Peace International
 RHC Radio Havana Cuba
 RL Radio Liberty
 RTBF Radio-Television Belge de la Communiaute Francaise
 RTM Radiodiffusion Television du Mali
 RTTY Radioteletype
 RVI Radio Vlaanderen International
 SASE Self Addressed Stamped Envelope
 SBO Voice of Oromo Liberation
 SINPO A code system used by radio hobbyists to indicate how well a station was received
 S=Strength, I=Interference, N=Noise, P=Propagation, O=Overall
 S.O. Sheriff Office
 SSB Single Sideband
 SW Shortwave
 SWBC Shortwave Broadcast
 SWL Shortwave Listener
 SWR Standing Wave Ratio
 TRT Turkiye Radyo-Televizyon Kurumu
 TV Television
 UHF Ultra High Frequency
 UK United Kingdom
 UPI United Press International
 URL Universal Resource Locator
 US or USA United States of America
 USB Upper Sideband
 UT or UTC Universal Time Coordinated
 UV Ultraviolet
 v variable
 VAC Volts Alternating Current
 VC Voz Christiana
 VDC Volts Direct Current
 VHF Very High Frequency
 VOA Voice of America
 VOR Voice of Russia
 VOV Voice of Vietnam
 VP Vice President
 VRT Vlaamse Radio en Televisie
 VSWR Voltage Standing Wave Ratio
 WFM Wideband Frequency Modulation
 WWW National Bureau of Standards Time Station in Boulder, Colorado
 WWWH National Bureau of Standards Time Station in Hawaii
 WWW World Wide Web

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BELOW 500 KHZ DXING THE BASEMENT BAND

(Continued from page 66)

its inductance will not change every time it rains or snows. Some experimenters place the coil in a small plastic garbage pail or other weathertight enclosure near the base of the antenna.

Lyle estimates that for a typical 50 foot base loaded antenna with a good-sized top hat, a 2500 microhenry (μH) loading coil will be required. The same antenna without a top hat would require about 5000 μH . You simply will not find such coils available for sale, so they must be built from scratch.

The first step in building a coil is to select the form. Coil form materials must exhibit low loss if the "Q" (quality factor) of the coil

is to be maintained. Good materials include Styrofoam, Teflon, and polyethylene. PVC should be avoided as it can be lossy at these frequencies. Lyle suggests a polyethylene 5-gallon pail can. He's also used circles cut from 2-inch thick Styrofoam and glued together the pieces to get the required form length. The 2500 μH coil used on his Lower beacon is built on a form 18 inches in diameter by 9 inches long. It holds 65 turns of #14 wire.

Lyle suggests using #20 or larger wire to wind loading coils. Multi-conductor "Litz" wire is preferred, but is hard to find and quite expensive. Teflon insulated wire is probably the second best material. If you don't have

either of these, consider using #14 insulated building wire. While it has somewhat more loss than Teflon, it is an acceptable substitute.

Once again, we find ourselves at the end of a column. Next month we'll discuss the specifics of winding the loading coil, installing a ground radial system, and tuning the antenna for resonance at the desired frequency. If you want a head start on these topics, be sure to check out Lyle's excellent write-up on LF antennas at <http://members.aol.com/us66soft/loferant.htm>. You will also find a coil design program written by him at <http://members.aol.com/us66soft/loferant.htm>.

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CLOSING COMMENTS



By Bob Grove,
Publisher

Storm Tracking...It Could Save Your Life

This spring brought casualties and devastation to communities across the country from storm-spawned tornadoes, with many of these areas having no advance storm alerting system. NOAA National Weather Service transmissions are too distant to be heard, or incomplete in their advisories to those remote areas which are so vulnerable, and community broadcasters rely on distant, tardy, and often unreliable updates; I know—I live in such an area.

■ *So what equipment is needed?*

Assuming you've had a TV set connected to a VHF/UHF antenna, have you ever noticed how nearby lightning discharges make flashes on your TV screen? This is due, of course, to the wideband electrical signal radiated by the electrical stroke. The lower the frequency (channel number), the stronger the discharge pulse. When storms become intense, as they do during tornado formation, the radio emanations are nearly constant.

During the 1950s this phenomenon was used as an ad hoc storm detector. In this scheme, the antenna was disconnected from the rear of the TV set, and channel 2 was tuned in. The brightness control was adjusted just to the point of threshold, so that the raster could not quite be seen. Then the antenna cable was reconnected.

As a storm moved in, the flashes across the screen were quite apparent, and when the screen remained lighted for longer periods, the storm was closer and more intense. This was the warning to take cover or, at least, remain alert.

Worldwide, the collective lightning-discharge noise is heard on shortwave receivers as static, the steady background hiss when neither signal nor electrical appliance noise interference is present. As the storms come closer, the individual lightning "crashes" become more distinct.

You can determine what is static and what is receiver (thermal) circuit noise by disconnecting the antenna: If the noise goes away, it's coming in on the antenna line; if it stays, it's being generated by the radio.

■ *So, will a radio work just as well as a TV?*

The radio equivalent of the TV scenario would be to listen to a vacant low frequency (typically 100-900 kHz); the lower the frequency, the more local the signals.

The radio equivalent of the brightening TV raster would be, of course, the increase in intensity and numbers of static crashes heard. If the background static crashes ascend to a raucus, prominent din, it may well be time to take cover!

■ *Can direction be determined?*

Most times, you can simply look out the window to determine the direction of the storm: that doesn't take a college diploma! But how far away is it, and which way is it going? That takes triangulation, a relatively easy task for the experimenter, but impossible to assess from one location.

Two observers can coordinate visual as well as radio observations quite handily. If they are several miles apart, and each has a magnetic compass, it is a simple matter to combine the two bearings on a map to see where the lines cross. That's the storm's current center. We can also use inexpensive portable radios to assist in the tracking.

Let's take a practice shot using several known, local, AM broadcasting stations. Start by finding north with a magnetic compass in the center of a fairly open room (not near walls with wiring). Adjust a state or regional map on the floor or on a table so that it is in proper compass alignment.

Tune in a moderate-strength broadcaster on a battery-operated portable AM/FM or shortwave radio, and set it on your location on the map. Rotate the radio slowly around its center (better yet, put it on a lazy Susan!) and listen for a sharp reduction in signal strength of the station. That is the "null," produced when the internal ferrite rod antenna is pointed toward the station; it will most likely be off either end of the radio.

Try this with several stations until you feel comfortable using the radio as a direction finder. You will be using that same technique to listen for reductions in static crashes during an advancing lightning storm. Naturally, it would be best if your portable had a signal strength meter, but even without one, you can listen for the signal strength to grow weaker as the radio is turned.

With a large or very close storm, the "center" is broad, and the closer it comes, the broader it gets. But while the storm is still distant enough to plan safety measures is when you need to do the plotting. And with several storm spotters plotting their bearings from different locations, accuracy is increased.

■ *But which way is it going, and how fast?*

By calculating visual and radio bearings on the map every few minutes, you can determine the location, path, and the speed of the storm as well. A local Skywarn ham radio network and/or Citizens Band REACT (Radio Emergency Associated Communications Team) could provide this service with constant updates and bearings for scanner listeners, hams, CBers, school officials, and other concerned community citizens. Local broadcasters could alert their listeners who aren't suitably equipped with scanners or CB radios.

So why aren't we doing it?

WORLD WIDE RADIO

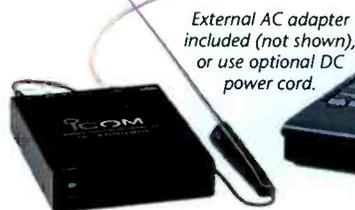


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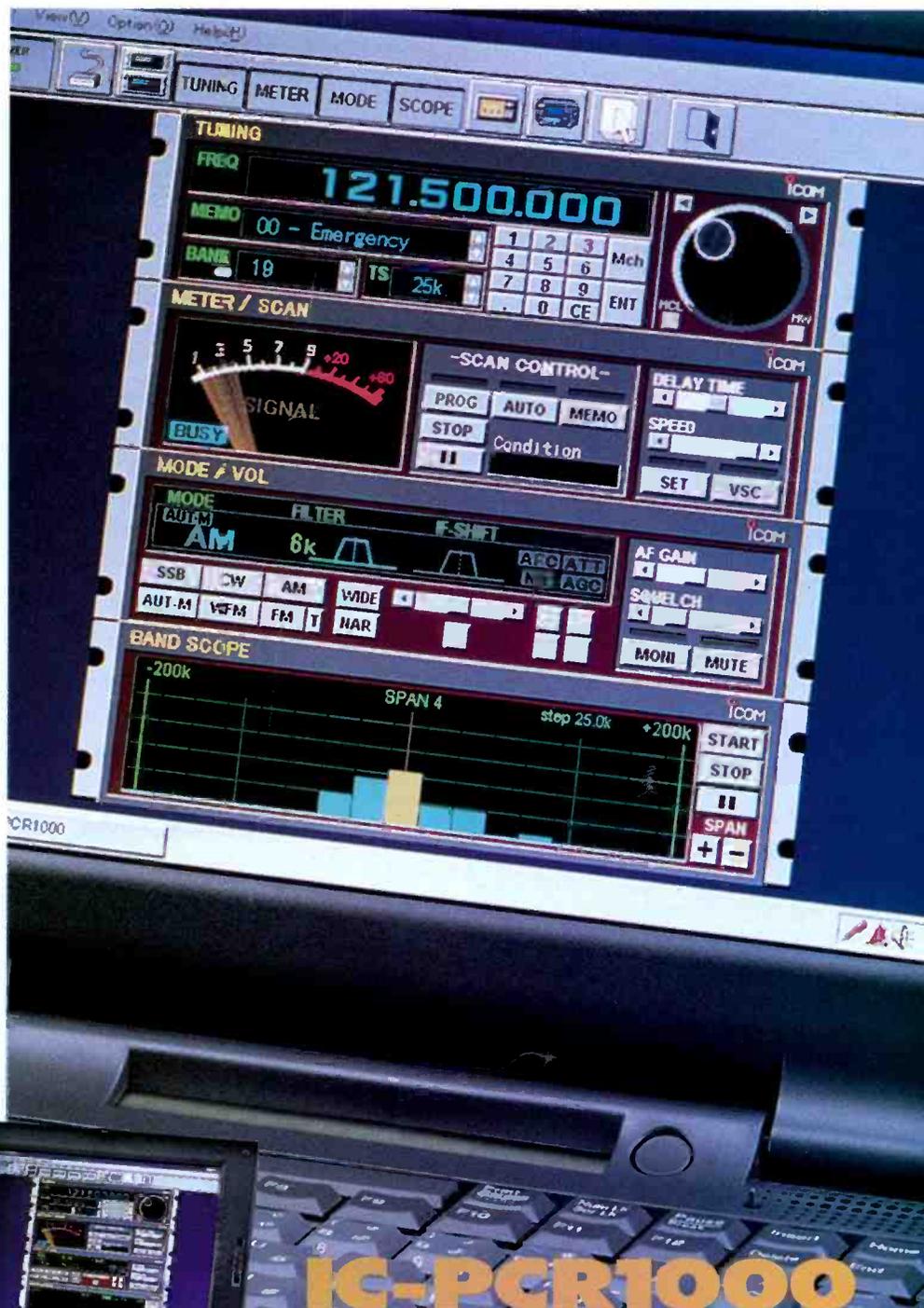


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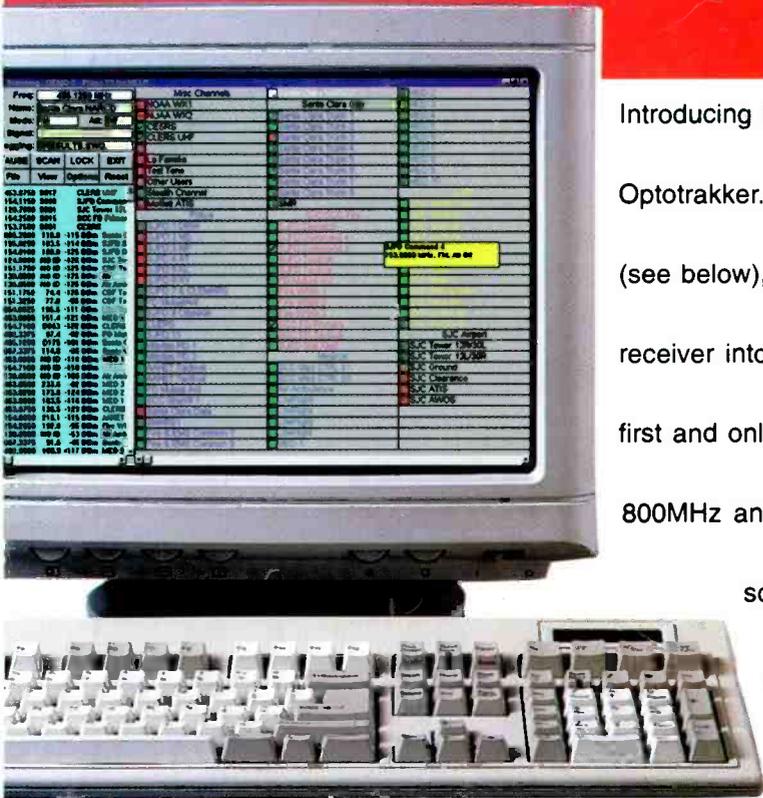


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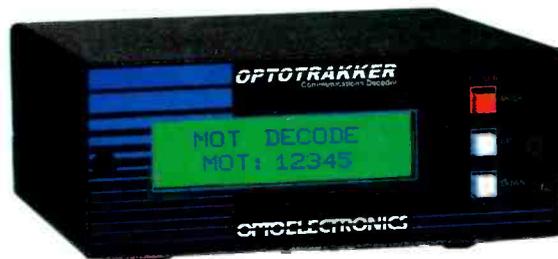
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