

Vol. 17, No. 5

May 1998

U.S. \$3.95

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Printed in the United States



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Cover Story

Inside the House of the Blues

By Steve Douglass

The author (well-known to long-time *MT* readers and military monitors), takes us along on one of his favorite activities—witnessing breathtaking performance by the Blue Angels, the Navy’s crack aeronautical demonstration team. The opportunity to view their practice run-through on press day meant he was able to check frequencies and program radios in advance of the show they put on for the public the next day.

There’s no better lead-in to our aeronautical issue than to revisit this world-renowned team of ace pilots. Turn to page 8 for a taste of the excitement and their 1998 schedule, then program your scanner and head for the nearest airshow! Cover photo courtesy USN Blue Angels.

C O N T E N T S

BeeWee in My Back Yard 12

By Ronald Perron

Most people hate living close to a major airport, but for a scanner buff, it’s nirvana. Baltimore Washington International (pronounced “BeeWee”) airport is host to a fascinating variety of civilian and military aircraft, and *MT* provides the frequencies to plug into your scanner for some good aero listening.

CIA vs. Saddam: The Radio War of the Nineties 18

By Nick Grace

Whenever a military build-up draws world attention once again to this flash point in the Middle East, one can be sure that before weapons fire, the war of words is already well underway. The US has had an ongoing presence on the airwaves for years, though their tactics may change with administrations and political realities.



VORTAC Goes the Distance 22

By Michael Scofield



These low power, workhorse beacons used for aeronautical navigation get put to a novel use by our author. He issues a challenge and provides some education along the way. Oh say, how far can *you* see?

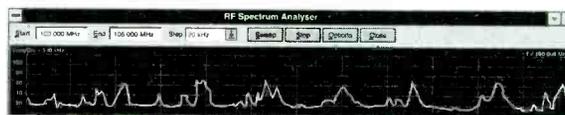
REVIEWS:

If you are wondering what the difference is between the BC235XLT TrunkTracker and Radio Shack’s PRO-2050, turn to page 86 for the definitive answer by Bob Parnass. Shortwave listeners will find the first of a two-part, in-depth analysis of the Drake R8B by Larry Magne on page 88.



Page 90 carries John Catalano’s promised review of the WiNRADiO Digital Suite. Turn to page 85 for reviews of two other useful accessories—

the MFJ-418 Pocket Morse Code Tutor and the Opto Techtoyz Micro RF Detector.





MONITORING TIMES
 (ISSN: 0889-5341;
 CPC IPN Sales Agree-
 ment #1253492) is
 published monthly by
 Grove Enterprises, Inc.,
 Brasstown, North
 Carolina, USA.

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Address: P.O. Box 98, 7540
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Internet Address: web: www.grove-ent.com
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Editorial e-mail: mteditor@grove.net
 Subscriptions: order@grove.net

Subscription Rates: \$23.95 in US; \$36.50 Canada; and \$55.45 foreign elsewhere, US funds. Label indicates last issue of subscription. See page 95 for subscription information.

Postmaster:
 Send address changes to *Monitoring Times*,
 P.O. Box 98, Brasstown, NC 28902-0098.

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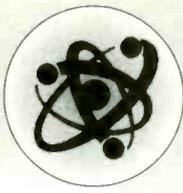
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The Grove Enterprises internet address is changing. To find all your favorite pages follow the links from www.grove.net, or try the new address www.grove-ent.com to find the *Monitoring Times* web pages and updates on these email forums.



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FCC Agrees to Examine "Microstations" Two Petitions Could Legalize "Pirate" Radio!

More than ever, the FCC has its hands full combating unauthorized "pirate" radio stations. But it recently granted a rulemaking number to a petition filed by Nikolaus E. Leggett, N3NL, of Reston, Virginia, seeking to create a "Microstation Radio Broadcasting Service." If authorized, such a service could eliminate the need for illegal operation.

The FCC receives some 13,000 inquiries a year about low-power broadcasting. Nikolaus Leggett and his cosigners Judith Leggett and attorney Donald Schellhardt hope to expand availability of the airwaves beyond the limited existing opportunities. The FCC placed their petition on Public Notice on February 5, and granted it number RM-9208.

The petition proposes that one AM and one FM channel would be assigned to the entire licensed microstation service. Each station would be licensed to operate in a specific location. Transmitter output power would be limited to 1W, with antennas limited to 50 feet above ground or building.

Licenses would be granted on a first-come, first-serve basis with random selection to be used "if the Commission is swamped with license applications." Congress has forbidden the FCC to continue using random selection, or lotteries, to award station licenses, so federal law would probably have to change—not too likely given the lure of auction revenues.

Asked by *Radio World*, an industry newspaper, for his views on pirate broadcasting, FCC Chairman Kennard pointed out the trend of massive consolidation in the radio industry, with some companies seeking to buy hundreds of stations. He said that there is a need to create more outlets for expression, and that he is receptive to hearing more about licensing some form of low-power broadcasting. He has instructed the FCC's Mass Media Bureau to look into whether it is possible to create a low-power radio service.

The FCC already has a "Low Power Radio Service" (LPRS) in the 216-217 MHz band. But the FCC has carefully limited it to certain obscure uses, such as transmissions for the hearing impaired, a broad category of short range "health care assistance devices" and

anti-theft beacons. LPRS is legally a form of CB Radio and may not be used for broadcasting to the public. LPRS is not an unlicensed operation, instead devices are "authorized by rule" (i.e. no license documents are issued).

Low Power Microradio Broadcasting Service

Rodger Skinner, of Pompano Beach, Florida, has also filed a petition with the FCC looking towards creating a Low Power FM broadcasting service. Skinner is president of TRA Communications Consultants, Inc. and also an Extra Class amateur, W4FM. The Commission has accepted the February 20th Petition for Rulemaking.

Skinner has worked in broadcasting since 1963...actually longer if you count the mini-station in his basement at age 16. He started his own consulting business in 1976 after working as a Top-40 DJ and engineer at about a dozen AM/FM radio stations. He now makes his living filing FM and LPTV applications for clients and also owns a low power TV station in Fort Lauderdale, Florida.

"I have been working on my LPFM petition for almost two years," Rodger told us. "I have always wanted to own a radio station, but like most I have not been able to afford to buy one. The 100 kW FMs here now are going for \$50 million."

Skinner says that four distinct types of Low Power FM service are needed throughout the country. First is for the hobbyist who wishes merely to transmit a signal to another part of his/her house or other needs. This is already adequately provided for under current Part-15 rules, which limit radiation to 250 uV/m at 3 meters from the antenna.

Secondly, there is a need for "special-event" stations to broadcast information concerning a special event such as a boating regatta or auto race for a limited time period. These stations may only need to broadcast for a weekend or a few days related to the event in question. There should be a streamlined system to coordinate these one-time requests, where coverage requirements might typically

be one to two miles, around a park, racetrack, etc. Skinner refers to these as "LPFM-3 Special Event" permits.

A third type of station is needed to serve small areas within larger communities, such as are operated today by some so-called "pirates" with a typical range of under five miles. Many in this group will prefer to operate with volunteers from the community offering a variety of programs and viewpoints by area residents and offer a loosely structured form of broadcasting, often without set hours of operation.

This LPFM-2 class station could be started at little cost. The station would have a maximum power limit of 50 watts (ERP), a minimum power limit of 1-watt (ERP) and maximum antenna height of 150 feet.

Finally, Skinner believes there is a need for a more structured type of station, again with local owners, who themselves will invest the time and money needed to create a station that will be responsive to local needs and interests. LPFM-1 stations will be the highest class with the largest possible coverage area as well as the most stringent requirements.

This type of station will mirror more closely the typical full-power station, may consist of a few employees in addition to the owner(s) and have a 24-hour per day continuous broadcast schedule. A minimum power level of 50 watts (ERP) and a maximum power level of up to 3 kilowatts (ERP) will provide a coverage area of up to about fifteen miles, similar to the old Class A FM stations.

LPFM would utilize commercial FM channels 221 (92.1 MHz) through 300 (107.9 MHz) with sufficient channels available to provide one or more new channels to each market area. Applications for the temporary special-event LPFM-3 stations could be handled by volunteer frequency coordinators so that interference is not caused to existing stations.

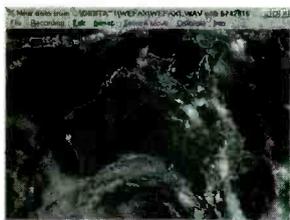
The petition for LPFM is online for reading or downloading from: <http://www.concentric.net/~radiotv>. Rodger Skinner's e-mail address is: radiotv@cris.com.

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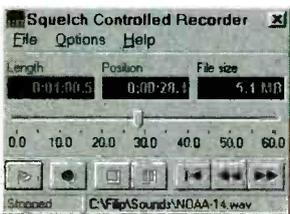
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HR2369 Passes the House

As anticipated, the cellular protection bill H.R.2369 came to a vote and passed the House with one dissenting voice in early March. The Bill now moves to the Senate Commerce Committee for further action. See this month's "Scanning Report" for all the details.

Lost in the clouds

A twin-engine plane flown by pilot Tom Cleary drifted 150 miles over the Atlantic on its way from Rochester bound for Newark, New Jersey. Above the clouds at 9,000 feet and with direction-finding and communications equipment knocked out due to electrical failure, the pilot was completely lost.

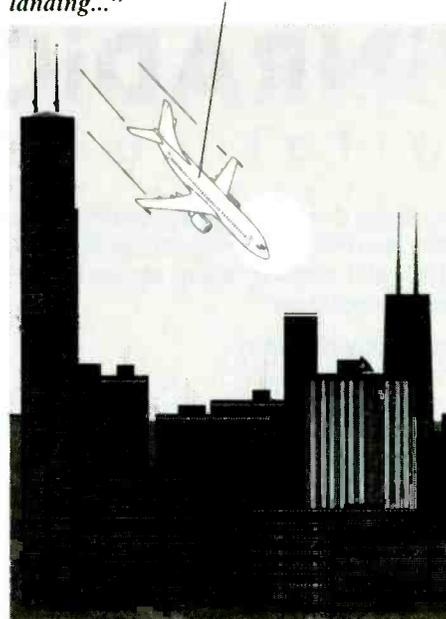
When the plane came up missing, air traffic controllers contacted the US Coast Guard. Two F-16s caught up with the plane and one signalled for him to follow by lighting his afterburners and flashing his exterior lights twice, said Lt. Col. John Dwyer. Once within 60 miles of the coast, two F-15s took over and escorted him to Atlantic City International Airport.

"He was real happy to be back, real happy to be alive," said Dwyer.

Clue: on a plane, by unknown passenger, with a cellphone

Reports forwarded to us by email claim

"Well, I'd better get off the cell phone, Margaret. We seem to be coming in for a landing..."



that a recent crash by a China Airlines A300 may be blamed upon interference from a cellular phone. According to the correspondent Tsung-Hsien, "the [Chinese] government has announced a new rule which can send anyone making cellular phone calls on an airplane to prison up to five years. If an accident is caused by the phone call, the penalty can go up to a life sentence."

Many US airlines recommend passengers

switch off their phones, but how many recognize the difference between switching off the phone and just not talking on it? And did the cellphone really do it?

FAA says cell site needs paint

In the search for existing structures on which to erect cellular antennas, Cellular One thought they had a good deal going; they would paint and restore a rusty old water tower and remove a second dilapidated tower. In return they would negotiate a bargain price on renting the tower to support their antennas.

Now the FAA says the water tower (which predated FAA safety regulations) is close enough to the Schenectady, NY, county airport that it may have to be painted with an orange and white checkerboard instead of the tasteful sea green and gray that had been planned. So much for cellsite stealth and good community relations!

Tower Space for Rent

One type of structure previously dismissed as a potential host to PCS and cellular antennas is the AM broadcast tower. As explained in last month's cover story, the tower is "hot" with RF energy, since the tower is the antenna.

However, consultants from Lawrence Behr Associates, Inc. (LBA), based in Greenville, NC, have announced a new proprietary conversion adaptation of these AM towers to

BULLETIN BOARD

May 3: Hagerstown, MD

Great Hagerstown Hamfest at Hagerstown Junior College, Exit 32B off I-70 to Edgewood Drive, right at Home Federal Bank. Contact Don Jones KB8WHW 304-728-7769. VE exams 9 a.m. (no charge, walk-ins accepted but preregistration requested) and seminars. Talk-in 147.090+ 8a.m. to 3p.m., \$5 admission. Food, prizes, indoor facility and tailgating.

May 15-17: Dayton, Ohio

Dayton Hamvention at Hara Arena. **Come see Grove Enterprises/MT/ST** and see a live demo of the latest WiNRADiO, booth #573 / #591.

May 30: Loveland, CO

Superfest Swapmeet sponsored by Northern Colorado ARC at Larimer County Fairgrounds, 700 S. Railroad. Contact Michael Robinson N7MR, 970-282-1167 for info. Free parking; commercial exhibitors, refreshments, VE session. Talk-in 145.115-100Hz, 146.52. 8a.m.-3p.m., \$3 admission.

June 7: Butler, PA

44th Breezeshooters' Hamfest (largest in western PA) at the Butler Farm Show grounds, north of Butler (PA Rt 68 East from I-79). Contact Bob Ferrey Jr. N3DOK 712-367-2393 or see <http://www.users.sgi.net/~wolfie/> for info. Talk-in 147.96/36. \$5 admission.

June 7: Queens, NY

Hall of Science ARC Hamfest held at the NY Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St. Contact Stephen Greenbaum WB2KDG 718-898-5599, WB2KDG@bigfoot.com. Free parking; prizes, food. 9a.m. - 3p.m. \$5 donation. Talk-in 444.200+ PL 136.5.

New web sites:

- Capitol Hills Monitors: www.hyattsvillevfd.org/chm/
- Cumbre DX: www.ralabs.com/cumbre
- Glenn Hauser's World of Radio: www.angelfire.com/ok/worldofradio
- The Celestial WWW: celestrak.com



allow them to support antennas for wireless communications.

"The ability to mount new antennas in an unobtrusive manner on [as many as] 10,000 existing towers will minimize the impact of wireless antennas in the community and encourage communities to expand the technology and the coverage areas," said Win Donat, President of Lawrence Behr Associates. "It creates an entirely new tower rental income stream for the AM segment of the broadcast industry, a sector of the industry generally regarded as depressed."

This spring more will be pushing up than just daisies

Every "stealth" solution to the coming cellular/PCS/HDTV tower explosion is a help, even if it's a drop in the bucket compared to the number of sites needed. Communities and even states are beginning to wake up to the need to establish site guidelines, and fast!

We have received news clippings and email from Arizona, Massachusetts, New Hampshire, New York, North Carolina, Vermont, and Washington regarding communities making a concerted effort to hammer out tower laws. Town boards are struggling to compose ordinances which match the desires of the neighborhood with the interests of the cellphone companies (which now receive rights similar to public utilities), and which

don't violate the mandates of the 1996 Telecommunications Act.

Vermont is even attempting to mount a challenge to the Telecommunications Act. Vermont Sens. Patrick Leahy and James Jeffords and Rep. Bernard Sanders are sponsoring legislation (S 1350 and HR3016) that would return the power to the towns.

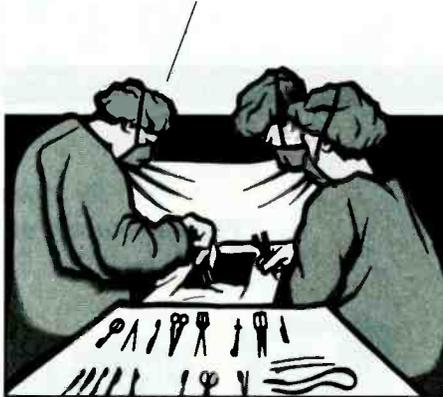
Is your township prepared? You'll only be allowed a limited amount of time to place a moratorium on new construction while your township, county, or state addresses the question. Waiting until the cellsites begin to sprout up may be too late!

Shaking out the digital bugs

The nation's first high definition television (HDTV) broadcast was a real heart-stopper—literally! WFAA-TV in Dallas beat all other US stations to the punch when it put its newly received Harris transmitter on air February 27th. It was also the first to encounter a unique interference problem.

At Baylor University Medical Center, sev-

"Gee, I can't imagine what's going on with these crazy heart monitors. Hey, isn't 'General Hospital' on right now? Somebody crank up the HDTV!"



eral of its 60 wireless heart monitors stopped sending data. Late that evening, the hospital thought it had the problem fixed, only to have it start all over again the next day. Steve Juett, senior clinical engineer, knew the low-power, unlicensed heart monitors used frequencies allocated to TV channels 7 and 9. As soon as a colleague mentioned WFAA's inauguration of digital TV on channel 9, he had the answer.

"It was very clear to me what was going on," Juett said. When WFAA's transmissions stopped at night, so did the problems with the monitors.

Baylor has decided to purchase a new monitoring system, but, meanwhile, WFAA is concerned about educating other engineers about this unforeseen side effect of a mode customers can't even see yet—since no major manufacturer will be selling TVs that can pick up the digital signal until this fall.

Communications is compiled by Rachel Baughn with help from this month's reporting team: Anonymous, New York; David Alpert, New Jersey; Roy Beavers, e-mail; Jean Foley, email; Wm. Hearty, Ohio; Steve Kaatz, Michigan; Maryanne Kehoe, Georgia; Kevin Klein, Wisconsin; Sergey Kolesov, Ukraine; Kenneth Lensing, Arizona; Claudio Morales, Argentina via Larry Van Horn; Dale Newton, VT; Ryan, Long Island; Bob Mills, California; Doug Robertson, California; Richard Sklar, Washington. We welcome clippings from your world of radio: send to MT headquarters or email mteditor@grove.net.

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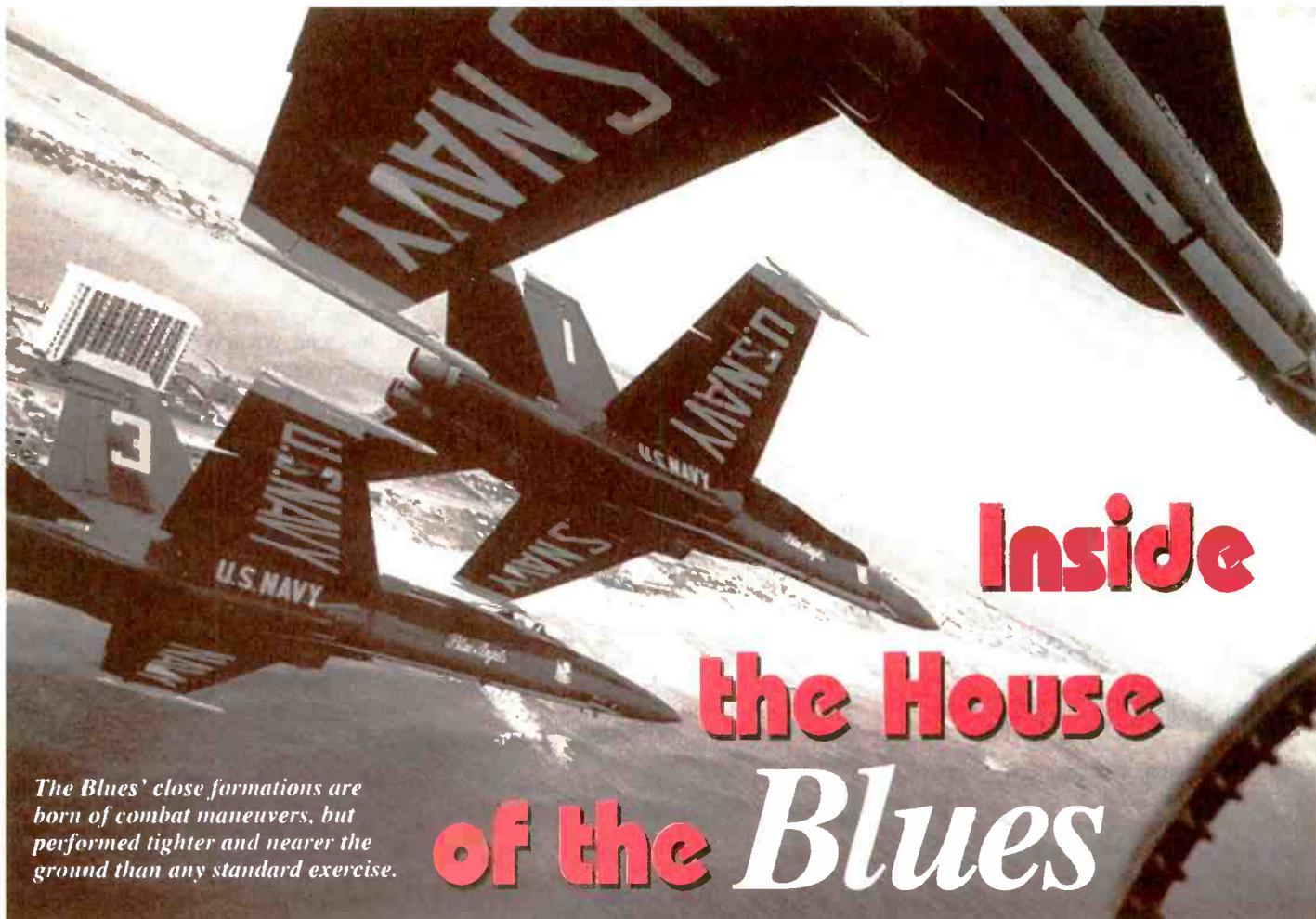
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Inside

the House
of the Blues

The Blues' close formations are born of combat maneuvers, but performed tighter and nearer the ground than any standard exercise.

Liberal, Kansas, is flatter than the proverbial pancake. In fact, Liberal is famous for pancakes. Each year they hold a pancake race right down the middle of main street. Lovely maidens brandishing skillets, flipping flapjacks and galloping for all they're worth is a major tourist draw, but that is not why we are here.

My monitoring buddy Frank Murphy and myself have made the trek from our home in Amarillo due north to Liberal to meet the Blues.

Today is press day at the Liberal Air Museum. Tomorrow the annual Mid-America Airshow 97 kicks off. Frank Murphy, a photographer for an Amarillo television station, is here to shoot some video for the local news. Naturally, when I heard of his assignment I boldly invited myself along.

I wasn't about to miss out on an exclusive private airshow put on for the members of the media and airshow staff by the Navy's Blue Angels Flight Demonstration Team. It would be an excellent chance to see the Blues in

By Steve Douglass
Photos courtesy of the USN Blue Angels



action and also monitor the exciting military communications involved in putting this top team in the air.

I brought along with me on this trip my trusty PRO-43 and my new Bearcat TrunkTracker. Although this new gee-whiz scanner is great at intercepting those hard to follow trunked systems, today we will be using it to search out the VHF air bands for airshow action. The PRO-43 will be tasked

with scanning the UHF military frequencies for the Blues air to air communications.

■ Blasts from the Past

The Liberal Air Museum is quite a thing to see. Who'd have thought that in the middle of the corn belt one would find such an excellent aviation museum? The displays are first rate.

Hanging from the rafters inside the main museum is one of my favorite aircraft, the F-

104 Starfighter. This 60s era superplane was the product of the amazing Skunk Works engineers and would lead to a new generation of secret spyplanes such as the U-2/TR-1 Dragonlady, SR-71 Blackbird and the F-117 stealth fighter.

As much as we wanted to linger and gawk at the museum displays, we had an appointment to keep with the Blue Angels. The distinct sound of an F/A-18 warming up drew us away from the fascinating yet very static displays. I promised myself that when we returned the following day for the airshow I would spend more time in this museum.

■ The Hornets

Outside, the beautiful blue and yellow F/A-18 Hornets glisten in the bright Kansas sunlight, but make no mistake: these glitzy showbirds can be transformed into warbirds in short order.

The F/A-18 is now the primary fighter/attack aircraft in use by the U.S. Navy. An improved version called the F/A-18E Super Hornet will be protecting carrier battle groups well into the next century. Although the Super Hornet is faster, stealthier and billed as more lethal than the F/A-18 the Blue Angels fly, looking at these stunning ambassadors in blue warning up on the tarmac it's hard to think they could ever become obsolete.

■ Best of the Best

It goes without saying to be a Blue Angel pilot you have to be better than good. To qualify to become one of the best of the best you have to have thousands of hours in tactical fighter aircraft. You have to be able to take off and land on the rolling deck of an aircraft carrier on the stormiest of nights and the dreariest of days.

Maverick, loner "Tom Cruise" types need not apply. No hot shots here. The precision maneuvers of the Blue Angels call for teamwork and tons of trust.

■ Home and History of the Blues

Formed in 1946 in response to the Navy's need to promote naval aviation, the Blue Angels soon became the premier military flight demonstration team.

Home is Naval Air Station Pensacola, but the Blues are



The author (below) wasn't about to miss out on a "private" airshow by this crack flight demonstration team.



"Fat Albert" is the C-130 which carries the team's maintenance equipment and supplies.

found there less than half the time. The Blue Angels fly six days a week, 300 days a year either preparing for or performing in airshows across America and the world. In the off season you'll find the blues training at their winter camp at Naval Air Facility El Centro, California.

Eight sleek F/A-18 and a chubby C-130 Hercules make up the Blue Angel's flight team. The team is backed by the Navy's best maintenance and support crews. All work as an well-honed integrated team to keep the Blues the best in the modern skies.

Although Frank, myself and a small band of museum workers were the only ones on hand to witness the Blue Angels practice show, they carried it off as if there were thousands in attendance.

Everything, from the ground crewmen removing the wheel chocks to the F-18s taxiing out, is done in perfect synchronization reflecting the dedication of all members of the team.

■ Showtime

The engines spool up and the jets taxi out to the active runway, the pilots giving their ground crewmen a jaunty salute for a job well done.

For the next forty-five minutes we were treated to an amazing exhibition of military air power.

Like homesick angels the Blues streak up into the deep blue with astonishing speed, power and grace. Rolls and loops thrill our eyes and afterburners shake us to the marrow. To borrow a well-known Navy aeronautical phrase, both Frank and I are "glad to be here."

The Blue Angels Flight Demonstration

Team is made up of eight aircraft. Each has an important role.

In aircraft number one is the flight leader and commander of the Blue Angels, otherwise known as the Boss.

In aircraft number two is the right wing pilot—his position in the Diamond Four formation.

Just opposite him in aircraft number three is the left wing pilot.

The slot pilot in jet number four has to be good. He flies in the precarious position below and behind the diamond four, constantly pushed around by the wake of the six powerful jets flying just feet away from his cockpit canopy.

In Hornet number five is the lead solo. Lead and the opposing solo, in jet number six, perform the eye popping “cross over break” maneuver where the jets appear to almost collide with each other.

The most difficult maneuver for the two opposing solos is the “Tuckover Roll.” The two aircraft start to the right of the airshow crowd, flying in tight formation inverted at 150 feet off the ground and traveling at 450 miles per hour. Just prior to the center of the crowd the lead solo will make a short radio call, “ready ... hit it.” At that moment both aircraft perform a maximum stick deflection roll to the left without seeing each other. If either pilot is late, they will collide. Talk about blind trust!

■ More Than Just Fancy Flying

Although the flying is graceful and beautiful to watch, it is born of military necessity. The maneuvers are the same used by jet aces



The ground crew is a respected part of the Blue Angel's team.

in military combat, compressed, refined and brought down to an altitude that lets us poor groundlings observe.

For example, the Blues take the standard tactic of formation flying. bring the aircraft closer together (to within a heart-stopping three feet) and down to a hundred feet over airshow center. With no room for mistakes, the diamond four loops, rolls and charges through classic air combat maneuvers that would make even the best hot dog pilots stop to admire.

To achieve this type of flying precision the Blues, practice, critique, practice, critique and practice again.

■ Zen and the Art of Flight

Before every show the Blues meet for a ritual that to the layman might seem a bit strange. Seated around a large table the pilots sit, most of them with their eyes closed. Some are scrutinizing aerial photos of the area. All are locked in a trance-like state visualizing the

airshow routine while the boss calls out flying cues as if talking on an invisible radio. The pilots hold invisible make-believe throttles in their hands and make small movements, flying the maneuvers in their heads.

The calls sound like a strange enchanted military mantra, “easing power..smoke on..a lit..tel.. more pull.. ready boards.. boards.”

This previsualization session helps the Blues practice the cadence, rhythm and flow of the airshow routine without ever leaving the ground. It becomes as automatic as breathing or more like a well rehearsed dance routine, a jet-powered ballet among the clouds.

Attending one of these practice sessions



BLUE ANGELS FREQUENCIES

LIBERAL AIRSHOW

BLUE ANGELS
“BOSS” : 307.00
OPPOSING SOLO : 390.100
GROUND SUPPORT & MAINT.
142.025, 143.600, 142.625

MID - AMERICA AIRSHOW

AIRSHOW CONTROL: 123.100
GOLDEN KNIGHTS: 123.425
123.475, 42.350, 32.300

KANSAS CITY CENTER

125.00, 132.200, 132.100,
134.00, 135.200, 281.400,
290.800, 319.00, 324.100,
379.200, 387.100

KANSAS MILITARY FREQS.

AR-330 PRIMARY: 305.500
AR-330 SEC: 260.200
AR-653 PRIMARY : 324.400

also helps military monitors understand the cryptic radio calls they will intercept.

■ Monitoring the Blues

Monitoring the Blues adds a new dimension of enjoyment to the demonstration. After searching out the Blue Angels frequencies and programming them into my PRO-43 I found the best technique is to monitor the Boss's calls on headphones. This helps shut out some of the confusing ambient noise around you and helps you hear the quick staccato calls over jet noise.

We found the Blue Angels's Boss transmitting on 307.700 MHz and the opposing solo on 391.100. Ground support and maintenance used the following frequencies: 142.025, 143.600, 142.625 and 143.600 MHz. Airshow Control could be found coordinating airshow acts on 123.100 MHz.

Other Liberal area military aviation related communications were uncovered as well on the following Kansas City Center frequencies: 324.100, 319.000, 379.200, 290.800, 281.400, 387.100, 133.200, 125.200, 134.000, 132.100 and 132.200 MHz.

We also were treated to a parachute drop by the U.S. Army's Golden Knights. The Golden Knights relayed wind speeds and drop instructions to their C-130 on 123.425 while their maintenance details could be found using 42.350 MHz.

In contrast to our exclusive private airshow, the next day we found ourselves on the flight line among twenty thousand rabid airshow fans, but the show was no less exciting. Our preshow-show had helped us prepare as much as the Blues. Armed with our scanners, the right frequencies, cameras and binoculars we wouldn't be distracted from enjoying the Blues by searching for active frequencies.

I lugged my gear to the flight line: a lawn chair, scanners and a portable Walkman style CD player. I had wired my headphones to be able to hear the Blues communications on the PRO-43 as well as my personal soundtrack that would play through the CD player. You may laugh, but as the Blues began to taxi I started the music—the sound track from *Crimson Tide* that I knew would fit their flying style like it was composed just for them.

As the Blues took to the skies, so did my thoughts, propelled to great heights by the music and the crystal clear voice of the Boss reciting the calls and cadence that coordinated the great flashing blue and yellow Hornets.

For just a split second I could imagine the G-forces pressing down on my body as the lead solo called for the Tuckover Roll. For a brief moment in time.. I was a Blue Angel.

BLUE ANGELS 1998 PERFORMANCE SCHEDULE

APRIL:

25-26 NAS Norfolk, VA, Air Show

MAY:

2-3 Ft. Lauderdale, FL, Intl. Air and Sea Show
 9-10 Chattanooga, TN, Air Show
 16-17 Andrews AFB, MD, DoD Open House
 20 USNA Annapolis MD, Air Show
 22 USNA Graduation Fly-By
 24 NAS Meridian, MS, Air Show
 30-31 NAS JRB Ft. Worth, TX, Air Show

JUNE:

6-7 Coney Island, NY, Air Show
 13-14 Eau Claire, WI, Air Show
 20-21 Grissom ARB, IN, Air Show
 27-28 Niagara Fall ARS, NY, Thunder over Niagara

JULY:

4-5 Traverse City, MI, Cherry Festival
 11 Pensacola Beach, FL, Air Show
 18-19 Dayton, OH, Air Show
 25-26 Latrobe, PA, Air Show

AUGUST:

1-2 Hanscom AFB, MA, Air Show
 8-9 Seattle, WA, Seafair Air Show
 14-16 MCAS Miramar, CA, Air Show
 22-23 Chicago, IL, Air-Water Show
 29-30 Offutt AFB, NE, Open House

SEPTEMBER:

5-7 Chesterfield, MO, St. Louis County Air Show
 12-13 Halifax, Canada Nova Scotia Air Show
 19-20 Warner Robbins AFB, GA, Open House
 26-27 Reading, PA, Redding Aerofeast

OCTOBER:

3-4 Stockton, CA, Air Show
 10-11 San Francisco, CA, Fleet Week
 17-18 Houston, TX, Air Show
 24-25 NAS Jacksonville, FL, Open House
 31-10/1 NAS New Orleans, LA, Air Show

NOVEMBER:

FL, Open House HOMECOMING

THUNDERBIRDS 1998 SCHEDULE

APRIL:

25-26 Point Mugu NAWS, CA, Air Show

MAY:

2-3 Knoxville, TN, Air Show
 9-10 San Angelo, Texas, Air Fiesta
 16-17 Fairchild AFB, WA, Aerospace Day
 23 Kelly AFB, TX, Air Show
 27 Air Force Academy, CO, Graduation
 30 Elmendorf AFB, AK, Open House
 31 Eielson AFB, AK, Open House

JUNE:

6-7 N. Kingstown, RI, Air Show
 13-14 Portland, OR, Rose Festival Air Show
 20-21 Santa Fe, NM, Air Show
 27-28 Davenport, IN, Air Show

JULY:

4-5 Battle Creek, MI, Air Show
 11-12 Plattsburgh AFB, NY, Air Show
 18-19 NAS Whidbey Island, WA, Sea 'N' Sky Fest
 22 Cheyenne, WY, Air Show
 25-26 Selfridge ANGB, MI, Air Show

AUGUST:

1-2 Vandenberg AFB, CA, Air and Space Show
 8-9 Abbotsford, Canada, Air Show
 15-16 Big Flats, NY, Wings of Eagles Air Show
 29 Minot AFB, ND, Open House
 30 Grand Forks AFB, ND, Open House

SEPTEMBER:

5-7 Cleveland, OH, Air Show
 12-13 Westover ARB, MA, Open House
 19-20 Durango, CO, Air Show
 26-27 Salinas, CA, Air Show

OCTOBER:

3-4 Sioux City, IA, Mid-America Air Show
 10-11 El Paso, TX, Amigo Air Show
 17-18 Muskogee, OK, Air Show
 24 Columbus AFB, MS, Open House
 25q Little Rock AFB, AR, Air Show

NOVEMBER:

31(Oct)-1 Victorville, CA, George Air Show
 7-8 Lake Charles, LA, Air Show
 14-15 Lake City, FL, Air Show



U.S. Army Golden Knights.

Baltimore Washington International Airport

BeeWee in My Backyard

View of the terminal entrance and the control tower with antennas.

BWI's new international terminal just opened in Dec 1997.

By Ronald A Perron
Photos by Dan Breitenbach,
provided courtesy of the Maryland
Aviation Administration



For some people, living near a major metropolitan airport is a real pain. However, for an aviation and scanner buff like myself it's like being thrown into the briar patch.

I live about six miles from Baltimore-Washington International (BWI) Airport — “Bee Wee” as it's sometimes pronounced on the air. My house lies in between the approaches to runways 33 Right/33 Left. The location gives me the best of both worlds. I can hear both the aircraft and the controllers and then go out in my backyard and watch the aircraft.

I've always been interested in aviation and did some real-life “scanning” when I served in Uncle Sam's Air Force. I recently decided to get into the hobby after reading a copy of *Monitoring Times* and browsing an internet site on military communications. I bought a Radio Shack PRO-2045 and linked that up to a D-130J discone up in my attic.

Boy, does my equipment ever get a work out. BWI is one of the busiest airports in the Middle Atlantic area. Karen Black of the Airport's Information Office says that in 1997 there were more than 266,000 take offs and landings. That compares favorably with totals from the other major airports in the area, Dulles International and Washington National. That total is certainly going to increase as major improvements are made to handle more airlines and passengers.

At the present time nineteen different scheduled airlines, both domestic and for-



BeeWee's modern new terminal doubles its international passenger capacity.

eign, operate from BWI. They run the gamut from the standard U.S. carriers US AIR, United, Southwest, etc. to foreign carriers such as Air Aruba, British Airways, El Al, Icelandair and Mexicana.

Starting in April of this year, the U.S. Air Mobility Command will use BWI to service various military locations in Europe. Using contract commercial carriers such as Air Transport International, American Trans Air and World Airways, AMC passenger operations from BWI are expected to grow to more than 20 flights per week.

The AMC and the foreign carriers are tenants in the newly opened (December 1997) International Terminal. This new addition will double BWI's current international passenger capacity. Eventually, the terminal will expand to a total of 15 gates as usage increases.

In addition to the passenger side of things there is a bustling cargo operation served by all the major bulk carriers. Emory Air Freight, DHL, UPS, and FedEx are among the many users. Last year more than 255,000,000 pounds of freight was handled by the cargo terminal.

BWI's handy location about halfway between Baltimore and Washington, DC, makes it a natural for executive and business travel. The General Aviation Executive Terminal, operated by Signature Flight Support, is open 24 hours a day, seven days a week. So there's a never-ending parade of corporate and general aviation aircraft and helicopters to tune into.

There's a bonus for us sports fans, too. The cargo terminal plays host to the charter aircraft used by several baseball and football teams as they visit Baltimore to play the Orioles and the Ravens.

So if you're interested in commercial aviation there's a wide variety of domestic and foreign commercial aircraft to whet your appetite. BWI is really user-friendly in this regard. There's a specially constructed observation deck at the domestic terminal that lets you enjoy a fine meal and a beverage and also see the aircraft close up and watch the take-offs

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- Continuously adjustable sharp cut-off "Sampled Data Switched Capacitor Audio Filter" can be set for optimum interference reduction for any mode and any band condition. AM, FM, SSB, CW or data. LED light bar readout shows cut-off frequency and is calibrated in kHz from 500 Hz to 10 kHz. As the knob is rotated each LED segment continuously dims or brightens showing precise filter frequency.
- Peaking circuitry (20 dB) allows CW/data signals to "pop" out of the background in adverse interference conditions allowing single-signal reception.
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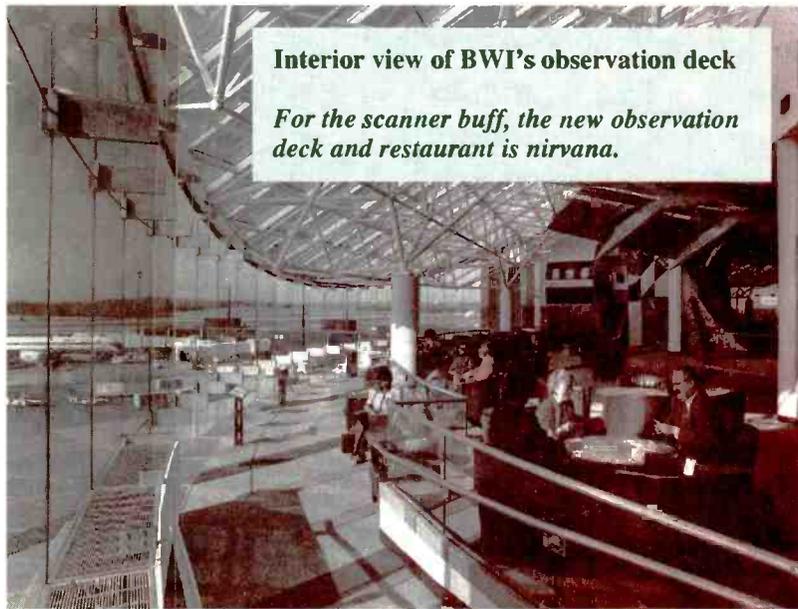
For hardier folks, the airport has constructed a large open observation/parking area at the end of runway 33. When the weather is nice, it's common to see families there enjoying a warm evening watching the aircraft take off and land. Many of the on-lookers are also carrying their portable scanners to enhance their enjoyment.

■ Federal, Military, and VIP Hub

For those like myself interested in military flight activity, BWI is a convenient traffic hub. Patuxent Naval Test Center, Dover Air Force Base, Andrews Air Force Base, several Army airfields, as well as the home bases of the Maryland, Pennsylvania, West Virginia and Delaware Air National Guards are all located within 100 miles of BWI. This dense military flight training and operations environment provides lots of opportunities for some very interesting loggings and visual sightings as their aircraft land at or transit the BWI control areas.

Probably some of the most unique are the periodic visits by the desert-camouflaged C-130s of the Egyptian and Saudi Arabian Air Forces. Several times a year they fly in to pick up avionics and other electronic equipment for their F-16s and AWACS aircraft. This equipment is produced at the Northrup-Grumman plant located on the edge of the airport. It's quite a sight to see these distinctive aircraft parked at the outer edge of the airfield in plain view. I've even seen one or two civilian Saudi Arabian (Saudia) aircraft and a commercially registered IL-76 parked here.

Since BWI is only about 40 miles from Andrews Air Force Base, there are regular visits by aircraft from units based there. These visits are highlighted by the Presidential VC-25s (SAM 28000 and SAM 29000) practicing touch and gos and approaches. The airport is one of the alternate fields for these aircraft should they have to divert from



Andrews, so the pilots must periodically familiarize themselves with the airfield area. I also assume that training for any new pilot or co-pilot assigned to the Presidential unit includes trips to BWI.

Other Andrews aircraft that I've noted "visiting" BWI are the non-presidential Special Air Mission (SAM) Gulfstreams (callsign *Venus*) of the 89th Air Wing; EA-6Bs (callsign *Cobra*) from VAQ-209 at the Naval Air Facility; and F-16s (callsign *Combat*) from the DC Air National Guard's 113th Fighter Wing. I believe that all of these visits are for aircrew airfield familiarization and flight proficiency training.

The airport also gets a fair share of visits from Priority Air Transport (PAT), Joint Operational Support Aviation (JOSA) and AMC's



Below, aerial view of BWI with terminals and runways. BWI is becoming one of the busiest airports in the midatlantic area.

Reach aircraft. For me there's nothing quite like the thrill of listening to a Reach "heavy" aircraft working with a BWI controller and then going out on my deck and watching a C-141 or C-5 fly over the house on its way into the airport. For me that's what scanning is all about.

The Maryland Air National Guard's 175th Wing, based at Martin State Airport just a few miles northeast of Baltimore, also uses BWI for training. Their A-10s (callsign *Raven*) and C-130s (callsign *Witch*) are routinely noted using BWI airspace and controllers. The A-10s usually transit BWI airspace

to/from Martin State on their way to special training areas near Patuxent Naval Air Station or near Willow Grove, Pennsylvania, while the C-130s use the local airspace for navigational flight training. EC-130s from the Pennsylvania Air Guard's 193rd Special Operations Group (callsign *Baton*) from Harrisburg Airport also use BWI facilities for flight training.

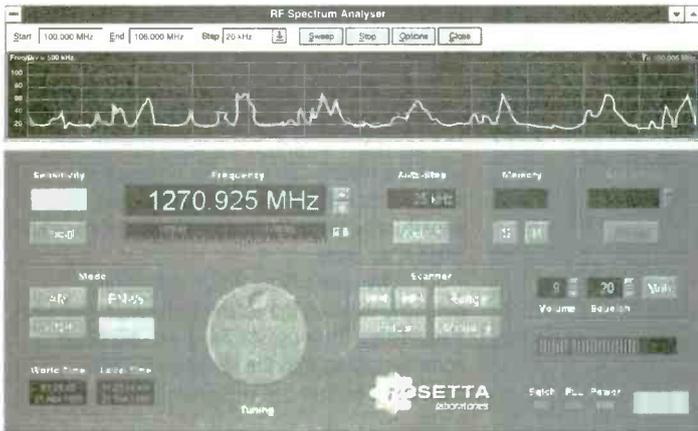
NASA's Headquarters are only about 20 miles down the road in Greenbelt. There are periodic visits by various NASA aircraft into and out of BWI; especially when there is activity at NASA's Wallops Island Flight Facility which is located on the Virginia seashore, not far from the Baltimore-Washington area.

Other interesting local users are some of the area's law enforcement units. The Maryland State Police Aviation Unit (callsign *Trooper*) operates eleven Aerospatiale SA-365N helicopters used for search and rescue, medical evacuation and police search duties. They are based at Martin State Airport but are regularly heard operating with BWI controllers. The Anne Arundel County Police Department also operates aircraft out of the General Aviation Terminal.

No, you won't find me complaining about living so close to a major airport: Just when I think it's another routine logging day, up pops a Saudi, Egyptian, NASA or unusual civil aircraft to make things interesting. With BWI almost in my backyard there's never a dull scanning moment.

WINRADIO WR-1000i

The receiver of your dreams on your computer screen!



This computer-controlled receiver and spectrum display appear on your computer screen!

ACCESSORIES

| | | |
|---------|-------------------------------|---------|
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| ANT 3 | Grove Mini-Skywire | \$29.95 |
| ANT 7 | Scantenna | \$39.95 |
| ANT 9 | Professional Wideband Discone | \$87.95 |
| ANT 15 | H800 Skymatch Active Antenna | \$99.95 |
| CBL 50 | 50' RG-6U cable | \$14.95 |
| CBL 100 | 100' RG-6U cable | \$19.95 |
| TUN 4A | Grove TUN-4A Minituner Plus | \$99.95 |

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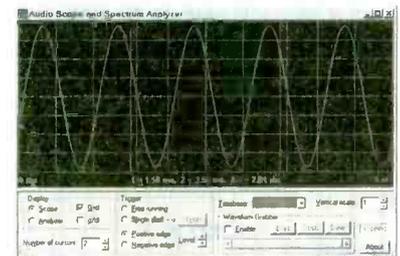
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BWI Airport Technical Data

To tune in to Baltimore Washington International activity, following are the most current frequencies (all in MHz):

Aircraft Frequencies

| | |
|-------------------------|--------|
| UNICOM: | 122.95 |
| ATIS: | |
| 115.1 | 127.8 |
| FSS: | |
| 122.1 | 122.2 |
| GROUND: | |
| 121.9 | 120.2 |
| TOWER: | |
| 119.4 | 257.8 |
| APPROACH: | |
| 119.0 (020-100 Degrees) | |
| 119.7 (131-180 Degrees) | |

| |
|--------------------------|
| 124.55 (101-130 Degrees) |
| 128.7 (181-019 Degrees) |
| 228.4 (020-100 Degrees) |
| 231.6 (131-180 Degrees) |
| 307.9 (181-019 Degrees) |
| 325.8 (101-130 Degrees) |
| 125.3 287.1 |

DEPARTURE:

| |
|--------|
| 128.7 |
| 124.55 |
| 133.75 |

CLEARANCE: 118.05

AS ASSIGNED: 325.8

CLASS B:

| |
|------------------|
| 119.0 (020-100) |
| 124.55 (101-130) |
| 128.7 (181-019) |
| 228.4 (020-100) |
| 307.9 (181-019) |
| 325.8 (101-130) |

CLASS B IC:

| |
|-----------------|
| 119.7 (131-180) |
| 231.6 (131-180) |

In addition to those above, I've also noted the following unlisted air frequencies used by BWI controllers: 125.525/254.3/265.4/281.6/286.2/304.1/.

The Maryland Air National Guard A-10's at nearby Martin State Airport use UHF tower (257.8) and approach (228.4) when working with BWI, while the ANG C-130's use the normal VHF frequencies. BWI provides approach and departure services for these aircraft since Martin State is so close.

The Maryland State Police helicopters generally work on the established tower/approach frequencies. They use 44.74 and 47.66 when communicating with the Medevac System Command control and with State Police road units.

The Anne Arundel County Police aircraft use standard VHF radios to communicate with the airport controllers. However, they use their Motorola 800 MHz trunked hand-held radios when communicating with police road units.

Airline Ground Operations Frequencies

| | |
|---------------------------|---------|
| American | 129.225 |
| Continental (Maintenance) | 129.250 |
| United | 129.300 |
| US Air | 130.100 |
| Northwest | 130.350 |
| Continental | 130.400 |
| United | 131.075 |
| Continental (Operations) | 131.225 |
| Northwest | 131.750 |
| Delta | 131.850 |

Other airport frequencies of interest:

| | |
|---------------------------|---|
| Administration Operations | 453.8 |
| America West | 464.60 |
| Butler Aviation | 462.1125 |
| Continental Airlines | 460.700/460.750/ 460.875 |
| Delta Airlines | 460.675/460.750 460.825/460.850 |
| Henson Aviation, Inc. | 463.2625 |
| Icelandair | 462.1625 |
| Northwest Airlines | 460.650 |
| Trans World Airlines | 460.675 |
| US Air | 460.700 |
| United Airlines | 460.725 |
| American Airlines | 461.7875/461.9375 462.8375/463.8375 464.1125/464.6125 |
| Allied Aviation Fuel | 151.850 |

Aeronautical Radio Inc. (ARINC) operates an 800 MHz trunked system which provides administrative communications support to various airport entities.

Non-Aircraft Frequencies

| | |
|---|---------------|
| Dept. of Transportation Police | 453.90 |
| Airport Fire/Rescue | 154.10/154.98 |
| <i>NOTE: Maryland State Police from the nearby Glen Burnie Barracks (39.04 MHz) and Anne Arundel County Police and Fire (trunked 800 MHz) unit also respond to airport emergencies.</i> | |

Bearcat Intercepts Trunked Radio

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Save big on radio scanners, weather stations, two-way transceivers and more from CEI during our 29th anniversary. To get your free fax-on-demand catalog dial 734-663-8888 from the telephone handset on your fax machine and follow the recorded voice prompts or visit CEI on the web at www.usascan.com. Get many free benefits such as extended warranty coverage on CEI merchandise when you use your Communications Electronics Platinum Plus Master Card[®] issued by MBNA. No annual fee. Call 1-800-523-7666 anytime and mention offer Q3K1.

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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 Weather Monitor II 7440-A | \$334.95 |
| Davis Weather Wizard III 7425-A | \$149.95 |
| Davis Perception II Indoor stand-alone weather monitor 7400-A | \$124.95 |
| Davis Weather Talker 7861-A - Call 734-994-9000 for demonstration | \$334.95 |
| Davis Solar Radiation shield 7714-A, helps protect temperature sensor | \$54.95 |
| Davis Remote Display Unit 7815-A | \$84.95 |
| Davis Rain Collector Heater - excellent for winter use 7720-A | \$99.95 |
| Davis Aluminum Rain Collector Shield 7704-A | \$29.95 |
| Davis Rain Collector II 0.01 inch resolution 7852-A | \$59.95 |
| Davis Rain Collector II 0.2 mm 7852METRIC-A | \$59.95 |
| External Temperature/Humidity Sensor 7859-A | \$99.95 |
| Davis Weatherlink Software for IBM PC-Windows version 4.0 7862-A | \$134.95 |
| Davis Weatherlink Software for Apple Version 3.0 7866-A | \$134.95 |
| Davis 4-Conductor 40' (12.2 m) extension cable 7876040-A | \$17.95 |
| Davis 6-Conductor 40' (12.2 m) extension cable 7878040-A | \$21.95 |
| Davis 8-Conductor 100' (30.5 m) junction box cable 7880100-A | \$44.95 |
| Davis Interface Cable Adapter Module 7760-A | \$59.95 |
| Davis Weather-resistant Terminal Box Shelter 7774-A | \$34.95 |
| Davis Electrostatic & RFI Protected Junction Box 7740-A | \$39.95 |
| Davis Optically coupled Weatherlink Isolator Kit 7764-A | \$39.95 |
| Davis Grounding Kit, helps protect your station - 7780-A | \$19.95 |
| Davis Car/Boat/RV Lighter Power Cord 7873-A | \$9.95 |
| 2400 baud modem for Weatherlink MEXT-A | \$29.95 |
| Davis aluminum Sensor Mounting Arm - 7702-A | \$54.95 |

Radio Transceivers

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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 repeater. 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

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Mfg. suggested list price \$429.95/CEI price \$269.95
300 Channels • 10 banks • Trunk Scan and Scan Lists
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Size: 2-1/2" Wide x 1-3/4" Deep x 6" High
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The Bearcat TrunkTracker BC235XLT, is the world's first scanner capable of tracking a selected radio transmission as it moves across a trunked radio system. Now it's easy to monitor fleets and subfleets in analog trunked radio systems. The BC235XLT can also work as a conventional scanner. This 300-channel, programmable handheld scanner provides scanner users with uninterrupted monitoring capabilities of Type I, II, III and hybrid trunking systems. One of the biggest obstacles in the scanner industry has been the increasing use of trunking radio systems in business and public service agencies throughout the 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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| | |
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| Cobra 148FGTL-A SSB CB with frequency counter | \$179.95 |
| Cobra 29WXT-A CB with sound tracker technology | \$149.95 |
| Cobra 2010GTLWX-A SSB CB Base (\$25.00 shipping) | \$299.95 |
| Cobra HH45WX-A Handheld CB radio with weather | \$89.95 |
| Cobra FRMS200-A Family Radio Service transceiver | \$89.95 |
| Max1 GMRS210+3-A GMRS transceiver/SPECIAL | \$166.95 |
| RELI RH256NB-A 25 watt VHF mobile transceiver | \$284.95 |
| Sangean ATS909-A portable shortwave receiver | \$229.95 |

Radio Scanners

Monitor fire, police, weather, marine, medical, aircraft and other transmissions with your Bearcat scanner.

| | |
|--|----------|
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| Bearcat 3000XLT-A handheld | \$329.95 |
| Bearcat 895XLT-A TrunkTracker base | \$319.95 |
| 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 |
| Bearcat BCT12-A information mobile | \$169.95 |
| Bearcat BCT7-A information mobile | \$149.95 |
| Relm MS200-A computer programmable | \$219.95 |
| Relm HS200-A handheld CTCSS/800 MHz. | \$224.95 |

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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
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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: PS001 Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter \$14.95; PS002 DC power cord - enables permanent operation from your vehicle's fuse box \$14.95; MB001 Mobile mounting bracket \$14.95; 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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It's easy to order from us. Mail orders to: Communications Electronics Inc., P.O. Box 1045, Ann Arbor, Michigan 48106 USA. Add \$18.00 per weather station or radio product for UPS ground shipping, handling and insurance to the continental USA unless otherwise stated. Add \$12.00 shipping for all accessories and publications. Add \$12.00 shipping per antenna. For Canada, Puerto Rico, Hawaii, Alaska, Guam, P.O. Box or APO/FPO delivery, shipping charges are two times continental US rates. Michigan residents add state sales tax. No COD's. Satisfaction guaranteed or return item in unused condition in original packaging within 61 days for refund, less shipping charges. 10% surcharge for net 10 billing to qualified accounts. All sales are subject to availability, acceptance and verification. Prices, terms and specifications are subject to change without notice. We welcome your Discover, Visa, American Express, MasterCard, IMPAC or Eurocard. Call anytime 1-800-USA-SCAN or 800-872-7226 to order toll-free. Call 734-996-8888 if outside Canada or the USA. FAX anytime, dial 734-663-8888. Dealer and international inquiries invited. Order from Communications Electronics Inc. today and save. Price schedule effective May 1, 1998 AD #050198CR ©1998 Communications Electronics Inc.

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The EC-130E Command Solo is one-of-a-kind. It is the only airborne broadcast facility in the world with the capability of transmitting on FM, MW, SW, and even in color television. Based in Harrisburg, PA, the 193rd Special Operations Wing of the Pennsylvania Air National Guard has flown the aircraft during every major U.S. military intervention since 1982. Today it broadcasts the two Iraqi National Accord clandestines on MW. (Photo courtesy of Department of Defense)



By Nick Grace

Clandestine radio is a tool that governments use to wage a psychological war against other nations. Sometimes it works, sometimes it doesn't. The United States regularly employs this tactic both to support covert paramilitary operations, such as the 1954 Guatemalan revolution coordinated by the Central Intelligence Agency (CIA), and overt military intervention, including the 1994 campaign in Haiti.

Since 1990, the US has waged a war with broadcasts against Iraqi president Saddam Hussein. For DXers and clandestine radio enthusiasts, this has been a dynamic time full of mystery, intrigue, and excitement. Until now there had been more questions than answers.

■ The Gulf War

Saddam, bold after his victory over neighboring Iran, ruthlessly invaded Kuwait on August 2, 1990, prompting American president George Bush to take decisive action. At stake was the world's oil supply and regional stability in the Middle East. Before the bombing began, Bush and his advisers ordered the

CIA and US military into action. These soldiers weren't armed with bullets, however. They were armed with a plane and a radio station: The Voice of the Gulf.

The Voice of the Gulf premiered on Thanksgiving Day 1990 on medium wave aboard the

Pennsylvania Air National Guard's EC-130 aircraft dubbed "Command Solo." Before the plane and station took to the air, however, the CIA along with the Army's 4th Psychological Operations Group quickly organized a group of Kuwaiti exiles and Saudi intelligence officers to produce programming. Shows were recorded from a studio in Riyadh and sent via satellite to Command Solo once it arrived in Saudi Arabia.[1]

The Voice of the Gulf's purpose was twofold. First, it aired broadcasts to undermine

CIA vs. Saddam: The Radio War of the Nineties



"Time is up!" This was one of many leaflets dropped over Kuwait by the CIA to ensure that the Voice of the Gulf programs were having an effect. Hundreds of thousands of Iraqi soldiers surrendered or fled into Iran. (Photo courtesy of Central Intelligence Agency)

the commitment of the Iraqi troops occupying Kuwait by offering medical care and food. Covert air drops of propaganda leaflets warning Stealth bomber attacks helped to strengthen the effectiveness of the station. "Your only safety is across the Saudi Arabian border," one broadcast announced. "That is where the bombing and the starvation stop. The Joint Forces offer you asylum." [2] Secondly, the Voice of Gulf reinforced the hope of the Kuwaiti people that liberation was soon to come.

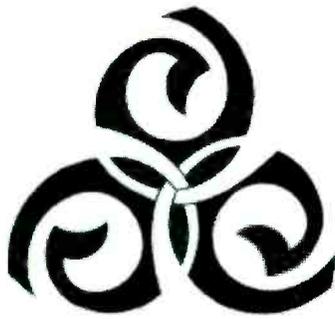
On February 27, 1991, Kuwait was indeed liberated and the radio station's utility greatly diminished. The coalition forces fighting Saddam's troops ended the campaign on that day without pushing into Baghdad, but the war of propaganda continued — taking a very interesting turn.

■ The CIA, a PR Firm, and a Clandestine

Later that year, George Bush signed a Presidential Finding ordering the CIA to build an effective opposition group in Iraq that could replace Saddam's regime with a democratic government. With Saddam boxed in by the internationally sanctioned "No Fly Zone" safe havens to protect the Kurds in the north and the Shi'ites in the south, CIA officers scouted the area for Iraqis who could make such an opposition group a reality. They soon found Ahmad Chalabi, an Arab Shi'ite banker with good connections among Iraqi Shi'ites, dissident Sunnis and armed Kurds. Chalabi, they felt, could do the impossible: unite Iraqis under one umbrella.

With a potential leader already recruited, the CIA turned to a renowned public relations firm in Washington, DC, to design and "market" this organization. The Rendon Group was no stranger to this. In fact, this firm had been hired by intelligence officials to spin the public image of the 1989 American invasion of Panama.

Among the first things the Rendon Group did was to give a name to the Iraqi opposition: the Iraqi National Congress (INC). Providing a voice for the INC was also accomplished: The Iraqi Broadcasting Corporation. Internal budget documents within the firm released to the media last year show that nearly \$24 million was spent on INC propaganda between 1991 and 1992, including costs of the radio station. [3] During its inaugural broadcast on February 15, 1991, the station aired George Bush calling for, in his words, "the Iraqi military and the Iraqi people to take matters into their own hands and force Saddam Hussein, the dictator, to step aside." [4] His speech echoed through Iraq and bolstered



المؤتمر الوطني العراقي الموحد

Iraqi National Congress

The Iraqi National Congress' clandestine built with US taxes, the Iraqi Broadcasting Corporation (Sawt al-Shab al-Iraqi), is audible in North America on 9568.5 kHz at 2030 UTC and in Europe at 1030 UTC. Although a QSL has never been received by the station, reports can be mailed to the INC headquarters in London: 9 Pall Mall Deposit, 124-128 Barlby Road, London W10 6BL, UK. You can visit the INC's homepage, which contains information about this station as well as their slant on current developments: <http://www.inc.org.uk/>

confidence that the INC was the group which could change the nation's future.

The INC's clandestine station broadcast from both its own facilities in northern Iraq and US government transmitters in Kuwait on MW and shortwave frequencies. [5] Additional transmitters were set up in Jeddah, Saudi Arabia, Amman, Jordan, and Cairo, Egypt, with the assistance of various intelligence agencies. [6] From 1992 until American support for the group ended in 1995, the Bush and Clinton administrations sent \$4 million annually to keep the station operational "so the CIA could have an Iraqi outlet for the anti-Saddam Hussein propaganda they had spent

all that other money on." [7]

The Clinton administration, playing partisan politics and losing patience with the INC, lost its confidence with the group in 1995. A covert paramilitary operation was planned for the INC to attack a number of cities in Iraqi Kurdistan, but within hours of its start National Security Adviser Tony Lake cabled Chalabi with the words "You are on your own." The INC and two major Kurdish groups followed through with the operation but were finally decimated by Saddam's forces. The Iraqi Broadcasting Corporation was quickly yanked off of the transmitters in Kuwait, but eventually resumed broadcasts from a site in northern Iraq.

Evidence of the IBC's effectiveness is well known. According to Chalabi, "Through INC broadcasts... the INC is well known inside Iraq and has a large but unorganized following. During the 1996 Atlanta Olympics, the Iraqi Olympic flagbearer defected to the Iraqi National Congress. Before his defection he had never spoken to an INC member — yet from INC radio he was familiar enough with the INC program for a democratic Iraq that within hours he was speaking for the INC on U.S. and international network television." [8]

■ The CIA, Rebels, and Clandestine Radio

While the CIA built the INC, British intelligence (MI6) constructed their own opposition group in Iraq: the Iraqi National Accord. The Bush administration decided to contribute covert funding for this group as well since it aims to recruit Iraqi military officers and quietly overthrow Saddam. [9] A revolution coordinated by the INC, on the other hand, would require massive internal support, American air cover, and a long-term military campaign. Although respect for democracy and human rights would probably not be a priority for the Accord, its objectives seemed

The Rendon Group

A GLOBAL STRATEGIC COMMUNICATIONS FIRM

The Rendon Group, located in Washington, DC, was hired by the CIA to build both an Iraqi opposition group and a clandestine radio station from scratch. You can see a history of the firm's previous work, including image-repair for the Kuwaiti royal family during the Gulf War and media consulting for a CIA-backed Panamanian politician in 1989 on their homepage: <http://www.rendon.com/>

to be pragmatic for the American government.

President Clinton continued modest support for the Accord until funding for the INC was discontinued in 1995. Full fledged funding and supervision of the Iraqi National Accord began later that year.

The Accord brought two clandestine stations to life in 1996. On April 21, The Future (al-Mustaqbal) hit the airwaves from a MW transmitter in Jordan.[10] "This is The Future," an announcer began. "A voice for all the Iraqis confronting oppression and dictatorship, a voice that looks forward to a safe future for a new Iraq." [11] Iraqi Army Radio also began that year from the same broadcast facility. According to various news reports, these stations are recorded in London and sent by satellite to the transmitting site.[12]

The Accord was nearly demolished by an Iraqi invasion of the northern "No Fly Zone" during August and September 1996. Clinton's lack of support for the INC-led military campaign the year before caused tension between two Kurdish groups and led to a battle. Saddam seized upon the opportunity to weaken the northern threat by pushing thousands of troops into Iraqi Kurdistan. CIA officials in territory controlled by the Accord reportedly "ran for their lives." [13] After hundreds of Accord supporters were executed, Jordan dropped its support for the group and the clandestine stations lost a transmitter.

A year later, as Saddam argued with the United Nations over weapons inspections, The Future and Iraqi Army Radio resumed transmissions from the American broadcast facility in Kuwait — the same facility which brought the INC's radio station to life.[14] The Command Solo aircraft that broadcast the Voice of the Gulf in 1990 was deployed to the Persian Gulf in February, just one week after American officials met with Accord representatives in London, presumably to blanket Iraq with these broadcasts as well.

Ahmad Chalabi was not pleased. During testimony in front of the U.S. Senate in March, he stated, "The INC deplors recent CIA-sponsored radio broadcasts promoting military rule of Iraq. It is not up to the CIA to determine Iraq's leadership..." [15]

■ Birth of an Overt Clandestine

The CIA-run stations and operations within Iraq have made little headway since 1991; therefore political analysts are now focusing on alternative contingencies. One such plan gained popularity at the beginning of 1998 for a new clandestine radio effort by Republican congressmen. The Conservative think-tank



The National Accord is comprised of former Iraqi military officers and encourages troops loyal to Saddam to revolt. Their two clandestines operate on MW from a CIA transmitter in Kuwait and, for the time being, from an American aircraft. The schedule for al-Mustaqbal (The Future) and Iraqi Army Radio (Sawt al-quwwat al Musallah) is between 1700 and 0700 UTC on frequencies ranging from 1557 to 1584 kHz. If you hear them, you can try writing to their office in London: P.O. Box 3124, London SW19 1RL, UK. The Accord also maintains a webpage at: <http://www.iraq-free.demon.co.uk/>

Heritage Foundation initially proposed the idea of operating a Radio Free Iraq to loosen Saddam's grip on power.[16] By March, Clinton administration officials also supported the idea.

Radio Free Iraq will be overt, fully committing the United States to advance change in Iraq. American commitment through propaganda is cheaper than military intervention, less risky than covert operations, and more effective over the long term. "You can engage tyrants of totalitarian regimes on a day-to-day basis without firing a single shot," presidential hopeful Steve Forbes summarizes.[17] The best example of this tactic is Radio Free Europe (RFE), which played an important role in ending the Cold War by building faith among the anticommunist Eastern Europeans.

If the station becomes a reality, it will fall under the administration of the International Board for Broadcasting, as RFE is, allowing maximum flexibility in its programming and personnel management. Radio Free Iraq will also be manned by INC staff to promote democracy, freedom and human rights. \$4 million has already been allocated to build a Radio Free Iran; however, it is likely that this money will be used to start a new clandestine aimed at Saddam.[18] We will probably have yet another station to chase after on SW and MW.

■ Conclusion

Covert clandestine broadcasting clearly did not support U.S. policy efforts to overthrow Saddam. The intensity with which the CIA is employing radio propaganda, nevertheless, does reveal how vital clandestine radio remains as a tool and strategy to undermine enemies of state. Any question that these subversive radio stations would disappear after the Cold War can now be answered: Clandestines will always be somewhere on the bands ready to challenge our DXing and QSLing skills.

Nick Grace is a guest lecturer of political science at Muhammadiyah University Malang, Indonesia. Those interested in monitoring the middle east crisis will appreciate the "Show-down with Iraq" website created by Cumbre DX at <http://www.ralabs.com/swl/>

Footnotes

1. Psywarrior
2. ibid
3. Atkinson
4. Bush speech to U.S. Congress as quoted by Jennings
5. *Washington Post*, March 1, 1998, A17
6. *Washington Post*, June 26, 1997, A21
7. Jennings
8. Chalabi testimony before the US Senate Foreign Relations Committee, March 2, 1998
9. Stearns
10. *Issues*, April 1996
11. Accord press release, December 1997
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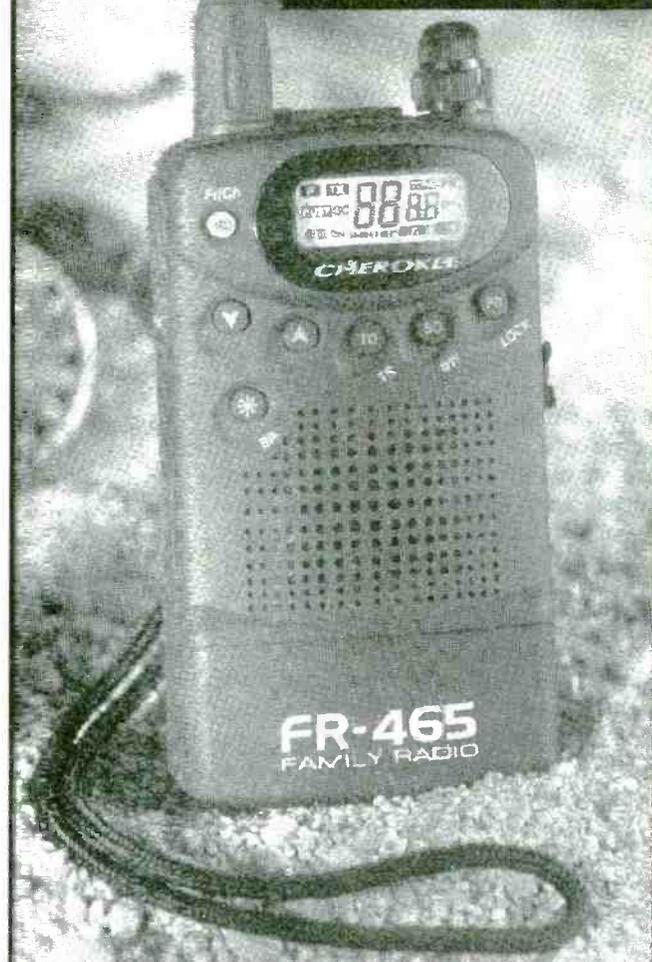
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Oh, Say Can You See?

VORTAC Cuts Through the Haze and Goes the Distance

By Michael Scofield

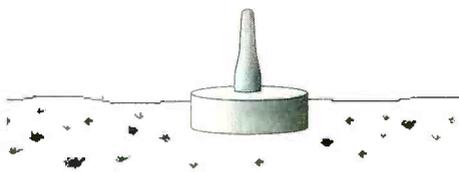
I love mountain tops, especially when it is clear. It is both an emotional and cerebral experience. The cerebral part of me sees a mountain or valley off in the distance, and I want to know what that is. The clearer the day, the more challenging it is to identify a mountain in the distance. In other words, I want to know how far I can see.

Being a radio buff, I know one trick to discovering the distance of the horizon that doesn't depend on whether it's clear or hazy. You can use distant aeronautical navigation beacons whose VHF signals generally propagate only as far as one can see.

There are over 1,300 VOR (VHF omnidirectional range facilities) or VORTAC (VOR combined with TACAN-tactical air navigation system) transmitters scattered across the United States. Almost all of them are operated by the Federal Aviation Administration (FAA), and they generally transmit a complex radio signal on a base frequency somewhere between 108 and 118 MHz.

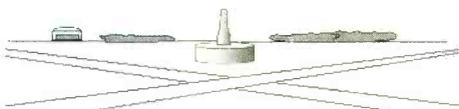
The signal is slightly different in each direction, thus allowing electronics in the cockpit to determine in what direction (or "radial") from that beacon the aircraft is located. Additional equipment allows the plane to interrogate the site to determine its distance from the site. With this combination of direction and distance, the pilot can know exactly where he is in three-dimensional space.

VOR stations have a distinct shape, and because they are generally away from trees or other buildings, they are easy to spot. The most obvious configuration is a small building in a clearing looking like the one above.



Most VORTAC transmitters have the distinguishing "cone" shaped structure on the top, although not all do. Inside the cone are a set of antenna which construct the distinct signal in each direction. The cone itself is about 15-20 feet tall.

This uniquely shaped building is often sighted in the middle of major airports. You can see it at Washington's National Airport, Oakland, Boston, and in the middle of Chicago's O'Hare.



Some VOR transmitters do not have the TACAN portion to them and lack the top portion of the conical structure. Good examples of this include in the one in the middle of San Francisco International Airport.

In more remote areas, you may see the cone structure mounted on the ground, on a leveled-off hilltop.



The configuration above is seen in many places in California, including Big Sur, Gaviota, San Marcus Pass, Pomona, and Julian. They generally will house the electronics in a building just off the summit, down a little so

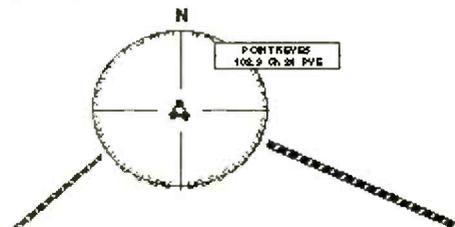
it won't obstruct the propagation of the signal in all directions. Indeed, VORTACs cannot be placed too close to buildings which may either obstruct or reflect the signal and hence give off erroneous signals.

A second antenna design for the VOR is a circle of little red domes. This is a common configuration on some gentle hilltops (such as on the dunes near Van Nuys). Usually just down the slope in some direction is a building containing the electronics. Where a TACAN antenna is also required at this site, it is usually set off a few yards to the side.



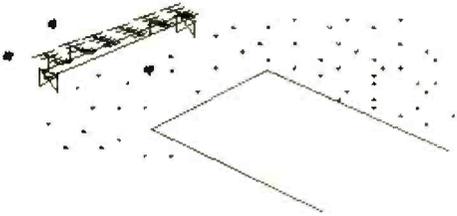
On most aeronautical charts, the VORTAC is usually designated by a symbol (right), with a compass rose around it and the letter "N" indicating magnetic north. A small box attached or nearby indicates the name of the beacon, the frequency, and the three-character symbol for it (which you can hear in Morse code).

Aeronautical flight paths often radiate off from the VORTAC, and indeed, many flight paths go from VORTAC to VORTAC.



Localizers

Sharing the 108-118 MHz band are runway localizers. These are narrow beams of a radio signal guiding aircraft down the center line of a runway. The antennae themselves are generally located at the far end of the runway they serve. Other antennae nearby provide distance-measuring signals.



Localizers are often found in pairs at each end of a major runway. On the instrument flight rule (IFR) charts, such a runway would appear as shown below. This map also shows an outer marker on the localizer at the right.



On airports where the prevailing wind is generally in one direction, there is only one localizer. Localizers generally have a Morse code identifier of four characters, the first being an "I".

Picking up the signals

Many scanners manufactured recently include the 108-118 MHz range. The signal from the VOR transmitter usually has a clicking sound, with an occasional Morse code identification.

It helps to have a larger antenna (a telescoping whip, for example) than the "rubber duck" which comes with most scanners. And I find that the VOR and localizer signals are horizontally polarized (unlike the air traffic control signals), so one must hold the radio sideways. You may look a bit silly, but no one's likely to see you; there are few crowds on the mountain tops we're headed for.

A modest contest

With that introduction, I can now describe a pursuit I have (a contest, of sorts, if anyone else is crazy enough to pursue it), of seeing how many VOR and localizer signals I can hear from one point on the surface of the earth. Obviously, a jet flying at 35,000 feet over West Virginia can probably pick up well over 100 VOR signals from a radius of 250 miles in

any direction. But being earth-bound as I am and of limited budget, I must find a mountain top which will afford me a suitable "view."

Four points in southern California have yielded a good list of signals. But to establish an unbreakable record, it's likely I shall have to go to Northern California, either to Mount Diablo (east of Oakland) or to Mount Hamilton (southeast of San Jose).

One problem, of course, is the intense radio signals which one often finds on the highest and best mountain sites. One may have to walk around the mountain, perhaps 100 yards away from some of the transmitters, to get the scanner to be sufficiently sensitive to the faint and distant VOR signals.

What follows are a few of the sites in southern California which I have found fruitful.

Mt. Vicente

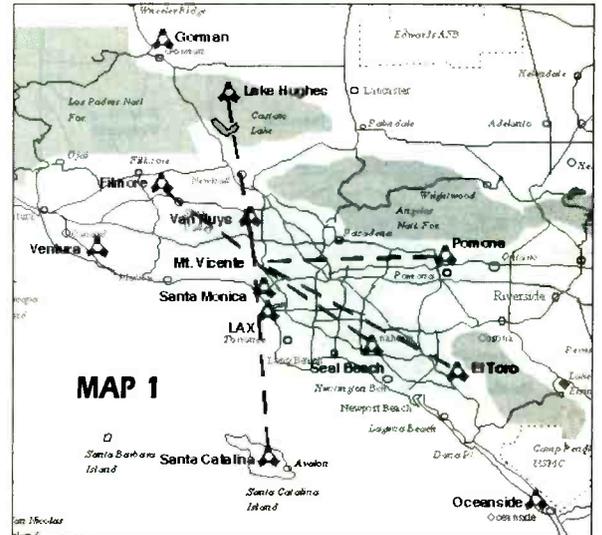
Mt. Vicente is one of the highest points on Mulholland Drive which runs along the crest of the Santa Monica Mountains between Hollywood and Topanga Canyon. The peak—originally a radar site for Nike missiles—has now been restored into a park by a conservationist organization. (See Map 1)

The last mile is rough dirt road, but if you drive slow, you can make it. This was one of the first sites I used, and it proved fruitful with nine VORs audible.

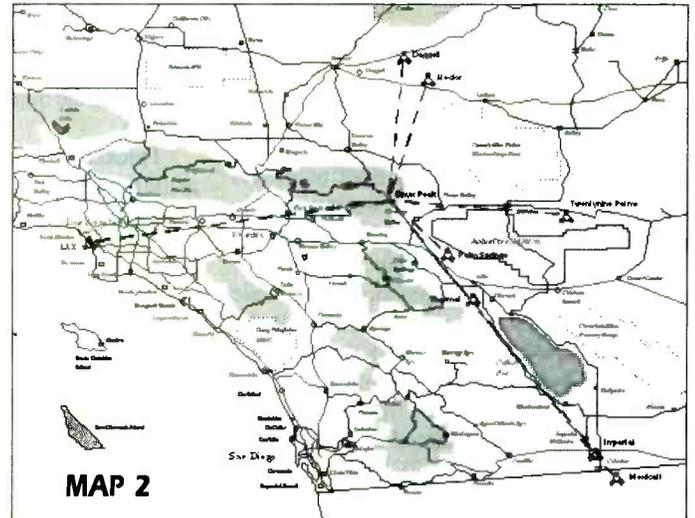
I could not pick up the Ventura VOR; too many high mountains (such as Castro Peak) were between us. I did, however, pick up localizers at Van Nuys and Burbank.

Onyx Peak

This 9,114 ft. mountain dominates the eastern end of the San Bernardino range. To the east or northeast nothing comes close to its height. It has a clear view over much of the Mojave Desert. But using the VOR signals, I discovered it has a "view" far down the Coachella and Imperial Valleys, all the way to Mexicali. (See Map 2).



Onyx Peak doesn't have easy access. The road to the summit is blocked by a gate, but a 2-mile hike will get you there. The mountain has quite a few electronic sats on it, so one has to move away from them for the scanner





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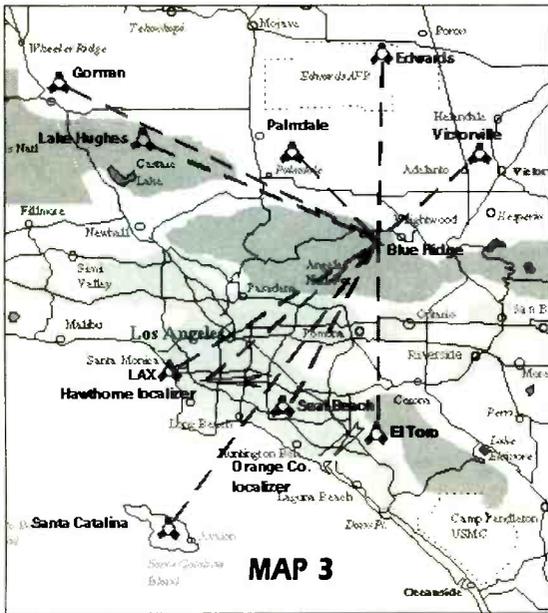
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receiver to be sufficiently sensitive.

What surprised me about this peak was being able to pick up the signals of the Daggett (DAG) and Hector (HEC) VORTACs far to the north. I question whether this is true line of sight!

■ Glendora Mountain Road

This is not a particularly high point and wasn't one of my first choices, but it proved to be very fruitful, yielding 10 VOR signals and six localizer signals. (See Map 3).

There was no single point along the 3-mile stretch of road where I could hear all the signals at the same time. Indeed, the higher up you got, especially when you got in sight of Sunset Peak to the east and Mount Wilson to the west, the scanner tended to pick up harmonics from the powerful TV broadcast transmitters.

In addition to the VOR signals, I could hear a number of localizers. There were two at LAX, one from the Pomona airport (Brackett Field), one from the Riverside Airport (which

points westward), and two from Orange County John Wayne airport.

The plum at this site turned out to be the Julian VORTAC. I could see the observatory dome on Mt. Palomar, but I was surprised that the Julian VORTAC put a signal all the way up here.

■ Blue Ridge Summit

This high point is one of my favorites. On a single ridge, you can see the high desert to the north and some of the LA basin to the south.

On the day I took these readings, I could see San Clemente Island about 105 miles to the south and the Telescope range

above Death Valley about 120 miles to the north. Higher up on the ridge, I did successfully pick up the Gorman VORTAC which is a hefty distance up the ridge line. (See Map 4).

I picked up two localizers at the Orange County airport. I expected one (I-SNA, 111.75 MHz.), but was surprised to discover a new signal (I-OJW, 108.3 MHz) which I later learned was another beacon at John Wayne airport.

I was rather surprised that I could not pick up any beacon on San Clemente Island. I once read that there was a VORTAC there near the runway, but nothing on the internet confirmed this.

■ Cerro Noroeste (Mt. Abel)

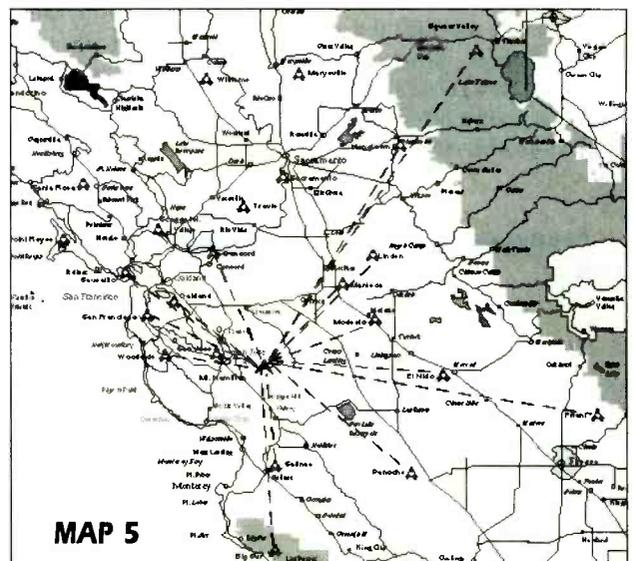
This 8,000+ ft. peak affords a spectacular view to the north, west, and south. Its twin peak to the east, Mt. Pinos, is slightly higher, and will afford a view in that direction. Perhaps next trip. On this trip, I took what I could drive to quickly.

From the road ascending the northwest slope of Mt. Abel, I could clearly hear a number of VOR signals around

central California. The most surprising, to the north, was the Friant VORTAC north of Fresno, which is up on a hill with a low valley between. I could clearly hear the FRA VORTAC signal which measures 160 miles from Mt. Abel. (See Map 5).

I could also hear a HIWAS (Hazardous Inflight Weather Advisory Service) transmission on 114.0, but I could not hear an ID, so I probably was hearing Julian; I can't really be sure. That would be quite a bounce!

I was most surprised to be able to hear the LAX beacon far to the south, with so many high mountains between us. However, if I could hear the LAX and Filmore beacons in



spite of the terrain, why couldn't I hear the Ventura and Catalina beacons also?

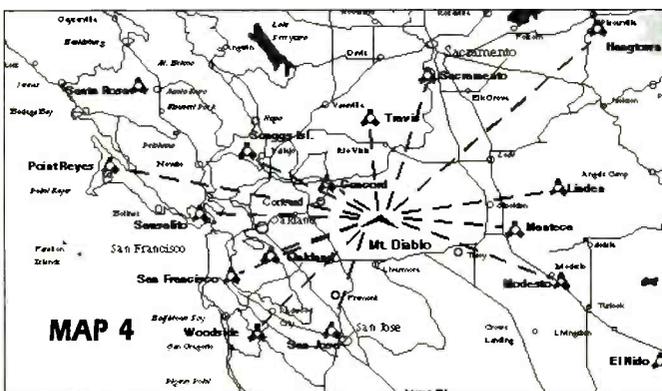
■ Mt. Diablo

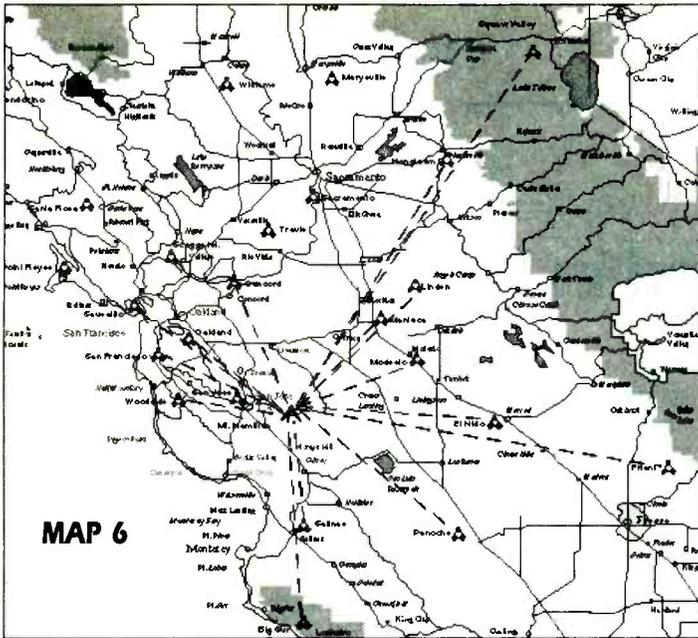
Mt. Diablo is a conspicuous landmark in northern California, partly because it stands alone. There are no other hills near it of its height, and the land around it is relatively low. It can be seen from so many places in the Bay area and the Sacramento valley.

Early on a Friday morning, I drove the narrow, winding (but paved) road to the top of this mountain east of Walnut Creek. It was clear and windy, and the view was spectacular.

To the east, above a layer of haze covering the San Joaquin Valley, I could see peaks of the high Sierra mountains around Yosemite National Park. I could see about half way up the Sacramento River to the city of Sacramento, lost in that haze.

To the north, south, and west, it was sparkingly clear. I could see Mt. St. Helena to the north. To the west, the Golden Gate Bridge





and every house in Marin County. To the southwest, the giant blimp hangar at Moffett Field, and the peak of Loma Prieta south of San Jose. To the due south, I could see the domes on Mt. Hamilton. (See Map 6).

I heard a number of VOR's from the top, but was surprised not to hear some from the northern Sacramento valley. I couldn't get Williams, Maxwell, or Marysville. This may be partly because there is so much RF interference from the FM broadcast stations on the peak.

But I was pleased to pick up the Pt. Reyes VOR which is on the top of a ridge. I could not, however, hear El Nido, or Panoche (which had a ridge between us).

All in all, even with fourteen logs, the radio reception at Mt. Diablo was a bit of a disappointment, primarily because of the radio interference. Visually, it was spectacular!

■ Mt. Hamilton is a Winner

I suspected this mountain peak would give me the most VOR signals. This 4,209 ft. peak is about 15 miles east of San Jose, and the white dome of the famous Lick Observatory is clearly visible from much of the west San Francisco bay area.

The road to the top is not for the faint-hearted. It is narrow and winding, in places reduced to a 30-ft. turning radius. It is paved all the way, but must be driven quite slowly in places because of the tightness of the turns. (See Map 6).

At the top of Mt. Hamilton are a number of telescope facilities. The original observatory building is open to the public from 1:00 to 5:00 most afternoons, and contains the original 24-inch refractor telescope built in 1888.

From the top of the peak, I got some

interference from FM broadcast stations, although not as severe as that encountered on Mt. Diablo to the north. There appear to be no such FM or TV broadcast transmitters on this peak, although there are a few utility stations at the east end of the ridge.

I was very pleased with the total of 16 VOR signals, and an additional six runway localizer signals. Air-

ports with localizers included San Francisco International (both runways 28-left and 28-right), the San Jose runways, Hayward, and Oakland.

As expected, I successfully heard a number of VOR signals in the Bay area. Similarly, some VOR's in the central valley were to be expected. Hangtown (the VOR at the Placerville airport) was a pleasant surprise. And Salinas was to be expected.

To the south, I had hoped to hear the Big Sur VORTAC which is a good distance down the coast, but atop a ridge overlooking the Pacific. It came through quite clearly, as did the Panoche VOR down the Diablo range to the southeast. I was surprised and quite pleased to hear the Friant VORTAC located on a ridge north of Fresno. I had heard this one from Mt. Abel to the south.

I was, however, totally surprised to hear a weak but discernable signal from the Squaw Valley VORTAC up in the high Sierras near Lake Tahoe. Indeed, not thinking I could hear that far, when I noted the frequency (113.2 MHz.) and the last two characters of the Morse Code identifier (somewhat obscured by the voice HIWAS broadcast riding on the same carrier). I initially didn't look that far east on my aeronautical chart to find it.

I expected to pick up Pt. Reyes, because two years ago, I could clearly see Mt. Hamilton from the Pt. Reyes lighthouse on an unusually clear day. But while the Pt. Reyes VOR is up on a ridge, it may be shielded by Mt. Tamalpais. Similarly, I didn't hear the Scaggs Island VORTAC as I expected to. Again, it may have been shielded by the Oakland hills. But then, I could hear the Concord VOR, which was a total surprise given the terrain between.

I tried for several VORs which I had hoped

to hear (Mendocino, Pt. Reyes, Scaggs Island, Sacramento, Clovis, and Marysville) but could verify nothing above the noise. So they don't go into the log.

Even so, 16 VOR's and 6 localizers is rather phenomenal, and I doubt if any other point on the surface of the earth (in the United States, at least) will yield that many signals.

I think I have a record. Should I contact Guinness?



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The New Band in Town

As we all know, the federal government has directed the FCC to auction off portions of the spectrum to help balance the budget and provide additional monies to fund Social Security and other programs. The fact that many high-bidders for spectrum have recently defaulted on their obligations to Washington has not, apparently, dissuaded legislators from taking the position that the sale of the ether can be their manna from heaven.

During the New York City World Trade Center tragedy, in which a terrorist group bombed the garage of the building in an attempt to topple one of the towers, police, fire, and EMS units found that they could not communicate with officials from other agencies such as the Port Authority as well as the state and federal authorities that responded. Representatives from the various groups argued to Congress and the Commission that there was not enough spectrum available to allow for seamless public safety communications with easy interoperability.

spectrum. So, where did the FCC look for more spectrum, spectrum that had to be near existing public safety channels in order not to require mature systems to move and save the expense of dual-band equipment? Naturally at the top-end of the UHF-TV channel plan, just below the input side to 800 MHz conventional and trunked systems: TV channels 60-69.

Television broadcasters, who have had a free ride up until now, have fought to retain their mammoth amount of spectrum (512 to 806 MHz for UHF alone!) and, despite their mega-profits, have naturally been disinclined to pay for the ultimate bandwidth. This FCC action moves broadcasters closer to the day when, if they expect to keep their special status, will at least have to trade off a good deal of their spectrum. The following are a few brief, and most important, snippets from the FCC report on this new scanner band we'll call "700 MHz." You can read the full report at http://www.fcc.gov/Bureaus/Engineering_Technology/Orders/1997/fcc97421.txt



Search Contact
APCO International
Association of Public-Safety
Communications Officials -
International, Inc.

This initiative, which was supported by the numerous radio groups such as the Association of Public Safety Communications (APCO) and the International Municipal Signal Association (IMSA), as well as two-way manufacturers, could not have been better timed. By backing the movement, government could demonstrate a crying need for additional spectrum and, at the same time, auction off pieces of that spectrum to commercial users.



How could they pull that off? Call it the fault of technology. Full- and half-duplex systems require base and mobile frequencies. Since most of the available spectrum is near the top end of the scale, greater separation between input and output channels is required. This is why there are 45 MHz between the base and mobile units on 800 MHz trunked public safety and cellular systems. According to the manufacturers, there would be an extremely heavy price to pay in filtering should the channels be much closer together (although at 900 MHz the spacing is 39 MHz).

Therefore, as the government worked to grant input and output channels to public safety, they noticed they could nicely slot commercial users in between (this is pure conjecture). And, voilà, they have their commercial spectrum to auction.

As all of this was occurring, the government was continuing its push toward the future of television transmission schemes, HDTV (High Definition Television) or DTV (Digital Television). As we understand it, with digitally compressed signalling techniques, broadcasters can pump more signal down a narrower path, thus freeing up

INTRODUCTION. By this action, we (the FCC) are reallocating the 746-806 MHz band, currently comprising television (TV) channels 60-69. As mandated by the Balanced Budget Act of 1997, we are allocating 24 MHz, at 764-776 MHz and 794-806 MHz, on a primary basis to the fixed and mobile services, and designating this spectrum for public safety use. This allocation will help meet the need of public safety to ensure interoperable communications among various public safety organizations, provide for growth of existing systems, and accommodate new types of services that will strengthen and enhance public safety.

As further mandated by the Budget Act, we are allocating the remaining 36 MHz at 746-764 MHz and 776-794 MHz on a primary basis to the fixed, mobile, and new broadcasting services for commercial use. Licenses in this 36 MHz of spectrum will be assigned through competitive bidding in accordance with procedures that will be determined in a later proceeding. This 36 MHz of spectrum can be used to make new technologies and services available to the American public. These proposals are an outgrowth of our digital television (DTV) transition plan.

DISCUSSION. In the Notice, we observed that increased dependence upon radio communications by public safety agencies has led to a shortage of spectrum available for public safety communications. Because the 794-806 MHz band is subjacent to existing public safety operations in the 806-824 MHz band, it holds the best potential for expansion of and interoperability with existing systems. The close proximity to existing spectrum used for public safety could also reduce the difficulty and cost of designing equipment. Further, most public safety communications systems require some minimum separation between the receive and transmit frequencies, for technical reasons. We tentatively found that a separation of 30 MHz is adequate for public safety systems.

COMMENTS. Commenters representing public safety agencies, radio equipment manufacturers, and many states, counties, and municipalities strongly supported reallocating 24 MHz of channels 60-69 for public safety use. For example, the Association of Public-Safety Communications Officials-International (APCO) states that Congress, the Administration, and the Commission itself have recognized the substantial need to reallocate additional spectrum to public safety. APCO stresses that the reallocation of 24 MHz from the 746-806 MHz band will address a significant portion of public safety spectrum needs.

The State of California applauds the speed with which we have moved to satisfy public safety spectrum needs, citing its own report which identifies several spectrum related deficiencies in its ability to meet the needs of state agencies.

The Land Mobile Communications Council (LMCC) concurs with our proposal to allocate spectrum for public safety services, stating that additional public safety spectrum would help mitigate current spectrum overcrowding, enhance interoperability among public safety agencies, and allow the development of cost effective advanced communications systems.

What does this all mean for scanner manufacturers? It's very simple: Customers who had purchased very wide-band high-end scanners, such as the ICOM series, with full spectrum coverage from 25-1300 MHz (less cellular, of course), should be okay. All other hobbyists will be out of luck if a nearby agency happens to license this band.

Unclear at the moment is what transmission scheme will be used by public safety agencies in their new slice of spectrum. Presumably the band will be used by trunking systems, and, increasingly, by digital trunked systems, probably with 12.5 kHz spacing (and eventually 6.25 kHz spacing), as opposed to the standard 25 kHz. How this is addressed by the manufacturers and software developers is a topic for another article. (We're also not 100 percent sure which side will be the input and which the output.)

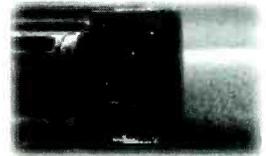
In practice, the scanner manufacturers may find the opening of 700 MHz to be an opportunity similar to the addition of 800 MHz some 15 or 20 years ago. Ever since the Bristol, Connecticut, police (which we believe was the very first 800 MHz public safety agency) switched bands, Uniden and Radio Shack have charged a premium for a scanner incorporating these high frequencies (just as they did, for a short while, when the UHF "T-Band" was first introduced). The two titans of scanning, hopefully, will eventually offer scanners with 700 MHz. If customers are asked to once again cough-up a small premium for it, then so be it.

■ The Bill Goes On

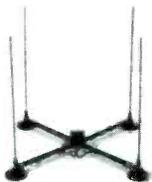
H.R. 2369, The Wireless Privacy Enhancement Act of 1998, may soon become law. In February, the bill quickly moved through the House Commerce Committee on a voice vote and, as expected, was sent to the House floor with no further amendments. On Thursday, March 5th, the bill was placed before the House of Representatives for consideration. We understand that there was a short "debate" between Billy Tauzin (R, LA) who introduced the bill, discussing it for the

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record with Rep. Markey (D, MA) who co-sponsored it.

If there was a "debate," it was likely more of a pat-on-the back session between the two, as well as a "colloquy" in which statements are read into the record concerning the purported goals and consequences of the Act. We understand this language can be used in court cases to demonstrate, for one side or the other, the actual desired effects of the bill the legislators had in mind it was penned. (This editor has ordered a copy of the tape of the House debate and of Billy Tauzin's C-SPAN roundtable discussion the morning of the vote. If there is anything interesting to report, you'll read about it later this year.)

As we've discussed many times in these pages, H.R. 2369 is not a bill we wanted. There are still deleterious issues that the legislation raises, most particularly the matter of decoding public safety digital transmissions. Many also continue to argue that there should be no monitoring restrictions whatsoever. They believe that, if Congress wishes to write a law, it should be one that requires cellular and PCS providers to encrypt, and guarantee the security of, their customers' transmissions. This editor won't bore you with the counter-arguments again other than to say it's not political reality.

H.R. 2369 passed the House 414 to 1. (The one dissenting voice came from Ron Paul, a Texas Republican representative from Texas, perhaps the Ft. Worth area... You can figure that one out.)

Those who voiced the opinion that the airwaves should remain completely free were dismissed as laughingstocks or who had no understanding of how Washington works. H.R. 2369 requires scanner manufacturers to remove cellular and PCS frequencies from their scanners. This may mean that we'll lose narrowband PCS frequencies from 901-902 MHz, from 930-931 or 932 MHz, and from 940-941 MHz, as well as wide-band PCS from 1850-1990 MHz. All in all, this is not much of a loss, especially considering the original language of the bill which would have meant the end of our hobby, many jobs, and a terrible loss of freedom.

A "Section-by-Section Analysis of the Legislation," provided to me by attorneys working for the House Commerce Staff, sheds increased light on the intentions of H.R. 2369. Here are some of the more critical passages of this Report, which may not have represented the final version to be read into the record:

"Section 2(a) extends the prohibition in section 302(b) of the Communications Act of 1934 on manufacturing, selling, etc., scanning devices to modifying as well. While the Committee believes that this is already covered by existing law, it has decided to make the prohibition explicit to prevent any misreading of the statute." (No comment necessary.)

This section is perhaps the most interesting and controversial: "Section 2(b) makes amendment to section 302(d) of the Communications Act of 1934. Section 2(b) amends section 302(d)(1) to expand the scope to new communications technologies such as personal communications services (PCS), and protected specialized mobile radio and paging services. It also requires the Commission to deny equipment authorization to scanners that are capable of being equipped with certain decoders.

"By this language, the Committee does not intend to hamper the inclusion of consumer-friendly features on radio scanners such as ear-plug jacks or other ports. But the Committee intends manufacturers now to design scanners with ports that cannot be used to equip the scanner with a decoder that can convert digital cellular, personal communications services, protected specialized mobile radio services to analog voice audio; or convert protected paging services to

alphanumeric text; or otherwise decrypt radio transmissions for the purposes of unauthorized transmissions. (Editor: Reception must be the intended last word instead of 'transmission.')

Thus, manufacturers, after the enactment of the Wireless Privacy Enhancement Act, will be under an obligation to ensure that consumer-friendly features cannot be used to equip scanners with such prohibited decoders."

The document then goes on to discuss how the FCC, with the passage of this Act, now has the authority to prescribe rules to enhance the privacy of "users of frequencies shared by commercial services and the public safety community."

The FCC will also consider rules and regulations requiring "that scanning receivers be manufactured in a manner that prevents any tampering or alteration by the user that would permit the device to be used unlawfully for interception or divulgence of radio communications." We may actually see warning labels on scanners in the future. The manufacturers are provided sufficient time to sell off their current inventory.

While the entire Report is of great interest, the last bit of language which directly affects our ability to scan legally is found in section three: "Section 3(a)(4) preserves the authorization of certain interceptions or disclosures provided in Chapter 119 of Title 18. That chapter governs wire and electronic communications interception and interception of oral communications. Section 2511(g) provides a number of exceptions for the interception to the chapter's prohibitions on interception. The majority of these exceptions relate to government interceptions. However, Section 2511(g) provides a number of broad exceptions for the interception by private parties of radiocommunications, including those that are transmitted over a) a system that is configured for ready access by the general public; b) by any station for the use of the general public, or that relates to ships, aircraft, vehicles or persons in distress; (c) any governmental, law enforcement, civil defense, private land mobile, or public safety communications system that is readily accessible to the general public; d) by a station operating in the amateur, citizen's band (CB); and e) by any marine or aeronautical communications system.

"Because the Committee preserved the Chapter 119 exceptions in its amendment of Section 705(a) of the Communications Act, the Committee does not intend for the Commission or any other enforcement agency to investigate or fine parties for the interceptions authorized by Chapter 119. Therefore, the Committee does not intend for uses of scanning receivers and receiving radios such as shortwave radios, that are consistent with the Section 2511(g) exceptions to be investigated or fined under Section 705(a)."

We shouldn't need to spend too much more time discussing H.R. 2369. Although the Senate has yet to act upon the Bill, it is generally considered noncontroversial and is likely to be voted on without discussion. The next time you'll probably read about it on these pages is when President Clinton signs it into law. I'll leave you with this: It all could have been a helluva lot worse.

Final Notes

Trunkcom, the list server dedicated to the exchange of trunking-related information, is moving (or perhaps already has moved) to another home. We gratefully thank Grove Enterprises for freely hosting Trunkcom since its inception. You will be able to find details on our move at the www.grove.net web site. As always, a special note of thanks goes out to list administrator John McColman, without whom the list would be in chaos.

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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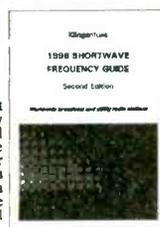
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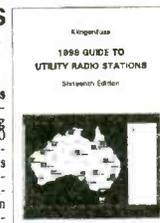


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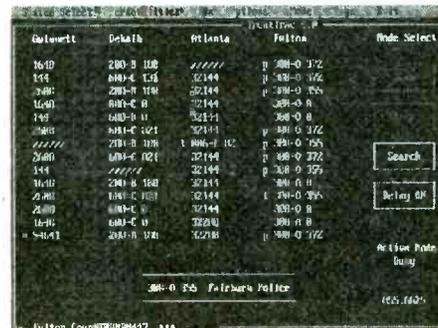
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We've Got Your Numbers

Recent tensions in Iraq have apparently caused an increase in HF "numbers" broadcasts. Nowhere is this more dramatic than on those three-letter-ID stations reputedly operated by Israel's controversial spy agency, the Mossad.

This formidable organization, whose name translates as "Institute," is a combined secret police and intelligence group. It's been given a sweeping mandate to counter military and terrorist threats, both foreign and domestic. Operations are covert, often bold, and sometimes bloody.

Mossad was established in 1951 by then-Prime Minister David Ben Gurion. Its Director General, sometimes known as "S," still reports only to the PM and defense secretary. They've been in the news of late, following a botched assassination plot, and an uproar which nearly brought down Israel's government.

For some years, Mossad has been linked to an especially loud and bizarre set of HF "numbers" transmissions. "Numbers," in radiospeak, are stations that broadcast long strings of digits and letters in groups, perhaps as coded messages. At any time of day, there's probably a numbers transmission going somewhere.

Modern numbers, as we know them, started during the Cold War. Many assumed that they'd end with it. They didn't. In their utter strangeness, they remain as compelling as ever.

For a generation, these signals have been tracked, located, and analyzed for any technical clues at all. Traffic has been crunched, correlated, and attacked with every statistical tool known. Authors, often with entertaining pseudonyms such as "Havana Moon," have come and gone.

What is the result of all this work? Absolutely nothing. We have suspicions, some evidence, some spy stories, but no hard facts. The people who know are still not telling.

It's especially interesting that numbers stations go out of their way to get noticed. No spy-movie stealth for these guys. They're running serious power, hammer-down power, grab-the-channel power, wattage to your cottage. Some, in addition, send hours of

carriers, or play music, or count to ten. Are they merely a colossal diversion, an expensive disinformation, or a guaranteed minimum noise to foil traffic analysis? Or are they control messages for grunt-level informers, ordinary folks recruited or blackmailed by real spies, who listen on inconspicuous, consumer radios and use easily concealed one-time code pads?

We don't know. Nor are we about to know.

Getting back to Mossad, one especially striking logsheet came from Takashi Yamaguchi, of Nagasaki, Japan. He heard a lot of numbers stations, representative of the type we're talking about here. This month's column contains a list of his and other loggings.

Mossad's five-number, phonetic, English language format is distinctive. It's also rather captivating in its sheer weirdness, making no attempt whatsoever to explain itself to anyone.

Broadcasts are in a female voice, using standard phonetics, always in AM or USB. There's a mechanical sound, as with most of these stations. They're probably using digitized words, phone company style. For some reason, there's often a French accent. If "she" says the phonetic "N" as "Novembrair," you have a dead giveaway.

They begin on the hour or quarter-hour, with lengthy repetition of what is probably a call sign or identifier. These are always three letters, usually postpended by the number two. Most of the time, it's followed by a string of phonetic, five-letter groups.

Parallel transmissions on two or more frequencies are common. It's very productive to keep a log of Mossad stations, as times and frequencies don't change much.

I have always hoped that the radio engineers for these various intelligence groups get a chuckle reading all our theories in the shortwave press. I certainly enjoy writing about them.

Quick corrections

In the March Utility World, the frequency for marine bulletins from Coast Guard groups

was given as 2760 kHz. Well, I transposed digits. The real frequency, of course, is 2670, and it's as active as ever.

Some people may not be hearing the double ticks mentioned in the April WWV column. This is because, for the first time in a while, there aren't any! I suspect that UTC has drifted into close sync with UT1, but this never lasts.

Recent Mossad Numbers Loggings

| kHz | ID | Time | By | Simulcasts or Comments |
|-------|-------|------|----|-------------------------------------|
| 2270 | SYN 2 | 2200 | Y | JSR usually heard here |
| 2626 | MIW 2 | 2215 | Y | |
| 2743 | ULX | 2300 | B | |
| 2953 | KPA 2 | 1815 | Y | |
| 3150 | PCD | 1800 | B | |
| 3150 | PCD | 1800 | B | |
| 3152 | PCD | 1800 | Y | 4270 |
| 3270 | MIW 2 | 1415 | Y | 6370 |
| 3270 | SYN 2 | 1745 | Y | 5267 |
| 3417 | ART | 1930 | Y | 5437 |
| 3640 | MIW 2 | 0119 | R | |
| 3840 | Unk | 2245 | B | Joined in progress |
| 3840 | YHF | 1730 | Y | |
| 4270 | PCD | 1800 | Y | 3152 |
| 4360 | SYN 2 | 1945 | Y | 5630 |
| 4360 | SYN 2 | 2145 | Y | 5629 |
| 4463 | FTJ | 1730 | B | Heavy jamming |
| 4463 | FTJ | 2158 | B | |
| 4665 | VLB 2 | 1545 | Y | Interference to Pacific air control |
| 4880 | ULX | 2200 | B | |
| 5091 | JSR | 1831 | R | |
| 5230 | CIO 2 | 1848 | R | |
| 5267 | SYN 2 | 1745 | Y | 3270 |
| 5437 | ART | 1930 | Y | 3417; freq is usually 5435 |
| 5629 | SYN 2 | 1945 | Y | |
| 5630 | SYN 2 | 2145 | Y | 4360 |
| 5820 | YHF | 1400 | Y | 7918 |
| 6270 | ULX | 1440 | Y | |
| 6370 | KPA 2 | 1405 | Y | ID only, repeated for 1+ hr |
| 6370 | MIW 2 | 1415 | Y | 3270 |
| 6498 | PCD 2 | 1400 | Y | |
| 6500 | PCD | 1500 | Y | Very strong |
| 6658 | MIW 2 | 1415 | Y | |
| 6658 | VLB 2 | 1245 | Y | |
| 6745 | VLB 2 | 1245 | Y | |
| 6840 | EZI | 1800 | B | Again at 2000 |
| 6840 | EZI 2 | 1600 | B | 9130 |
| 7445 | SYN 2 | 1345 | Y | 5629 |
| 7918 | YHF | 1400 | Y | 5820 |
| 9130 | EZI 2 | 1600 | B | 6840, again 2100 |
| 10352 | CIO 2 | 1445 | B | |
| 11565 | EZI | 1430 | Y | 13533 |
| 13533 | EZI | 1430 | Y | 11565 |

B Ary Boender, Holland
R Alf Rosenstock, WUN News
Y Takashi Yamaguchi, Japan

Hugh Stegman

Abbreviations used in this column

| | | | |
|--------|---|--------|--|
| 75/150 | RTTY speed/shift (varies) | MFA | Ministry of Foreign Affairs |
| AB | Air Base | NASA | National Aeronautics and Space Administration |
| AF | Air Force | NORAD | North American Aerospace Defense Command |
| AFB | Air Force Base | PACTOR | Teleprinter system combining characteristics of packet radio and SITOR |
| AM | Amplitude modulation | RAF | Royal Air Force (U.K.) |
| ANDVT | Advanced Narrowband Digital Voice Terminal | RTTY | Radio Teletype |
| ARQ | Automatic Repeat Request (an RTTY mode) | RY | RTTY test (from traditional RYRYRY...) |
| ARRS | Aerospace Rescue and Recovery Service | SAM | Special Air Mission (USAF VIPs) |
| CG | Coast Guard | SHARES | Shared Resources (US Government) |
| CP | Command Post | SITOR | Simplex Telex Over Radio |
| CQ | General call: Hello all stations | Unid | Unidentified transmission |
| CW | Continuous Wave (Morse code) | USAF | U.S. Air Force |
| DoD | Department of Defense | VIP | Very Important Person |
| DSN | Defense Switched Network (formerly AUTOVON) | VNA | Vietnam News Agency |
| EAM | Emergency Action Message | VOLMET | "Flying Weather" (from French) |
| FEC | Forward Error Correction (an RTTY mode) | | |
| GHFS | Global High Frequency System | | |

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

- 60.0 MSF-Teddington time signals, from UK in CW, at 1245. (Ary Boender, Netherlands)
- 75.0 HBG-Swiss Observatoire Neuchatel time signals, in CW at 1246. (Boender, Netherlands)
- 77.5 DCF 77, German PTB time signals in CW at 1232. (Boender, Netherlands)
- 2840.7 DLVK-ZB Hiddensee, German customs launch with position report for Coast Guard Neustadt, SITOR-A (100 baud), at 1639. (Boender-Netherlands)
- 2941.0 Moscow Volmet, flying weather at 2244. (Boender-Netherlands)
- 3084.0 Unid-Female 5-figure numbers in Chinese, LSB at 1435. (Takashi Yamaguchi-Japan)
- 3196.9 Orange 400 and 430-Possible US Navy, working something sounding like, "Superior Valley Tower," mentioned "Alameda" and "taxi runway 090," at 0145. (Paul Bunyan-MO)
- 3756.0 Unid-"The Pip," station that makes CW pips in 80 meter amateur band, around for years, at 0048. (Boender-Netherlands)
- 4077.0 RMP-Russian Navy, Kaliningrad, CW weather at 1719. (Boender-Netherlands)
- 4398.0 YQI-Constanta Radio, Romania, working unid vessel at 1728. (Boender-Netherlands)
- 4482.0 Unid-Russian Man "numbers" in AM at 2210. (Boender-Netherlands)
- 4485.0 Unid-Czech Lady "numbers," also 5027, several days at 1355. (Boender-Netherlands)
- 4507.0 Unid-Spanish 5-figure "numbers" in AM, at 1102. (Bunyan-MO)
- 4594.0 Golf Kilo-German language, 5-figure "numbers" broadcast at 2230. (Boender-Netherlands)
- 4601.5 0A-Dublin, Navy station with routine messages in SITOR-A at 1732. (Boender-Netherlands)
- 4745.0 Teardrop-USAF, calling Nightwatch 01 at 1625. Also 5026. (Jeff Haverlah-Texas)
- 5190.0 Liberty Star-NASA Booster Recovery Vessel, working Cape Radio at 2308, went to 3365. (Bunyan-MO) *Usually recovery of spent space shuttle boosters.* -Hugh
- 5266.0 HEP 5-Kantonspolizei Zuerich, with CW VVV marker, at 1144. (Boender, Netherlands)
- 5391.0 B80-Royal Navy, UK, in exercise with C-0-P, at 1424. (Boender-Netherlands)
- 5403.0 Unid-RAF, Buchan, radio check with E-9-I, at 1407. (Boender-Netherlands)
- 5422.0 Unid-Lincolnshire Poacher. numbers, at 1700. Also 6485 and 8464. (Yamaguchi-Japan)
- 5429.5 Air Force Two, working Andrews AFB at 0727. (Bunyan-MO)
- 5598.0 Air Force One-SAM 28000, position report for unknown station at 0041. Alitalia 4361, possibly the Pope leaving Cuba, working New York Radio at 0405. (Bunyan-MO)
- 5687.0 DHM 91-German AF, Muenster, working unid aircraft at 1422. (Boender-Netherlands)
- 5714.0 Architect-RAF, Upavon, UK. with "celebrity" broadcast at 1132. (Boender-Netherlands)
- 5914.7 KAWN-USCG, Saddlebunch Key, with coded weather, in RTTY (75/850), at 0604. (Bob Hall-RSA)
- 6255.0 Unid-Spanish female 5-figure numbers, at 0410. (Bunyan-MO)
- 6485.0 Unid-Lincolnshire Poacher numbers at 1600. Also 6655, 10426. (Yamaguchi-Japan)
- 6493.5 LYL-Klaipeda Radio, Lithuania, with CW navigation warnings at 2206. (Boender-Netherlands)
- 6502.0 TBB 6-Turkish Navy, Ankara, calling TBJD in CW at 2202. (Boender-Netherlands)
- 6712.0 Offutt-USAF GHFS, Nebraska, EAM at 0656. (Haverlah-Texas)
- 6739.0 Offutt-USAF GHFS, Nebraska, EAM at 1504. Concourse working Nightwatch 01, moving to Z175 at 2131. (Haverlah-Texas)
- 6751.0 Unid-USAF with relay of Nebraska football game from a local FM station, 2015 through 2255. (Bunyan-MO)
- 6779.0 DHJ 59-German Navy, Wilhelmshaven, working unknown vessel in baudot RTTY and USB, at 2153. (Boender-Netherlands)
- 6802.0 Unid-Spanish 3/2-figure "numbers" in full-carrier USB, at 0304. (Bunyan-MO) *Usually mode R3E.* -Hugh
- 6817.0 SAM 60201 and 60202-USAF VIP aircraft, radio checks with Andy on F-709, at 1512. (Bunyan-MO)
- 6826.0 Unid-Spanish 5-digit numbers in AM at 0334. (Dean Burgess-MA)
- 6871.0 HEP 7-Kantonspolizei Zuerich, Switzerland, with VVV marker in CW, at 1505. (Boender-Netherlands)
- 6945.0 Unid-5-figure CW "numbers" at 1500. (Boender-Netherlands)
- 6959.0 Unid-Lincolnshire Poacher with 5-figure "numbers," simulcasting 11545, at 2000. (Boender-Netherlands) Long 5-figure broadcast, at 2040. (Burgess-MA) Unid, might be the Poacher, 5-figure, at 2217. (Bunyan-MO)
- 6984.0 SNN 299-MFA, Warsaw, with messages in RTTY (Pol-ARQ, 100), at 1440. (Boender-Netherlands)
- 6993.0 Air Force two, patch to Crown via Andy, at 0151. (Bunyan-MO) *Crown is the White House Communication Office.* -Hugh
- 7325.0 SAM 60201 and 27000-USAF VIP aircraft, working Andy on F-268. (Bunyan-MO)
- 7337.0 Unid-Lincolnshire Poacher numbers, late tune in at 2245. (Boender-Netherlands)
- 7600.0 Unid-"Counter" type 5-figure numbers, also 10597, at 1500. (Boender-Netherlands)
- 7831.0 Alligator-USAF working Nightwatch 01 (Airborne CP) in net with New Guard, Yalaman, Rebellion, Genetic, Textbook, and Ski Boot. Clear and ANDVT were used, beginning at 2010. (Haverlah-Texas)
- 8032.0 SAM 60206-USAF VIP, patching Robert Gray Base Ops, via Andrews AFB on F-498, at 0137. (Bunyan-MO)
- 8375.0 New Star Broadcasting, Taiwan, with Chinese female 4-figure numbers in AM at 1300. Similar transmissions heard on 8300, 9725, 11430, 13750, and 15338. (Yamaguchi-Japan)
- 8496.0 CLA-Havana, Cuba, with CW traffic list at 0628. (Dick Dillman-CA)
- 8636.0 HLW-Seoul, Korea, working CW ship traffic at 0612. (Dillman-CA)
- 8688.5 ZSC-Cape Town, RSA, with CW traffic list at 0635. (Dillman-CA)
- 9016.0 Chalice Alpha-signal check with Nightwatch at 1544. WAR 46, working Nightwatch, went to Z190 at 0123. Nightwatch with 26 character EAM, masked by own 400-Hz tone at 1517 and 1523. Magnavox-USAF, repeating 26 character EAM from Offut, then working Projector,

- Nightwatch 01, and Double Up, advised that working freqs are Z175 and Z130, at 0135. (Haverlah-Texas)
- 9094.0 Unid-Spanish 5-figure numbers in AM, at 1113. (Bunyan-MO)
- 9132.0 King One working DoD Cape, told, "T minus 53," at 0148. (Bunyan-MO) *Atlantic Missile Range op. -Hugh*
- 9219.0 Unid-English female numbers, 3/2 figure code groups in AM, at 2024. (Dix-NY)
- 9220.0 Unid-Spanish 5-figure numbers in AM, at 1106. (Bunyan-MO)
- 10204.0 Nightwatch 01-airborne CP, working Valorous, clear and ANDVT, at 1502. (Haverlah-Texas)
- 10600.0 XVN37-VNA, Hanoi, with news in English, RTTY (50/495), at 1518. (Hall-RSA)
- 10917.9 RFFIC-Marine Sirpa Paris, with news in French, mode ARQ-E3 (48/436), at 0725. (Bob Hall-RSA)
- 11043.7 RFTJ-French embassy, Dakar, in RTTY (ARQ-E3, 192/400), at 0631. (Hall-RSA)
- 11175.0 Hickam-USAF GHFS, Hawaii, with patch from U.S. Navy XD 03 to DSN number for "Naval Air Labs" in HI. Told aircraft, "Your party is on the line, requesting the shade." Reply was, "Exo has landed and been taken home." (Allan Stern) Unid-USAF C-141 with patch through Ascension GHFS to Newark, for landing arrangements and meteorological report, then piprep (44N by 54W), at 0050. (Ed Muro-NY) Teal 28-USAF weather recon, patch to Miami Monitor (National Hurricane Center) through MacDill Global, with coded data, saying satcom was down, at 1828. (Bunyan-MO) Unid-"German Air Force Calling Andrews [AFB], can you hear me?" answered by Offut GHFS, patch to German officer in Washington, DC, inbound for Dulles, heard at 2000. (Alden Wires-GA)
- 11181.0 King 33-USAF Rescue 33, ARRS, with patch to Rescue Ops via Offutt. (Bunyan-MO)
- 11244.0 Reputable-USAF, with test count, at common time for these, 0123. Offutt-USAF GHFS, with 6 character EAM "for Hailstorm" at 2340. Offutt with EAM "for Bell Pepper" at 2245. (Haverlah-Texas)
- 11270.0 Unid-Russian man, numbers in AM at 0820, and again at 1600. (Boender-Netherlands)
- 11470.0 Unid- English female "counter" numbers in 3/2 groups, AM at 1600. Also 12168. (Yamaguchi-Japan)
- 11494.0 Nightwatch 01-Airborne CP, working Valorous at 1507. (Haverlah-Texas)
- 11545.0 Unid-Lincolnshire Poacher, 5-letter "numbers" at 1400. Same, simulcasting 13375, at 1500, simulcasting 14487, also at 1500, simulcasting 13375, at 1600, and 6900 at 2000. Also at 2100. (Boender-Netherlands) *Wonder if this traffic picked up in the Iraq crisis. The Poacher seems pretty busy. -Hugh*
- 11570.0 Unid-Cherry Ripe, 5-figure numbers format like the Poacher, twice at 1300. (Boender-Netherlands)
- 12056.0 Unid-Cherry Ripe numbers at 1200. Also 8320 and 13866. (Yamaguchi-Japan)
- 12204.4 ZSO-Durban, South Africa, with Navarea VII warnings in RTTY (75/150) at 0950. (Hall-RSA)
- 12270.0 Shark 11-aircraft over Texas, in radio check with Lobo (Howard AB Ops) . (Bunyan-MO)
- 12831.0 3BM-Port Louis Radio, Mauritius, with CQ and announcement, "500 kHz is off the air until further notice," CW at 1806. (Dix-NY)
- 13207.0 Dark Star Mike-USAF, working Dragnet Sierra, at 2141. (Bunyan-MO)
- 13242.0 KGD 34-SHARES master control station, working stations in voice and data (PACTOR), at 1950. (Bunyan-MO)
- 13375.0 Unid-Lincolnshire Poacher, numbers at 1700. (Boender-Netherlands)
- 13467.0 SNN 299-MFA, Warsaw, Poland, CW channel marker at 1442. (Dix-NY)
- 13650.0 Unid-Spanish female voice with 5-figure "numbers," at 0303. (Sue Wilden-IN)
- 13996.4 STK-Khartoum Air, test slip with RY and callsign in RTTY (50/400) at 0516. (Bob Hall-RSA)
- 14405.0 UNHCR-United Nations, Bujumbura, with French messages about staff movements, in RTTY (Pactor), at 1550. (Hall-RSA) *UN High Commission for Refugees aid ops. -Hugh*
- 14406.0 Unid-"Counter" 3/2 English numbers in AM at 1100. Also 13555. (Yamaguchi-Japan)
- 14487.0 Unid-Lincolnshire Poacher, jammed and unreadable, at 1100, 1200, and 1300. Again, clear, simulcasting 10426, at 1400. (Boender-Netherlands) Unid-Poacher at 1200, also 15682 and 16804. (Yamaguchi-Japan)
- 14890.0 Unid-Russian man AM numbers, two days at 0800. (Boender-Netherlands)
- 14996.0 RWM-Russian CW time signals at 1710. (Boender-Netherlands)
- 15016.0 Offutt-USAF GHFS, with 6 character EAM "for Postulate" at 1938, "for Curley Top," at 1939. (Haverlah-Texas)
- 15821.7 SAM -MFA, Stockholm, with embassy traffic for Tel Aviv, in RTTY (Swed-ARQ, 100/400) at 1729. (Bob Hall-RSA)
- 16335.0 FZS 63-St. Denis Meteorological, with tropical cyclone warning from Reunion Island, in RTTY (75/400), at 0940. (Hall-RSA)
- 16357.0 OLZ-MFA, Prague, with news in Czech, RTTY (100/400), at 0859. (Hall-RSA)
- 16661.7 EGY-possibly London embassy, with 5-letter code groups in Sitor-B at 1150. (Hall-RSA)
- 16668.0 SAM-MFA, Stockholm, with news in RTTY (Swed-ARQ, 100/400), at 0945. (Hall-RSA)
- 17050.0 4XZ-Israel Navy, Tel Aviv, with VVV marker in CW, at 1415. (Boender-Netherlands)
- 17105.0 IRM-Rome, Italy, with CW traffic list at 1704. (Dillman-CA)
- 17113.0 GKB-Portishead Radio, England, CW traffic list at 1700. (Dillman-CA)
- 17416.8 SAM-MFA, Stockholm, with 5-letter code groups to Lagos embassy, in RTTY (Swed-ARQ, 100/400), at 0915. (Hall-RSA)
- 17417.3 SAM-MFA, Stockholm, with 5-letter code groups to Nairobi embassy, in RTTY (Swed-ARQ, 100/400), at 1537. Changed frequency from 17417.1. (Hall-RSA)
- 17432.0 DFZG, MFA Belgrade, with encrypted messages to many embassies, in RTTY (Baudot, 75), at 1437. (Boender-Netherlands)
- 17441.5 5YE-Nairobi Meteorological, with coded weather in RTTY (100/825), at 1555. (Hall-RSA)
- 17521.0 HSW61-Bangkok Meteorological, with coded weather in RTTY (50/209), at 1534. (Hall-RSA)
- 18064.0 SNN299-MFA Warsaw, with administrative details, then long message about Luanda, in RTTY (Pol-ARQ, 100/240) at 0801. (Hall-RSA)
- 18183.5 Algiers MFA (tentative ID), with news in French, at 0943. (Hall-RSA)
- 18183.5 MFA, Algiers, with French to "AMBALG Lagos," then Conakry, Kampala, and Budapest, all RTTY (Coq-8, 26.67), at 0840. (Hall-RSA)
- 18258.5 HBD 32-Swiss Embassy, Brasilia, with 5-letter code groups signed BRAZILAMA, in RTTY (ARQ) at 1240, again at 1527. (Hall-RSA)
- 18276.7 HBD31-Swiss embassy, Buenos Aires, with 5-letter code groups in RTTY (ARQ), at 1547, again at 1726. (Hall-RSA)
- 18360.0 KHAS-French embassy, Kinhasa, with 35 minutes of 5-letter code groups for MFA Paris, in RTTY (ARQ, 200/400), at 0930. Same station with 40-minute message to Paris at 0940. (Hall-RSA)
- 18538.0 NDJA-French embassy, N'Djamena, with French language in RTTY (ARQ, 200/400), at 0940, code groups at 1545. (Hall-RSA)
- 18661.7 EGY-London embassy, (tentative ID), with 5-letter coded message in RTTY (ARQ) at 1148. Kinhasa, with similar, at 1200. (Hall-RSA)
- 18760.0 RFGW-MFA, Paris, with scheduled transmission in 5-letter code groups, RTTY (FEC-A, 192/400), at 1520. (Hall-RSA)
- 19721.0 RKLK-Archangelsk Fishery Radio, Russia, calling 4LY in CW, at 1400. (Boender-Netherlands)
- 19860.0 GYA-Royal Navy, London, with RTTY (Baudot, 75), at 1404. (Boender-Netherlands)
- 20518.2 KHAS-French Embassy, Kinhasa, with several messages headed "SVC DIPL de KHAS," in RTTY (ARQ, 200/400), at 1009. (Hall-RSA)
- 20699.7 SAM-MFA, Stockholm, with traffic to Pretoria, then 5-letter code groups, in RTTY (Swed-ARQ, 100/400), at 1514. (Hall-RSA)
- 22108.0 Unid-Cherry Ripe numbers format at 0000. Also 15616 and 19884. (Yamaguchi-Japan)
- 26150.0 Unid-Lowest of Dutch paging signals, every 100 kHz all the way to 26850, in data mode, at 1530. (Boender-Netherlands) *Oh good, sounds like yet another 10-meter band indicator. -Hugh*
- 26810.0 Unid-Another Dutch paging system, different from 26150 and others, data mode, at 1533. (Boender-Netherlands)



The First Digital Mode — Radioteletype

One of the oldest codes still in use today is the Baudot or Murray 5 bit code. Baudot radioteletype (RTTY) transmissions are based on the original 60 milliamp on/off current concept of the telegraph. Since there is no way to utilize current during shortwave transmissions, a *mark* and *space* system was developed to simulate on/off bit states.

The frequency separation (measured in Hz) between the mark and space is referred to as *shift*. Standard shifts used today for SW RTTY include 60, 85, 170, 425, 850 and 1200.

RTTY may be sent at different speeds, referred to as the *baud rate*. Typical baud rates and their equivalent words per minute are shown below. Speeds above 200 WPM are very unreliable for shortwave transmission purposes.

| Baud Rate | WPM |
|-----------|-------|
| 45 | 60 |
| 50 | 66/67 |
| 57 | 76 |
| 75 | 100 |
| 100 | 132 |

The *polarity* or *sense* of the mark and space bits may be either normal or reverse and must be set accordingly.

RTTY also uses several different *alphabets*. These may include International (ITA2), Telex, Military, and several multi-shift variants for Cyrillic, Amharic, Greek, Korean, Thai, Japanese and Chinese. *Case* is a subset of the alphabet and can be either letters, figures or national.

All Baudot RTTY is transmitted in upper case (capital letters). Each character is made up of a combination of five zeros and ones (i.e., marks and spaces). With only five bits per character, transmission of more than 32 characters is impossible. Therefore, 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. 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 complete Latin transliterations. Some decoders, such as the Universal M-7000 and Universal M-8000, can actually display Cyrillic characters on the video monitor.

■ The Rise of RTTY

Most RTTY monitors in the hobby originally started out listening to the international shortwave broadcasters and gradually began to notice other AM transmissions in the shortwave bands. A limited number of aeronautical stations and numerous cable and wireless transmissions began to appear.

With the introduction of SSB modes, the true digital monitor was born. Increased use of Baudot RTTY on the airwaves saw the introduction of outboard decoders. However, only the strongest and cleanest signals could be decoded by the early AEA, HAL and Kantronics units — more sophisticated monitoring required more expensive equipment, often in the form of surplus commercial hardware.

In the 70's, Infotech introduced its high end/high priced line of decoders. The Wavecom unit was introduced in Europe, but was never promoted successfully in North America. RTTY monitoring continued to be a practice requiring additional peripheral equipment and much experimentation until the 80's.

Perhaps the most significant factor in the rise of popularity of digital communications for the hobbyist was the introduction of the personal computer. A relatively simple interface, coupled with intelligent software, now provides not only a means of decoding but also of analyzing digital transmissions. As new digital communication protocols are introduced, progressive software engineers can implement new code routines to process them.

With the advent of satellite technology, RTTY monitors lost the myriad of frequencies once used by the major press agencies such as the Voice of America, Associated Press and United Press International. With the demise of the Soviet Union, over 50 former TASS frequencies are now silent.

The largest single user of shortwave RTTY was the former Soviet maritime fleet. How has the Soviet break-up affected RTTY's share in digital communications? An analysis of digital HF signals from over 4,000 reported fixed station frequencies heard in North America during the past 12 months reveals the following mode usage:

| | |
|-------|-------|
| RTTY | 53.7% |
| SITOR | 20.4% |
| ARQ-M | 11.1% |

| | |
|------------|------|
| ARQ-E3 | 9.4% |
| ARQ-E | 4.5% |
| FEC-A | 0.7% |
| All Others | 0.2% |

One can see that, despite the services that have now opted for newer communications modes and means of delivery, there is still plenty to monitor for today's digital utility enthusiast.

Although most stations use very low transmitting power in comparison to the international shortwave broadcasters, you will often be amazed at the strength of their signal. One prized North American catch for the broadcast listener is the Voice of Kenya: During the last 30 years, your editor has only heard them twice from his QTH. On the other hand, Nairobi Air and Nairobi Meteo deliver a 15 kW RTTY signal every night that will rival that of a local AM radio station! Digital transmissions, because of their signal nature, often have a way of "getting through," especially during poor propagation conditions when the broadcast bands seem dead.

Most of the 75 Baud RTTY transmissions you will encounter are military in nature and are indecipherable. Whenever you encounter an extremely strong 75 baud signal, you can generally assume it is one of Uncle Sam's facilities. Most diplomatic (embassy) communications using RTTY are also encrypted.

You can see that when first starting out in this phase of the hobby, it is just as important to know "what *not* to listen to." All too often new RTTY monitors are easily discouraged because they are trying to decode the wrong mode or encrypted signals.

With patience and experience you can develop an "ear" for the various modes, and in many cases be able to identify the mode by its sound. Many experienced monitors can even audibly determine the baud rate!

Virtually all decoders, from the most elementary to the most sophisticated, are capable of decoding RTTY transmissions. To get off to a good start with your hamfest hardware or your slick new software, try for these RTTY transmissions which should be easily logged:

| | |
|----------------------------------|---|
| CFH - Canadian Forces, Halifax | 4271.0, 6496.4, 10546.0, 13510.0 |
| 5YD - Nairobi Air, Kenya | 7423.0 |
| 5YE - Nairobi Meteo, Kenya | 7461.0, 9041.0, 10384.6, 17441.5 |
| HZN - Jeddah Meteo, Saudi Arabia | 4570.0, 7510.0, 10215.0, 11125.0, 17592.1 |
| USAF Offutt AWS AFB, Omaha, NE | 3228.0, 5904.0 |

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BBC, Others Commit to Digital Shortwave

BBC World Service has joined an international consortium in signing an agreement in China to develop standards for digital radio technology, which promises interference-free SW listening, and automatic frequency changing as needed. Digital Radio Mondiale also brings together transmitter and receiver manufacturers, such as Sony, Sangean and Telefunken.

Standards could be ready for ratification by the ITU in two years. Sets would cost about \$30 more than conventional SW receivers, and could be in shops by 2003. World Service SW transmitters could be upgraded for less than a quarter kilopound per site, says a BBC press release. The other stations involved are DW, RFI, VOA and RN, says *Radio-Enlace*.

■ Caribbean May Return on Shortwave

Aside from Cuban and Dominican Republic relay sites, there has been no SW broadcasting from the Caribbean since the demise

of R. Free Grenada. Now Carl Moore, chairman of the Barbados Broadcasting Authority, is calling for a SW service to be established in order to promote the island's development and for the Bajan diaspora.

Two four-hour services in the European and North American evenings would suffice; might cost \$1 million to set up but would be well worth it. The Government Information Service should run it; in the last four years there was one application for a SW service, but it was withdrawn, says a story by Barry Alleyne in the *Daily Nation* via John Ebeling, *World of Radio*.

Meanwhile, we wouldn't be surprised if there is a radio angle to **New Utopia**, a new country supposedly under construction beginning in April upon Rosario and/or Misteriosa Banks (submerged islands) between Cayman and Belize. It's designed as a tax haven, and offers citizenship if not residency for a price paid to Prince Lazarus with an Oklahoma phone number; as interviewed on *Talk USA* via WHRI, heard by Ernie Behr.

AFGHANISTAN R. Afghanistan, the anti-Taliban, pro-Rabbani station, appears to operate from Taloqan, in the centre of Takhar Province in northern Afghanistan; on the same frequency as the Tajik opposition's V. of Free Tajikistan, and may well be sharing facilities; erratic and times vary up to 10 minutes: 0230-0330, 1430-1530 on 7084v (BBC Monitoring)

ALASKA KNLS Z-98 English: 0800 9615, 1300 7365 (BC-DX)

ANGOLA Emissor Provincial da Huila, 4820, at 0407 with Elvis music, 0433 ID (Jon Oldenburg, *Cumbre DX*)

VORGAN might not close Feb 28 as planned due to renewed hostilities (Nick Grace, *Cumbre DX*) Remained on the air into early March, 6225 and 9770 (Mahendra Vaghjee, Mauritius; Godfrey Clemitson, RSA, DSWCI DX Window) UNITA was to shut down VORGAN by March 31 (HCJB DX Partyline)

AUSTRALIA An ABC advisory board has called for the reactivation of RA's transmitters in Darwin. Cost of recommissioning them would be more than compensated by the foreign affairs benefits to Australia. The Australian Democrats have urged the same, to get reliable news into Indonesia (R. Australia via BBCM) Another report says they were likely to be sold off (Mike Bird via Joe Hanlon)

Australian Defence Forces Radio says now on 15635 at 0300-0600 (Hans Johnson, *Cumbre DX*) 15635-USB, +0300-0332+ in English with a live variety show to *HMAS Tobruk*, RTTY QRM (John Kecskes, Australia, DSWCI DX Window)

BELARUS R. Belarus plans to increase transmissions with beams to NAM, Au (webpage via BC-DX) Home service heard 1600-2300 on 5 kW non-directional 11670, //6115, 7145 (DX Mix, Bulgaria, via DSWCI DX Window)

BELGIUM RVI Z-98 English: 0730 on 7290, 9940; 1030

on 9925, 15595; 1230 NAM 15545; 1630 on 5910, 7290; 1730 on 11810-Germany relay, 17655; these and 2000 also on 1512 MW, but at low power except for 2000 (RVI *Radio World*) The German relay at 1730 on 11680 to ME during W-97 always had good signals here (Brian Alexander, PA) RVI does not limit QSLs to one per semester; I get lots of them, and now everyone can with the demise of their listeners' club (David Crystal, Israel, *CIDX Messenger*)

BRAZIL R. Clube de Ribeirão Preto, 15414.8v, 2300-0500+ with Braz pop music, fair (Ernie Behr, Ont.)

R. Globo, weak but clear with echo ID at 2030 on exactly 11804.0 (Jay Novello, NC)

RNB's English at 1200 and Spanish at 1330 on 15445 suffer not only from worn-out tapes but a worn-out transmitter, putting spurs on 15500 and 15390 (gh, OK)

CANADA RCI has gotten a one-time grant of \$15 million from the government, spread over three years, for improvements at Sackville and up-

grading the studios in Montreal (Bill Westenhaver, RCI, *World of Radio*) This means RCI will be switching over in the next three years to brand new digital transmitters; two more recently bought can be converted to digital, with the equivalent of a computer card (Bob O'Reilly, RCI director, on RCI via BBCM)

CHILE Thanks to a tip from Ron Trotto, I heard Voz Cristiana testing on 21551 for three days only in early March, from as early as 1335 to as late as 1957* with soft gospel-rock music, IDs in English and Spanish claiming 21550. This is the former Voz de Chile facility, sold and reactivated at last (gh, OK) Preliminary tests toward Mexico; plans to program from Miami via satellite, powered down to 70 kW (Voz Cristiana via Tom Sundstrom)

CHINA Yunnan PBS General Service on SW now seems off the air; had been on 7210, 4760, 2460; but the minority language service from Kunming is on 6937v at 0355-0545, 1100-1500, 2200-2445 (BBCM)

Guangxi PBS, Nanning, 2200-1600 on 4915. Guangxi Economic Broadcasting Station, 2200-1600 on 5010 (BBCM)

Ten new transmitters with 500 kW each, and four MW of 600 kW each were installed in Xinjiang and Yunnan. A challenge in 1998 is adjusting the broadcast times of 38 foreign language services, some of which were set 40 years ago (CRI *Messenger* via Wolfgang Büschel, BC-DX)

CRI on 9900, probably via Urumchi, 1800-2227* in various Euro languages, huge signal since Jan 1, probably 500 kW. NASWA should count Xinjiang as a separate radio country, just like Tibet and Manchuria. Under Soviet control from 1944 to 49, Xinjiang was known as the Republic of East Turkestan (Ernie Behr, Ont.)

COSTA RICA RFPI expected more changes than usual for its 2nd-quarter programming, perhaps 15% retimed, and some new shows. *Feminist International Radio Endeavour* already in March reduced from daily to three days a week, opening many hours for repeats of other programs. The 30 kW AM on 7385 took a break at 0800-1400, but 6980-USB remained until 1200, then 15050-USB. There were also plans to exchange AM and USB on 6980 and 7385 (gh)

CUBA From February until mid-March, more than 200 kHz of the 31 meter band was blasted with noise bursts every few seconds, centered on 9550. We suspected it was Radio Havana Cuba's transmitter between 1100 and 1300, and reported this to the DX world. When RHC's Arnie Coro heard about it, he broadcast a vicious personal attack on yours truly, while admitting RHC in fact was the source and the problem had finally been fixed. No thanks for the information nor apology for weeks of interference (gh)

CYPRUS TURKISH CCA factory in Georgia finished testing new transmitter for R. Bayrak, 6150, March 10, shipped it, should be on air in 30 days (Hans Johnson, *Cumbre DX*)

ECUADOR HCJB abruptly dropped 9365 for English to Europe at 0700-0900, following a



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.

complaint from Colombia that it interfered with PTP communications; still on 5865 (Allen Graham, HCJB via BDXC-UK) It may take HCJB 3-4 years to relocate 11 SW transmitters, 32 antennas and 48 towers at Pifo, which is in direct line with a new international airport, at a cost of \$5 million. Some broadcasts may go on relays in other countries, some targets may be dropped, and HCJB may eventually drop SW to all areas outside Latin America. HCJB will not rebuild the European antennas. Emphasis will be to move as little as possible and rent and relay as much as possible (*WDXC Contact* via BC-DX)

EGYPT R. Cairo, English to NAm at 2300 on 9900 continues to disappoint with its audio quality. Poor modulation continues at 0200 on 9475. Voice is distorted and weak. Only music breaks through. This is on-going 6-7 years! Sigh! (Bob Thomas, CT)

ESTONIA Estonian Radio reported that its [only] SW transmitter on 5925 would be disconnected from March 1. External services would continue on FM, internet (BBCM)

ETHIOPIA R. Fana, 6210 at 0400-0435, but covered by Iran on same until 0426 (Bill Harms, MD, *hard-core-dx*)

[non] R. V. of United and Free Ethiopia, seemingly from Central Asia, 1615-1715 Sun and Wed in Amharic on 7570; RealAudio available at <http://ethiopia.org> (BBCM)

[non] Rainbow Radio, 5910, Sun 1000-1100 via Germany in Amharic gave address: P. O. Box 140104, 53056 Bonn, Germany (Martin Schoech, Germany)

FINLAND For Z-98, YLE R. Finland, English to NAm moves to evening, 0200-0230 on 9780, 11900; still in morning at 1230 on 15400 and 11900, but Sundays only (Raimo Makela, YLE Poro, *rec.radio.shortwave* via *radio-escutas*)

GEORGIA Abkhaz Radio, Sukhumi, 9494.74v puts a fine signal into Europe, Abkhazian at 0445 (Wolfgang Büschel, Germany, *BC-DX*)

GHANA GBC Radio 1, 4915, was putting spur on 4793v until 2400*. The spur drifted but not the fundamental (Bob Hill, MA, *NASWA Journal*)

GREECE [non] VOG planned many more relays via VOA Greenville and Delano USA sites for Z-98, including prime-time at last: 0000-0400 11605-G, 0200-0400 6125-D. At 1200-1400 on 9595-D, 9730-D, 9775-D; 1800-2200 on 11730-D; and many more in the 0600-1200 period (HFCC via Bob Padula and Matt Francis, *Electronic DX Press*)

GUINEA Rdf. Nationale, Conakry, reactivated in mid-March on 9650 //7125, 2330-2430+, also announcing 6155, 15310 (Jay Novello, NC)

INDIA Newest AIR transmitter is 50 kW on 6040 testing from Jeypore, the first in Orissa state, 0700-1000, 1600-1700. May have been the one on 5040 by mistake heard by Vaghjee (Manosij Guha, DSWCI *DX Window* and *Cumbre DX*) Later heard using both (Guha, *Cumbre DX*) The SW antenna switching hall in the Kingsway camp transmitter site in Delhi is in a state of disrepair (Guha, *DX Grapevine* via *Cumbre DX*)

INDONESIA VOI in English at 0100 on 11785 vs Brazil on 11785.14, even better on //9525 and in the clear on US (Al Quaglieri, NY)

IRAN IRIB finally has official homepage online, <http://www.irib.com> (Thorsten Koch, DSWCI *DX Window*)

[non] V. of Southern Azerbaijan (Azeri: *Bura Janubi Azerbaijan Sasi*) is operated by the National and Independent Front of Southern Azerbaijan. This Iranian province borders the Republic of Azerbaijan and is hostile to the Iranian government. The radio is believed to transmit from Israel. Says it broadcasts programs about the "daily life of the people of Southern Azerbaijan under Iranian oppression, the struggles of our brothers who live in Northern Azerbaijan (Republic of Azerbaijan), their long standing war with the Armenian enemy who receives help from Iran, programs about our Azeri inheritance, our great history and civilization..." Address is Vosa Ltd., Postfach 108, A-1193 Vienna, Austria. Anticipated timeshift for summer: 0515-0615 on 11935, 1530-1630 on 7095 (BBC Monitoring)

DTK pinpointed this to the Israel/Jordan/Saudi Arabia area (DARC via *BC-DX*) One day on Israel's HS channel 12080 or 12075 I heard open carrier with Reseht Bet in background, then VOSA signing on. So Israel seems to be right location (Nikolay Pashkevich, Russia, *Cumbre DX*) An investigative report shows how this could be connected to the Mossad and the Iran-Contra scandal of the 1980s, on the Clandestine Radio Intel web, <http://www.qsl.net/ybdrmi/vosa.htm> VOSA advocates integration with Azerbaijan (Nick Grace C., *Cumbre DX*)

IRAQ Iraqi News Agency, INA, radioteletype service as monitored in March with timeshifts expected for summer: 0600-2000 exc Fri, Arabic on 10162.5; 0830-1500 daily English on 14699; both F1B 75 baud. During periods of crisis, Arabic may start as early as 0300; signals alternate between idling and traffic over the entire span. Addr.: INA, P. O. Box 3084, Salihiya, Baghdad (BBCM)

R. Iraq Int'l resumed attempts at external service in late Feb (gh) Baghdad, 11785, varies day to day; one day German was at 2110-2130, the next +2100-2130+. They have managed to put the worst modulation into the air of all stations from the region. Even R. Cairo is better (Harald Kuhl, Germany, *Cumbre DX*) Strong carrier but poor, distorted audio with English at 0410-0430 on 11785, couldn't tell whether still English afterwards (Brian Alexander, PA)

Republic of Iraq R., the main domestic service at 0255-2415 was heard intermittently on 9715 around 0615-1000, 11785 at 1000-1400 in late Feb (BBCM)

[non] Among those supporting a R. Free Iraq proposal testifying at a congressional hearing were former CIA director James Woolsey, Republican

presidential candidate Steve Forbes, and Secretary of State Madeline Albright (Nick Grace, *Cumbre DX*) Republican senators have added \$5 million to the DOS authorization bill to be used to establish a R. Free Iraq via Kuwait (*Washington Post* via Hans Johnson, *Cumbre DX*)

IRELAND [non] RTÉ is relaying on SW the weekly program *Worlds Apart* on problems in developing countries, to reach thousands of Irish aid workers and missionaries, 13 weeks starting March 10 (Wesley Boyd, RTÉ) Tue 2305 on 9925 to SAm via Germany, repeated Wed: 1330 12015 Irkutsk, 1500 15120 South Africa, 1600 & 1700 11605 via Germany (via Finbarr O'Driscoll, *Review of International Broadcasting*) Times and frequencies may have shifted from April, especially the original 2300 broadcast, now 2200? (gh)

ISRAEL Israel Radio Z-98 in English: 0400-0415 on 17535, 11605, 9435; 1030-1035 on 15650, 15640; 1400-1430 on 17535, 15650; 1545-1557 on 17535, 15650 and 1545-1600 on 11605; 1900-1925 on 15650, 15640, 11605, 9435. Reshet Bet in Hebrew adds too much more powerful transmitters to us at 0100-0300 than we have had for several years, 9390 and 15615 (Doni Rosenzweig) Could that open the door for resuming prime-time English? (gh) Reshet Bet is 24h on Internet at <http://bet.netvision.net.il/> (via Alexandre Doria, *radioescutas*) See also IRAN

JORDAN R. Jordan inaugurated a new 8 megadinar building in Amman with modern studios; and started a new service on MW, The Voice of Awakening, Jordanian Armed Forces Radio (BBCM)

KOREA NORTH KCBS provincial stations relay Pyongyang except for local programs weekdays around 0500-0600: Chongjin 3980, Hamhung 3220, Pyongyang 3350, Sariwon 2350, Wonsan 3970v, Hyesan 3920, Kanggye 3960. All SW use is sporadic. KCBS, Pyongyang: 2100-1800 on 11680, 11400, 9665, 6100, 3960, 3350, 3220, 2850, 2350 (BBCM)

LIBERIA R. Veritas, 0514-0613 on new 5470, tribal African chants, 0558 English ID with frequency (Giovanni Serra, Italy, *The Four Winds*) Until 2204* in mid-song was still on 3450 (Jay Novello, NC)

MALAYSIA V. of Malaysia has Real Audio available at <http://asiacconnect.com.my/rtm-net/>; English is at 0700-0825 on 15295, 9750, 6175, preceded by V. of Islam at 0455-0700 (BBCM)

MALI March-April issue of *CRI Messenger* shows Mali relay again in use, but in English only on 7170, 2000-2130 Af, 2200-2300 Eu (Randy Stewart, MO)

MALTA [non] V. of Mediterranean relay via Italy for Z-98 expected to be re-timed to 0630-0730 Mon-Sat, 0700-1200 Sun. The W-97 frequency was 9660 (Francesco Clemente, BDXC-UK) And 2030 via Russia for Z-98 on 12060 Serpuukhov (Josef Zimmerman, Germany, *Weltweit Hören* via *BC-DX*)

MEXICO XERTA resumed testing 4800.7 in mid-March, with same IDs, same heterodyne with Guatemala, heard at 1230 (gh)

MONGOLIA The new station on 4790 was expected to start broadcasting this spring; installation was not completed before winter started (Ludo Maes, *Cumbre DX*) unID Mongolian on 4785 *2150, 2230 English lesson (Vladimir Titarev, Ukraine, *NU* via *BC-DX*) Maybe Hohhot, China, since it relays Beijing minority Mongolian service (Dave Kenny, England, *ibid*)

MOROCCO RTM seems to have resumed using Tangier transmitters, which had been off for at least a year, such as 1010 in Arabic on 15345 //VOA Briech relay on 15335, still at 1900 mixing with Argentina. And on 17814.8v strong at 1804 with English ID as "International Service of R. Morocco" (Noël Green, UKoGBaNI, *BC-DX*)

NEW ZEALAND For April, RNZI abandoned 15115 completely, switching from 11735 to 17675 around 2100, then 11905 from 0459, and replacing 9700 after 0717 (Sat and Sun 0759) is 9795, but another schedule takes effect May 4 (RNZI)

NIGER After many months off the air, La Voix du Sahel was back on 5020 in early March, 1700-1859+ (Mahendra Vaghjee, Mauritius, DSWCI *DX Window*) 5020.00 until 2301* on a Sat (Mark Fine, VA, *switalk*) -2200* on weekday, while off we could hear Solomon Islands from *1900 (Harald Kuhl, Germany, *DSWCI DX Window*) via WWCR? (gh)



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NIGERIA V. of Nigeria resumed 15120 in early March around 1900 (Ron Trotto, IL, *World of Radio*) External service is on 7255 and 15120 daily continuously from 0500 to 2300, with English at 0500-0700, 1000-1100, 1500-1700, 1900-2100; also French, Hausa, Swahili, Arabic; and a language you might not recognize, Fulfulde, at 0900-1000, 1300-1400, 2100-2200 (BBCM)

[non] With the help of bearings from several other European monitoring stations, we are now able to confirm that V. of Free Nigeria is coming from Jülich, Germany, rather than Africa. Signals from Germany hit the ionosphere over Africa, then bounce back towards Europe from a southerly direction, hence the false southerly bearings in the UK (Dave Kenny, BBCM, *World of Radio*) So, watch out for backscatter! (gh) VOFN is Sat 1900-2000 on 11645 in English and others, alternate 12015 (BBCM) Z98 registration is 12015, 170°, 100 kW Jülich (Wolfgang Büschel, *BC-DX*) But on 11645 mentioned new fq of 11985 (Nikolay Pashkevich, Russia, *Cumbre DX*)

R. Kudirat on new 11540 at 1913-2001*, lengthy anti-Abacha commentary, soliciting demographic info (Jay Novello, NC, *NASWA Journal*) New 11540 is synchronized with old 6205 at 1900-2000, definitely also via South Africa (Wolfgang Büschel, Germany, *BC-DX*)

R. NADECO plans to expand to two hours a day when funds become available (Hans Johnson, *Cumbre DX*)

NORWAY RNI Z-98 shows lots of out-of-band frequencies on 15 MHz: 15625, 15640, 15650, 15675, 15695, 15705, 15735. And 18950 at 1000, 1600 and 1800. Times for English on Sundays had not been decided in early versions (via Joe Hanlon, Richard Lemke)

PAPUA NEW GUINEA Drought and hydroelectric power shortage may account for absence of these stations: 3205, 3235, 3290, 3335, 3355, 3375 (Anker Peterson, Fiji and New Zealand, *DSWC1 DX Window*)

PERU R. Origen, Huancavelica, 1140-1215 huanynos, ID on 4700.6 (Pedro F. Arrunátegui, Lima) R. Origen used to be on 5323.6, celebrated 7th anniversary in Feb (Takayuki Inoue N., *Relámpago DX*) Then heard on 5323.7 was La Voz de Anta, in Anta, Acobamba, Huancavelica, at 0055-0140 and 1105-1150 with ID, folk music (Arrunátegui) Probably bought the transmitter from Origen (gh)

R. JSV, Huánuco on 6060 at 1028 with pentacostal service; had to use USB to avoid Argentina on same frequency (Fernando Vilorio, Venezuela)

PORTUGAL R. Portugal announced in mid-March that its foreign-language broadcasts, English, French and Tetum,



**INTERNACIONAL
RÁDIO PORTUGAL**

would be terminated at the end of March; the existing Portuguese services would continue on SW on a restructured schedule. English had been on the air since 1954, and was known as Voice of the West in the 60s and early 70s (Roy Baker, via Mike Barraclough, World DX Club) What a shame (gh)

RDP Lisbon put distorted signal in ham band on 21351.85, peaking weekends at 1650 on fundamental 21515, matched by 21678.15. German Amateur Radio Club bandwatch department found the spur (Wolfgang Büschel, *BC-DX*)

QATAR QBS Doha on new 9520 ex-7210 at *0245-0705* //9570, a bad choice with R. Liberty, Iran and V. of Sudan nearby (Mikhail Timofeyev, Russia)

ROMANIA RRI has 36 different QSLs (Frederica, RRI via Gigi Lytle) Loud roar, hardly any modulation audible on 17850 around 1330 (gh) It's Romania's home service (Kai Ludwig, *BC-DX*)

RUSSIA R. Bashkortostan, Ufa, 4485 at 2300-2100 for summer timing, carries music channel of Russia's Radio when not carrying its own local programs; in Russian, Bashkir, Tatar (BBCM)

R. Region Tyumen, 2300-2100 on 4895, 4820 (BBCM)

VOV's new 7100 with a megawatt at 0000-0600 replacing 7105, was pressured by German and IARU ham bandwatch organizations to quit intruding on the hamband (*BC-DX*)

SAUDI ARABIA BSKSA variant frequencies noted at 0300-0600: 9553.56, 9578.70, 9619.42, 9718.36; at 1600 on 11708.23, 11833.51, 12038.48 = 2 x 6019.24 (Wolfgang Büschel, Germany, *BC-DX*)

SIERRA LEONE SLBS, 3316, back on SW, now reflecting views of the civilian government instead of the Revolutionary Council (SL website via Hans Johnson, *Cumbre DX*)

SINGAPORE The Merlin SW relay here, once all for BBC, in M-98 added DW at 2200 Indonesian, 2300 English on 5975. Z-98 adds Switzerland, 1100-1330 on 9810, 1400-1615 on 9575; and Netherlands 2230 Indonesian 6120, 2330 Dutch 9590, 1130-1330 Indo 11690 (HFCC via Bob Padula, *Electronic DX Press*)

SOMALIA V. of the People on 7035 ex-6870 at 1610 in Arabic, 1700 ID in English (Mahendra Vaghjee, Mauritius, *DSWC1 DX Window*)

SYRIA Syrian Arab News Agency, RTTY service F1B 50 baud all on 11080, 3560 daily: Arabic to ME/Af 0800-1000, 1100-1400 on special occasions only, 1500-1800; French/English to Eu 1000-1100, 1400-1500, 1800-1900 (BBCM)

TAHITI RFO noted with greatly improved signals on 15170.0, not drifting, excellent during daytime, maybe on 24h; in Tahitian and French until 0600, then France-Inter relay from Paris, not the same program as RFI which is Radio-Monde-1. Suspect new transmitter, unlike previous erratic, weak and drifting signal around

15167v; first discovered by Chris Hambly (Bob Padula, Australia) Sometimes audible here, but rarely in evening. No powerhouse, but better than nothing which was expected (gh)

UK OGBANI BBC WS launched a breakfast news program for Europe March 30, 0330-0600 on MW, and SW 6195, 9410, *The World Today for Europe* (BBC Press Office)

[non?] *Media Zoo*, a media program on CMR via Astra satellite, planned to launch a new weekly show in addition, via Sirius 2 and on SW via the Merlin network (UK Gold teletext *In Orbit* via Ray Woodward, BDXC-UK)

USA FCC has issued WBCQ calls for Allan Weiner's new SW station in Maine. When it goes on air in late summer, will offer discount rates for free radio broadcasters (Anita McCormick, *DXing.com*)

WHRA added *DXing with Cumbre* to its schedule, but it failed to appear Sun 0500 on 9400; did appear Sun 2130 on 15460, the final airing when also on KWHR 17555 (gh) FINOVA officially sold the station to WHRA owner LeSEA on March 3 for \$1.5 million, lower than the \$5 million paid by the previous owner in 1994. FINOVA, a New Jersey-based lender, was forced to foreclose on WVHA last August. WVHA also did not pay property taxes. Tax bills were paid by FINOVA and are now current. The Christian Science Monitor Network contributed between \$115K and \$120K a year to the town coffers of Greenbush. The station would still be the town's biggest taxpayer, now an estimated 13% at its \$6 million tax assessment. It was unclear if LeSEA would seek property tax exemption as well (*Bangor Daily News* via Owen Williamson)

The expected UT Mon 0400 broadcast of *World of Radio* on WWCR would be on 5070, not 3210. Check our website for latest info (gh)

It may be July before WGTG's second transmitter is in use (Dave Frantz, WGTG via Hans Johnson, *Cumbre DX*)

More on Mother Angelica's conflict with the Vatican: she subsequently claimed to have heard directly from Jesus and Mary endorsing her broadcasting and healing an infirmity. Los Angeles Cardinal Mahony isn't buying it (*National Catholic Reporter* via Owen Williamson, *Review of International Broadcasting*)

With MUF rising, I'm hearing these remote-pickup links almost daily, both NBFM, full-quieting with little fading: 25870, WFLA Tampa around 1600; 26470, "Mix 107.1" with Motown, rap, reggae, hip-hop, Florida ads around 1600, 2-3 S-units stronger than WFLA (Robert Homuth, AZ)

USIA's expansion plans for 1998-99 include: shipping transmitters and other equipment from downsized or closed stations to those closer to priority audiences in Africa and Asia; constructing new antennas; adding satellite ground stations; installing energy-saving solid-state modulators at various sites; converting satellite transmission network to digital; expanding combined VOA/RFA service to China to 24 hours; augmenting the previously planned Tinian relay; purchasing and modifying a privately-owned facility on Saipan [KHB1]; expanding audience research. \$4M have been earmarked for developing a Farsi-language surrogate broadcasting service to Iran. However, the FY 1999 budget request calls for a reduction in positions, including eliminating the SW site in Rhodes, Greece, 27 positions; Office of Engineering headquarters staff reduced by 20 positions; Office of Cuba Broadcasting staff by 30 positions (from a much lengthier USIA press release via BBCM)

Donald Flamm, 98, died in February in West Palm Beach. During WW II, he devised the network of stations that broadcast American propaganda in Europe. That later became known as the VOA. He also produced plays and owned radio stations (Tim O'Meilia, *Palm Beach Post*, via Mike Cooper)

R. Free Asia added more Mandarin March 1 at 1800-2000 on 7530, 9355, 9650, 9885, and from 1900 on 9905 (Dan Ferguson, IBB, *Cumbre DX*) That's 2-4 a.m. in China: imagine traitorous citizens tuning in the barbarians' nasty truth with earphones under the covers in the middle of the night (gh)

UZBEKISTAN R. Tashkent, English at 0100 added another frequency for a total of six: 7105 //5040, 5955, 5975, 7205, 9540 (Wolfgang Büschel, Germany, *BC-DX*)

VIETNAM Yen Bai regional on new 6630.4 0950-1230* but not daily, with Hanoi relays except for local program 1130-1230* (Roland Schulze, Philippines, *BC-DX*)

V. of Vietnam Network 1: 2200-2400 10060v, 5925v; 0000-1600 11540v, 10060v, 5925v; Friday only to 1700* on 10060v, 5925v with *People's Army* program at dictation speed.

VOV Network 2: 2200-1600 on 12035, 4960.

VOV Minority Language Service, mostly on MW, has this on SW: Hmong 0500-0530 and 1300-1345 on 6165; 2200-2230 on 5035 (BBCM)

[non] VOV is relayed via Russia 7440 at 1800 English, 1830 Vietnamese, 1930 French, followed on same transmitter at 2000 by VOM Malta relay in English (Noël Green, UKOGBANI, *BC-DX*) When the VOV relay switches to 7390 in Russian, 2030 Vietnamese (Klaus Lieberwirth, Germany, *ibid.*) Feed isn't perfect, but modulation much better on the relays than direct from Vietnam (Kai Ludwig, Germany, *Cumbre DX*)

Until the Next, Best of DX and 73 de Glenn!

New website: <http://www.angelfire.com/ok/worldofradio>



Tahiti
RFO
POLYVAL FRANCAIS DE TAHITI

Gayle Van Horn

- 0000 UTC on 9680**
THAILAND: Radio Thailand. National news on Bangkok's future as an international aviation hub for business. Good clear signal throughout the 30 minute broadcast. (Dale Fisher, Cleveland, OH) 4830 at 1503. (Francesco Clemente, Udine, Italy/*Radio DX Net*)
- 0101 UTC on 3270.05**
NAMIBIA: NBC. Instrumental ballads to announcers chat, SINPO= 24343. (Mark Veldhuis, Borne, Netherlands, *Hard Core-DX*)
- 0102 UTC on 11785**
INDONESIA: (Java) Voice of. Woman announcer with English news items on the national economic crisis. Fair signal and gaining strength, battling with Brazil's **Radio Gualba** on 11785.14. (Al Quaglieri, Albany, NY) **RRI-Jakarta** (Java) noted at 1500 and 2330 on 11760 kHz. (Zacharias Liangas, Thessoliniki, Greece/*Hard Core-DX*)
- 0105 UTC on 5005**
NEPAL: Radio Nepal. Talk and commercials with fair signal quality. (Liangas, GRC) Station noted in Nepalese at 1558 with regional music at ID at 1603. (Klaus Elsebusch, Marienthal, Germany; Pierluigi Calligaro, Udine, Italy)
- 0130 UTC on 4800**
GUATEMALA: Radio Buenas Nuevas. Spanish. Religious text and music to 0330*. (Lee Silvi, Mentor, OH)
- 0130 UTC on 9905**
SWITZERLAND: Swiss Radio Int'l. Mellow music program to announcements. (Sue Wilden, Columbus, IN) Audible 1405 on 13635. (Moser, IL; Woody Pope, Garland, TX) 9885, 0100-0130; 6135, 0025-0130. (Albert Arnold, Chesterfield, VA)
- 0130 UTC on 9730**
SRI LANKA: SLBC. English programming with a good variety of music until wiped out by China Radio at 0255 nightly. (Silvi, OH)
- 0132 UTC on 9820**
CUBA: Radio Havana. Programming preview to newscast including item on the Helms-Burton Law, to *Time Out* program. (Wilden, IN) Heard 0320 on 9820. (Pope, TX; Arnold, VA)
- 0155 UTC on 4995**
PERU: Radio Andina. Spanish comments to ID and religious programming. Other Peruvians noted: **Radio Satellite** 6725 at 0155; **Nacional del Peru** 6095 at 0230; **Radio Cuzco** 6203 at 0230; **Radio Los Andes** 6480 at 0346; **Radio Ancash** 4991 at 0400. (Enrique Alejandro Wembagher, Buenos Aires, Argentina) **Radio Huanta** 4747.47 at 2000. (Yoder, PA)
- 0230 UTC on 7280**
SWEDEN: Radio Sweden. National news on Asia's financial woes affecting Sweden's economy. (Joe Wood, Augusta, SC) Station also noted at 1238 on 11650 (Wilden, IN) 1430 on 11650 (Moser, IL) Audible 11735//15400 at 1240. (Fraser, MA) Swedish satellite report on 7115 at 0344. (Pope, TX)
- 0237 UTC on 4800**
LESOTHO: Radio Lesotho. Audible at station sign-on, with interference from Guatemala's Radio Buenas Nuevas. Lesotho fading out by 0505. (Silvi, OH)
- 0245 UTC on 7160**
ALBANIA: Radio Tirana. General news featuring item about Italian immigration laws and cigarette smuggling into Albania. (Wood, SC) 2200-2228 on 6025. (Arnold, VA)
- 0300 UTC on 7100**
RUSSIA: Voice of. Interval signal to sports report. (Sue Wilden, Columbus, IN) *Science & Engineering* on 5905 at 2115. (Bob Fraser, Cohasset, MA; Moser, IL; Paul Ormandy, NZ)
- 0422 UTC on 4930**
HONDURAS: Radio Internacional. Spanish musical ballads to 0427 ID. Minimal QRM from Morse code adjacent to lower sideband, but otherwise nice signal. (Mark J. Fine, Remington, VA)
- 0441 UTC on 4770**
NIGERIA: Radio Nigeria. English newscast *News in Brief* to national news items. UTC time check into pop music show. (Harold Frodge, Midland, MI) Station noted on 6090 at 2225 in Hausa service. (Liangas, Greece/*Hard Core-DX*) **Voice of Free Nigeria** heard on 11645, 1900-2000 in English. (Richard J. LaFountain, Paulding, OH; Howard J. Moser, Lincolnshire, IL)
- 0523 UTC on 6055**
SPAIN: Radio Exterior Espana. News on Gallup Poles and Washington, DC, opera series. (Moser, IL; Pope, TX) Mailbag show, news and music 0003-0110 on 6055. (Arnold, VA)
- 0525 UTC on 7375**
BULGARIA: Radio Bulgaria. Sports report with fair signal. (Moser, IL) Station noted on 7530, 2236-2300 with item about King Basil II. (Wood, SC; Arnold, VA)
- 0539 UTC on 6064.55**
COLOMBIA: Colmundo Bogotá. Upbeat Latin popular music interspersed with announcements by woman. "Canned" ID at 0551, noted frequency down from nominal 6065 kHz. (Fine, VA)
- 0601 UTC on 9780**
YEMEN: Yemen Radio. English news to martial music and broadcast summary. Poor-fair quality. (Ormandy, NZ)
- 1016 UTC on 4682.25**
BOLIVIA: Folk accordion music to male DJ's chat to instrumental organ music. (Andrew Yoder, Mont Alto, PA)
- 1230 UTC on 6120**
CANADA: Radio Japan relay. *Music Journey Through Asia*, featuring music of the various Far East nations. (Bob Fraser, Cohasset, MA) **RCI** noted on 5975 at 2000-2025. (Arnold, VA)
- 1245 UTC on 17575**
FRANCE: Radio France Int'l. *Arts in France* featuring an exhibition of the late U.S. photographer Dorothy Langhorne. (Fraser, MA)
- 1245 UTC on 13730**
AUSTRIA: Radio Austria Int'l. Mailbag program with query on the present status of the various Far East nations. (Bob Fraser, Cohasset, MA) 2235-2258 on 6155. (Arnold, VA)
- 1300 UTC on 5965**
BRAZIL: Radio Nova Visao. Portuguese. Music to program comments. Meteorology report to station ID. Brazilian stations audible: **Radio Marumby** 9665 at 1530; **Radio Clube** 15415 at 1540; **Radio Clube Paranaense** 9725 at 1545; **Radio Nova Visao** 11705 at 1900. (Wembagher, ARG)
- 1423 UTC on 13700**
NETHERLANDS: Radio Netherlands. Closeup on quality of food vs large company monopoly in France, Netherlands, and Belgium. (Moser, AL) Feature on progress and improvements in Portugal on 11655 at 1855. (Fraser, MA; Pope, TX; Arnold, VA)
- 1455 UTC on 4815**
CHINA: China Radio Int'l. Closing music from Mongolian service, carrier to 1500 with "East is Red" interval signal. Chinese ID into Russian service. China's **CPBS** noted at 1613 on 5090; 1616 on 5125; 1620 on 5250. (John MacDonald, Poulsbo, WA)
- 1522 UTC on 4003.5**
INDONESIA: (Sulawesi) **RRI-Padang**. Indonesian. Regional music interrupted by sign-off announcement, 1600*. Indo's **RRI-Tanjungkarang (Sumatra)** audible on 1528, with gamelan music, I.S., and newscast. Heard to 1649. (Willi H. Passmann, Muelheim, Germany/*Hard Core-DX*)
- 1526 UTC on 9660**
PHILIPPINES: Radio Veritas. Russian to Central Asia. Music segments with ID/frequency quote and time check in English. (Stokes Schwartz, Madison, WI)
- 1815 UTC on 9630**
SEYCHELLES: BBC. English lessons to 1830 newscast. **Radio FEBA** in French to Africa on 9500 at 1830-1903*. (Silvi, OH)
- 1830 UTC on 12095**
UNITED KINGDOM: BBC World Service. *Play of the Week-Plantation*, about Pochontas and Jamestown. (Fraser, MA)
- 1945 UTC on 4545**
KAZAKHSTAN: Radio Almaty. Continuous English music to 2000 ID by lady. National anthem to sign-off. (Mahendra Vaghjee, Rose Hill, Mauritius) **Radio Kazakh** noted on 5905 at 0205 (Wembagher, ARG); 11840 at 0650. (Ormandy, NZ)
- 2011 UTC on 9540**
TURKEY: Voice of Bizarre pseudo-news items, announced as, *As the World Turns* at 2015. Mediterranean style music to ID at 2018. (Fine, VA; Paul Ormandy, NZ) Turkish service on 7185 at 0017, // 9445, 5980, 9460. (Quaglieri, NY) VOT programming in English 7300 at 2320. (Fraser, MA; Pope, TX; Arnold, VA)
- 2254 UTC on 5020**
NIGER: LV du Sahel. French. Popular music to 2255, followed by announcer's chat and recitations to 2259. Closing announcement to anthem and 2301*. (Fine, VA)
- 2300 UTC on 13760**
NORTH KOREA: Radio Pyongyang. Report on world celebrations for Kim Jong Il's 50th birthday. (Fraser, MA) Noted on 2850, 2055-2100+. (Passmann, Germany; Ormandy, NZ)
- 2348 UTC on 4939.4**
VENEZUELA: Radio Amazonas. Latin music to Spanish advertisements. ID format, SINPO=24343. (Vendhuis, NLD)

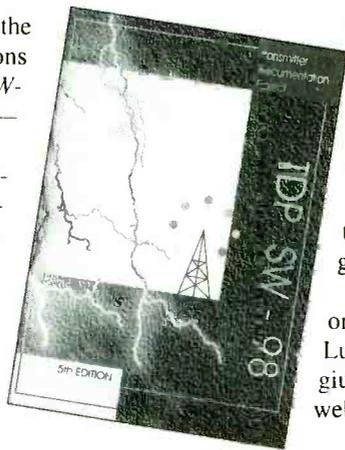
Thanks to our contributors — Have you sent in YOUR logs?
Send to **Gayle Van Horn**, c/o *Monitoring Times* (or e-mail gayle@grove.net)
English broadcast unless otherwise noted.

Transmitter Documentation Project Returns

Detailed information is available about the transmitters used by shortwave radio stations around the world in the fifth edition of *TDP SW-98*—the *Transmitter Documentation Project*—now sporting a color cover and advertising.

TDP is an 80 page booklet listing broadcast transmitters worldwide, arranged by country. Each listing indicates the name of the station, transmitter site, geographical coordinates and callsign. *TDP* also lists the number of transmitters at the site, their power, manufacturer, type number, year of installation, and year out of service.

This year's feature articles include, *HF*



Transmission: An Evolutionary Market? by Jeff Cohen from World Radio Network, *Antennas for the Shortwave Broadcaster* by Richard R. Greene from TCI (Technology for Communications International), and *History of Energy-Onix* by Bernard Wise.

TDP is read year after year by radio stations, transmitter manufacturers, radio consultants and engineers, as well as by the dedicated radio hobbyist.

To order a copy of the *TDP SW-98*, send ten IRCs or \$10.00 for the U.S., \$15.00 for Canada to TDP c/o Ludo Maes, P.O. Box 1, B-2310 Rijkevorsel, Belgium. Additional information is available at their website at: <http://www.ping.be/tdp>

ASCENSION ISLAND

BBC Atlantic Relay Station, 15400/7325 kHz. Full data verification letter signed by Nicola Nicholls-Transmitter Engineer, plus personal letter and info sheet about the island. Received in 123 days for a taped report. Station address: BBC Atlantic Relay Station, Ascension Island, South Atlantic Ocean. (Walter Szczepaniak, Philadelphia, PA; William R. Wilkins, Springfield, MO)

Voice of America relay, 15225 kHz. Full data Hawaii scenery card unsigned. Received in 21 days for an English report. Station address: 330 Independence Ave., SW, Washington, DC 20547 (Darren R. White, Hattiesburg, MS)

FINLAND

Radio Finland, 11735 kHz. Full data verification letter signed by Raimo Makela, plus station stickers. Received in 47 days for a taped report. Station address: PL 113, 28101 Pori, Finland. (Szczepaniak, PA)

FM/TV

WJBR-FM 99.5. Full data verification letter signed by Dave Banks, plus personal letter and station bumper stickers. Received in 25 days for an FM report. Station address: 3001 Philadelphia Pike, Claymont, DE 19703. (Jose Moura, Washington, DC)

KTXN-FM 98.7. Full data prepared QSL card signed by Peter B. Hoebjena-Chief Engineer. Received in two months for an FM report and mint stamps. Station address: Withers Broadcasting Company of Texas, 3808 N. Navarro, Victoria, TX 77904. (Robert S. Ross, London, ON Canada/*AmFmTvDx*)

WKOI-TV Ch. 43. Full data prepared QSL signed by Harry J. Monroe-Chief Engineer. Received in two months for a TV report and mint stamps. Station address: Trinity Broadcasting of Indiana, 1702 South 9th St., Richmond, IN 47374. (Ross, CAN)

CHCH-TV Ch. 3. Full data prepared QSL card and personal letter signed by Peter Blockland, plus complete set of color contour maps for all of *On TV's* Ontario transmitters. Received for a TV report and mint stamps. Station address: On TV, P.O. Box 2230 Station A, Hamilton, ON Canada L8N 3A6. (Ross, CAN)

KENYA

KBC, 4935 kHz. Full data prepared card signed by Martin Ouma Ojwach-Engineer in Charge. Personal letter on KBC letterhead enclosed. Received in 87 days for an English report, SAE (used for reply) and one U.S. dollar. Report sent to transmitter site and not to Nairobi office. Station address: KBC Maralal Transmitting Station, P.O. Box 38, Maralal, Kenya. (Randy Stewart, Springfield, MO)

MEDIUM WAVE

WPHG-AM 1620. Frequency only form letter/folder unsigned. Received in 16 days for an English AM report faxed to 334-368-9495. Mailing address: Maranatha Ministries Inc., 805 N. Main St., Atmore, AL 36502. (Stewart, MO)

CKDM-AM 730. Station QSL card unsigned. Received in 17 days for an English AM report and one U.S. dollar. Station address: 273rd Ave., N.E., Dauphin, MB Canada R7N 0Y5 (Patrick Griffith, Federal Heights, CO)

CKTA-AM 1570. Full data prepared card and verification letter signed by Tyler Everitt-Engineer. Received in 60 days for an English AM report and mint stamps. Station address: 401 Mayor Magrath Dr., Lethbridge, AB Canada T1J 3L8. (Terry Jones, Plankinton, SD)

RUSSIA

Voice of Russia, 5940 kHz. Full data QSL card, extra Moscow postcards and letter signed by Eugenia Stepanova. Received in 47 days for an English report. Station address: ul. Pyatnitskaya 25, Moscow. (Ed Luntley, Portland, ME)

SAO TOME

Voice of America relay, 6035 kHz. Full data Hawaii scenery card unsigned. Received in 24 days for a taped report and one U.S. dollar (both returned) Station address: (same as Ascension Island) (Szczepaniak, PA)

SATELLITE SERVICES

Radio Netherlands via U.K.'s World Radio Network One. C-band service-domestic satellite Galaxy 5/transponder 6, audio subcarrier 6.80 MHz. Full data Radio Netherlands station card unsigned, souvenir stickers, two cloth pennants and souvenir postcard. Received in 48 days for one IRC and details of satellite broadcast via WRN's broadcast monitored on home C-band dish. Station address: Radio Netherlands, P.O. Box 222, 1200 JG Hilversum, The Netherlands. (Gayle Van Horn, Brasstown, NC)

SHIP TRAFFIC

Kydonia-P3GB2, 156.600 MHz (Bulk Carrier). Full data prepared QSL card verified and stamped with ship's seal. Received for an English report, one IRC, SAE, mint stamps and one U.S. dollar. Ship address: Marmaras Navigation Ltd., 4-6 Filelinon St., 185 36 Piraeus, Greece. (Russ Hill, Oak Park, MI)

Ziemia Tarnowska-SQND, 156.600 MHz (Bulk Carrier). Full data prepared QSL card verified and stamped with ship's seal. Received for an English report, one IRC, SAE, mint stamps and one U.S. dollar. Ship address: Polish Steamship Co., (Polska Zegluga Morska) Plac Rodka 8, P.O. Box 527, 70-419 Szczecin, Poland. (Hill, MI)

UNITED STATES

KAIJ, 5810 kHz. Full data *Two If By Sea* logo card signed by Fred Bithell. Received in 275 days for an English report and a SASE. Station address: Two if by Sea Broadcasting Corp., 22720 S.E. 410th St., Enumclaw, WA 98022. (White, MS)

USCG CAMSLANT/NMN, 6501 kHz USB. Full data station QSL signed by TCC Thomas F. Sherwood. Received in 16 days for an English report, mint stamps and address label (both used) Station address: Commanding Officer, USCG CAMSLANT, 4720 Milepost Rd., Chesapeake, VA 23322. (Wilkins, MO)

Voice of America-Delano 13740 kHz. Full data *Yellowstone* scenery card unsigned. Received in 24 days for an English report. Station address: (same as Ascension Islands) (White, MS)

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 "VI" (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.

SWL PROGRAMS

COMPILED BY JIM FRIMMEL

Sundays

0024 Radio Exterior de Espana: "Distance Unknown"
0030 BBC (as): "Write On"
0109 HCJB (am): "DX Partyline"
0124 Radio Exterior de Espana: "Distance Unknown"
0200 Radio For Peace Intl: "World of Radio"
0234 Radio Havana Cuba: "DXers Unlimited"
0258 Vatican Radio: "On-the-Air"
0200 WWCR #3 (Tennessee): "Spectrum"
0305 Australia, Radio: "Feedback"
0323 Voice of Turkey: "DX Corner" (biweekly)
0330 WRMI (Florida): "Wavescan"
0409 HCJB (am): "DX Partyline"
0447 Radio Bulgaria: "Radio Bulgaria Calling"
0500 WHRA (Angel 5 Maine): "DXing with Cumbre"
0524 Radio Exterior de Espana: "Distance Unknown"
0530 WHRI (Angel 2 Indiana): "DXing with Cumbre"
0530 Australia, Radio: "Media Report"
0508 Vatican Radio: "On-the-Air"
0634 Radio Havana Cuba: "DXers Unlimited"
0730 KWHR (Angel 4 Hawaii): "DXing with Cumbre"
0630 WWCR #3 (Tennessee): "World of Radio"
0735 Radio Vlaanderen Intl: "Radio World"
0836 Radio Korea: "Multiwave Feedback"
0900 Radio For Peace Intl: "World of Radio"
0905 BBC (af/am/as/eu): "Write On"
0930 WHRI (Angel 2 Indiana): "DXing with Cumbre"
1100 AWR Latin America: "Wavescan"
1115 WWCR #1 (Tennessee): "Ask WWCR"
1138 Radio Korea: "Multiwave Feedback"
1147 Radio Bulgaria: "Radio Bulgaria Calling"
1205 BBC (am/eu): "Write On"
1205 BBC (as): "Write On"
1207 Radio Vlaanderen Intl: "Radio World"
1236 Radio Korea: "Multiwave Feedback"
1300 KWHR (Angel 4 Hawaii): "DXing with Cumbre"

1330 WHRI (Angel 1 Indiana): "DXing with Cumbre"
1230 WRMI (Florida): "Wavescan"
1354 Vatican Radio: "On-the-Air"
1430 WHRI (Angel 1 Indiana): "DXing with Cumbre"
1515 BBC (af): "Waveguide" (4)
1630 KWHR (Angel 3 Hawaii): "DXing with Cumbre"
1635 Radio Vlaanderen Intl: "Radio World"
1636 Radio Korea: "Multiwave Feedback"
1705 BBC (as): "Write On"
1735 Radio Vlaanderen Intl: "Radio World"
1830 KWHR (Angel 3 Hawaii): "DXing with Cumbre"
1830 WHRI (Angel 2 Indiana): "DXing with Cumbre"
1936 Radio Korea: "Multiwave Feedback"
2030 WRMI (Florida): "Wavescan"
2105 BBC (am/eu): "Write On"
2105 BBC (as): "Write On"
2130 KWHR (Angel 4 Hawaii): "DXing with Cumbre"
2130 WHRA (Angel 5 Maine): "DXing with Cumbre"
2135 BBC (af): "Write On"
2136 Radio Korea: "Multiwave Feedback"
2300 KSDA (Guam): "Wavescan"
2300 Radio For Peace Intl: "World of Radio"
2330 Australia, Radio: "Media Report"

Mondays

0106 Deutsche Welle: "World DX Meeting" (4/5)
0230 Radio Korea: "Multiwave Feedback"
0305 BBC (af/am/eu): "Write On"
0330 KWHR (Angel 4 Hawaii): "DXing with Cumbre"
0430 Radio New Zealand Intl: "Mailbox" (1/3)
0400 WWCR #1 (Tennessee): "Spectrum"
0400 WWCR #3 (Tennessee): "World of Radio"
0430 WWCR #3 (Tennessee): "Ask WWCR"
0700 Radio For Peace Intl: "World of Radio"
1040 All India Radio: "DX-ers Corner" (2/4)

1130 Radio New Zealand Intl: "Mailbox" (1/3)
1615 KTWR (Guam): "Pacific DX Report"
1840 All India Radio: "DX-ers Corner" (2/4)
2130 All India Radio: "DX-ers Corner" (2/4)
2100 WWCR #1 (Tennessee): "Ask WWCR"

Tuesdays

0030 BBC (as): "Waveguide" (4)
0900 KTWR (Guam): "Pacific DX Report"
1246 Radio Sweden: "MediaScan" (1/3)
1230 WWCR #1 (Tennessee): "World of Radio"
1346 Radio Sweden: "MediaScan" (1/3)
1355 FEBC (Philippines): "DX Dial"
1746 Radio Sweden: "MediaScan" (1/3)
1900 Radio For Peace Intl: "World of Radio"
2000 Polish Radio: "Polish Radio DX Club"
2111 Radio Havana Cuba: "DXers Unlimited"
2311 Radio Havana Cuba: "DXers Unlimited"
2340 All India Radio: "DX-ers Corner" (2/4)

Wednesdays

0140 Radio Havana Cuba: "DXers Unlimited"
0146 Radio Sweden: "MediaScan" (1/3)
0246 Radio Sweden: "MediaScan" (1/3)
0300 Radio For Peace Intl: "World of Radio"
0335 Radio Havana Cuba: "DXers Unlimited"
0346 Radio Sweden: "MediaScan" (1/3)
0535 Radio Havana Cuba: "DXers Unlimited"
0730 HCJB (eu): "Ham Radio Today"
0730 BBC (af): "Waveguide" (4)
0930 HCJB (pac): "Ham Radio Today"
1000 Radio For Peace Intl: "World of Radio"
1315 FEBC (Philippines): "DX Dial"
1720 Polish Radio: "Polish Radio DX Club"
1820 Argentina, RAE: "DXers Special"
1930 HCJB (eu): "Ham Radio Today"
2106 Radio Budapest Intl: "Radio Budapest DX Show"
2300 Radio For Peace Intl: "Continent of Media"

Thursdays

0130 HCJB (am): "Ham Radio Today"
0236 Radio Budapest Intl: "Radio Budapest DX Show"

0239 Argentina, RAE: "DXers Special"
0430 HCJB (am): "Ham Radio Today"
0545 BBC (am/eu): "Waveguide" (4)
0700 Radio For Peace Intl: "Continent of Media"
0730 BBC (as): "Waveguide" (4)
0754 Radio Netherlands Intl: "Media Network"
0830 Radio New Zealand Intl: "Mailbox" (1/3)
0953 Radio Netherlands Intl: "Media Network"
1153 Radio Netherlands Intl: "Media Network"
1220 Polish Radio: "Polish Radio DX Club"
1352 Radio Netherlands Intl: "Media Network"
1753 Radio Netherlands Intl: "Media Network"
1954 Radio Netherlands Intl: "Media Network"
2030 WWCR #1 (Tennessee): "World of Radio"
2115 BBC (as): "Waveguide" (4)

Fridays

0053 Radio Netherlands Intl: "Media Network"
0253 Radio Netherlands Intl: "Media Network"
0345 BBC (as): "Waveguide" (4)
0453 Radio Netherlands Intl: "Media Network"
0730 Australia, Radio: "Media Report"
0915 BBC (am/eu): "Waveguide" (4)
1045 KTWR (Guam): "Pacific DX Report"
1930 Radio For Peace Intl: "Continent of Media"
1930 Radio New Zealand Intl: "Mailbox" (1/3)
1947 Radio Bulgaria: "Radio Bulgaria Calling"
2000 Radio For Peace Intl: "World of Radio"
2000 WWCR #1 (Tennessee): "Ask WWCR"
2105 Australia, Radio: "Feedback"
2238 Voice of Turkey: "DX Corner" (biweekly)
2344 Radio Bulgaria: "Radio Bulgaria Calling"

Saturdays

0010 Australia, Radio: "Feedback"
0100 WRMI (Florida): "Wavescan"
0230 KWHR (Angel 3 Hawaii): "DXing with Cumbre"
0330 Radio For Peace Intl: "Continent of Media"
0338 Voice of Turkey: "DX Corner" (biweekly)
0400 Radio For Peace Intl: "World of Radio"
0600 WHRI (Angel 1/2 Indiana): "DXing with Cumbre"

(Continued on P. 42)

FREQUENCIES

| | | | | | | | | | | | |
|------------------|----------------------------|---------|---------|---------|---------|-----------------|---------------------------|---------|---------|---------|---------|
| 0000-0100 | Anguilla, Caribbean Beacon | 6090am | | | | 0000-0100 | Ukraine, R Ukraine Intl | 5915na | 5940eu | 6020eu | 6050eu |
| 0000-0100 | Australia, Radio | 9660pa | 12080pa | 13605pa | 13755pa | | | 6080eu | 7150na | 7205na | 7290eu |
| | | 15510pa | 17750as | 17795pa | | | | 7420eu | 9560eu | | |
| 0000-0100 vl | Australia, VL8K Katherine | 5025do | | | | 0000-0100 | USA, KAIJ Dallas TX | 5810am | | | |
| 0000-0100 vl | Australia, VL8T Tent Crk | 4910do | | | | 0000-0059 | USA, KHBI N Mariana Is | 15665as | | | |
| 0000-0100 | Canada, CBC N Quebec Svc | 9625do | | | | 0000-0100 | USA, KTVN Salt Lk City UT | 7510am | | | |
| 0000-0100 | Canada, CFRX Toronto | 6070do | | | | 0000-0100 | USA, KWHR Naalehu HI | 17510as | 17555pa | | |
| 0000-0100 | Canada, CFVP Calgary | 6030do | | | | 0000-0100 | USA, Voice of America | 7215as | 9890as | 11760as | 15185as |
| 0000-0100 | Canada, CHNX Halifax | 6130do | | | | | | 15290as | 17735as | 17820as | |
| 0000-0100 | Canada, CKZN St John's | 6160do | | | | 0000-0030 twhfa | USA, Voice of America | 5995am | 6130ca | 7405am | 9455am |
| 0000-0100 | Canada, CKZU Vancouver | 6160do | | | | | | 9775am | 11695am | 13740am | |
| 0000-0029 | Canada, R Canada Intl | 5960na | 6040na | 9535na | 9755na | | | | | | |
| | | 11865am | | | | 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 | 21455am | | | 0000-0100 | USA, WHRI Noblesville IN | 5745am | 7315am | | |
| 0000-0030 | Egypt, Radio Cairo | 9900na | | | | 0000-0100 | USA, WINB Red Lion PA | 11950am | | | |
| 0000-0100 | Germany, Overcomer Ministr | 5840na | | | | 0000-0100 | USA, WJCR Upton KY | 7490na | | | |
| 0000-0015 vl | Ghana, Ghana Broadc Corp | 3366do | 4915do | | | 0000-0100 twhfa | USA, WRMI/R Miami Intl | 9955am | | | |
| 0000-0045 | India, All India Radio | 7410as | 9705as | 9950as | 11620as | 0000-0030 a | USA, WRMI/R Miami Intl | 9955am | | | |
| 0000-0015 | Japan, R Japan/NHK World | 6155eu | 6180eu | 9665af | 11705na | 0000-0100 | USA, WRNO New Orleans LA | 7355am | | | |
| | | 11815as | 13650as | | | 0000-0059 mwf | USA, WSHB Cypress Crk SC | 9430am | | | |
| | | 5100do | | | | 0000-0059 smwfa | USA, WSHB Cypress Crk SC | 7535na | | | |
| 0000-0100 | Liberia, LCN/R Liberia Int | 5100do | | | | 0000-0100 | USA, WWCR Nashville TN | 3215am | 5070am | 7435am | 13845am |
| 0000-0100 | Malaysia, Radio | 7295do | | | | 0000-0100 | USA, WYFR Okeechobee FL | 6085na | 9505ca | 15440na | |
| 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 | | | | 0029-0059 | Canada, R Canada Intl | 5960na | 9755na | | |
| 0000-0100 | North Korea, R Pyongyang | 11845ca | 13650sa | 15230na | | 0030-0100 | Iran, VOIRI | 6055eu | 9022eu | 9685eu | |
| 0000-0100 vl | Papua New Guinea, NBC | 9675do | | | | 0030-0100 | Lithuania, Radio Vilnius | 5950na | | | |
| 0000-0030 mtwhfa | Serbia, Radio Yugoslavia | 6195na | 7115na | | | 0030-0100 | Netherlands, Radio | 6020na | 6165na | 9845na | 9855na |
| 0000-0100 | Singapore, SBC Radio One | 6160do | | | | | | 11655as | 12090as | | |
| 0000-0100 vl | Solomon Islands, SIBC | 5020do | | | | 0030-0100 | Sri Lanka, Sri Lanka BC | 9730as | 15425as | | |
| 0000-0100 | Spain, R Exterior Espana | 6055am | | | | 0030-0100 | Thailand, Radio | 9655as | 13695na | 15395as | |
| 0000-0030 | Thailand, Radio | 9655af | 9680af | 11905af | | 0030-0100 | UK, BBC Asian Service | 5965as | 6080as | 6195as | 9410as |
| 0000-0030 | UK, BBC Asian Service | 3915as | 6195as | 7110as | 9410as | | | 11955as | 15310as | 15360as | |
| | | 9580as | 11945as | 11955as | 15280as | | | 7520na | | | |
| | | 15310as | 15360as | | | 0045-0100 | USA, WYFR Okeechobee FL | 7520na | | | |
| 0000-0100 | UK, BBC World Service | 5970sa | 5975am | 6175na | 9590am | 0050-0100 | Italy, RAI Intl | 6010na | 9675na | 11800na | |
| | | 9915sa | 11750sa | | | | | | | | |

SELECTED PROGRAMS

Sundays

- 0000 UK, BBC London (am/eu/as): Newdesk. World news and dispatches from overseas and UK correspondents.
- 0030 UK, BBC London (am/eu): Letter from America. Alistair Cooke shares his inimitable view of contemporary American life.
- 0030 UK, BBC London (as): Write On. Air your views about World Service; write to PO Box 76, Bush House, Strand, London WC2B 4PH.
- 0040 UK, BBC London (as): Science View. A look at complex issues and the implications of the latest research findings.
- 0045 UK, BBC London (am/eu/as): Britain Today. News about Britain.

Mondays

- 0000 UK, BBC London (am/eu): Chimes of Big Ben (1). Hear the famous bells at this time on the first Monday of each month.
- 0000 UK, BBC London (am/eu/as): Newdesk. See S 0000.
- 0030 UK, BBC London (am/eu): Westway Access. Explaining the soap opera as an English learning tool.
- 0030 UK, BBC London (as): Variable Feature. See S 0130.
- 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.

Tuesdays

- 0000 UK, BBC London (am/eu/as): Newdesk. See S 0000.
- 0000 USA, VOA Washington DC (ca): VOA News. Ten minutes of worldwide news on the hour.
- 0010 USA, VOA Washington DC (am): VOA Business Report. A weekday review of business and financial matters.
- 0010 USA, VOA Washington DC (ca): American Gold. Fifty minutes of classic pop music hosted by Ray Freeman.
- 0030 UK, BBC London (am/eu): Westway. See M 0330.
- 0030 UK, BBC London (as): Variable Feature. See S 0130.
- 0030 UK, BBC London (as): Waveguide (4). See S 1515.
- 0030 USA, VOA Washington DC (am): News (Special English). Ten minutes of news in slow English.
- 0040 USA, VOA Washington DC (am): Agriculture Report (Special English). Developments and reports on farming and agriculture.
- 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.

- 0045 USA, VOA Washington DC (am): Science in the News (Special English). Recent scientific developments.

Wednesdays

- 0000 UK, BBC London (am/eu/as): Newdesk. See S 0000.
- 0000 USA, VOA Washington DC (ca): VOA News. See Carib 0000.
- 0010 USA, VOA Washington DC (am): VOA Business Report. See Am Repts 0010.
- 0010 USA, VOA Washington DC (ca): Report to the Caribbean. The latest news affecting the region, as well as a roundup of sports, financial news, and the weather forecast.
- 0030 UK, BBC London (am/eu): The Farming World. See S 0815.
- 0030 UK, BBC London (as): Variable Feature. See S 0130.
- 0030 USA, VOA Washington DC (am): News (Special English). See Am Repts 0030.
- 0030 USA, VOA Washington DC (ca): Studio 38. A bright, fast-paced show highlighting American lifestyles and culture.
- 0040 USA, VOA Washington DC (am): Science Report (Special English). Developments in the world of science and technology.
- 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.
- 0045 USA, VOA Washington DC (am): Exploration (Special English). NEW! Steve Ember and Shirley Griffith report on space news.

Thursdays

- 0000 UK, BBC London (am/eu/as): Newdesk. See S 0000.
- 0000 UK, BBC London (as): Chimes of Big Ben (1). See M 0000.
- 0000 USA, VOA Washington DC (ca): VOA News. See Carib 0000.
- 0010 USA, VOA Washington DC (am): VOA Business Report. See Am Repts 0010.
- 0010 USA, VOA Washington DC (ca): Report to the Caribbean. See Carib 0010.
- 0030 UK, BBC London (am/eu/as): From Our Own Correspondent. See S 0330.
- 0030 USA, VOA Washington DC (am): News (Special English). See Am Repts 0030.
- 0030 USA, VOA Washington DC (ca): Studio 38. See Carib 0030.
- 0040 USA, VOA Washington DC (am): Science Report (Special English). See Am Repts 0040.
- 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.

- 0045 USA, VOA Washington DC (am): The Making of a Nation (Special English). Chapters from U.S. history in special English.

Fridays

- 0000 UK, BBC London (am/eu/as): Newdesk. See S 0000.
- 0000 USA, VOA Washington DC (ca): VOA News. See Carib 0000.
- 0010 USA, VOA Washington DC (am): VOA Business Report. See Am Repts 0010.
- 0010 USA, VOA Washington DC (ca): Report to the Caribbean. See Carib 0010.
- 0030 UK, BBC London (am/eu): Westway. See M 0330.
- 0030 UK, BBC London (as): Short Story. See S 0715.
- 0030 USA, VOA Washington DC (am): News (Special English). See Am Repts 0030.
- 0030 USA, VOA Washington DC (ca): Studio 38. See Carib 0030.
- 0040 USA, VOA Washington DC (am): Environment Report (Special English). A five-minute report on a specific environmental subject.
- 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.
- 0045 USA, VOA Washington DC (am): American Mosaic (Special English). Reports about music, books, movies, and student life in the USA.

Saturdays

- 0000 UK, BBC London (am/eu/as): Newdesk. See S 0000.
- 0000 USA, VOA Washington DC (ca): VOA News. See Carib 0000.
- 0010 USA, VOA Washington DC (am): VOA Business Report. See Am Repts 0010.
- 0010 USA, VOA Washington DC (ca): Report to the Caribbean. See Carib 0010.
- 0030 UK, BBC London (am/eu/as): From the Weeklies. Review of the British weekly press.
- 0030 USA, VOA Washington DC (am): News (Special English). See Am Repts 0030.
- 0030 USA, VOA Washington DC (ca): Studio 38. See Carib 0030.
- 0040 USA, VOA Washington DC (am): Environment Report (Special English). See Am Repts 0040.
- 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.
- 0045 USA, VOA Washington DC (am): American Mosaic (Special English). See Am Repts 0045.

FREQUENCIES

| | | | | | | | | | | | |
|-------------------|----------------------------|---------|---------|---------|---------|-----------------|---------------------------|---------|---------|---------|---------|
| 0100-0200 | Anguilla, Caribbean Beacon | 6090am | | | | 0100-0130 | Slovakia, R Slovakia Intl | 5930na | 7300af | 9440sa | |
| 0100-0200 | Australia, Radio | 9660pa | 12080pa | 13605pa | 15240pa | 0100-0200 vl | Solomon Islands, SIBC | 5020do | | | |
| | | 15415as | 15510pa | 17750pa | 17795pa | 0100-0200 | South Korea, R Korea Intl | 7275as | 11725am | 11810am | 15575am |
| 0100-0200 vl | Australia, VL8K Katherine | 5025do | | | | 0100-0200 | Spain, R Exterior Espana | 6055am | | | |
| 0100-0200 vl | Australia, VL8T Tent Crk | 4910do | | | | 0100-0200 | Sri Lanka, Sri Lanka BC | 9730as | 15425as | | |
| 0100-0200 | Canada, CBC N Quebec Svc | 9625do | | | | 0100-0130 | Sweden, Radio | 11985as | | | |
| 0100-0200 | Canada, CFRX Toronto | 6070do | | | | 0100-0130 | Switzerland, Swiss R Intl | 9885na | 9905ca | | |
| 0100-0200 | Canada, CFVP Calgary | 6030do | | | | 0100-0200 | UK, BBC Asian Service | 5965as | 6195as | 9410as | 11955as |
| 0100-0200 | Canada, CHNX Halifax | 6130do | | | | | | 15280as | 15310as | 15360as | |
| 0100-0200 | Canada, CKZN St John's | 6160do | | | | 0100-0200 | UK, BBC World Service | 5970sa | 5975am | 6175na | 9590am |
| 0100-0200 | Canada, CKZU Vancouver | 6160do | | | | | | 9915sa | 11750sa | | |
| 0100-0200 | Costa Rica, RF Peace Intl | 7385am | 15050am | | | 0100-0200 | USA, KAIJ Dallas TX | 5810am | | | |
| 0100-0105 | Croatia, Croatian Radio | 5840am | | | | 0100-0200 | USA, KJES Mesquite NM | 7555am | | | |
| 0100-0200 | Cuba, Radio Havana | 6000na | 9820na | 9830na | | 0100-0200 | USA, KTBN Salt Lk City UT | 7510am | | | |
| 0100-0127 | Czech Rep, Radio Prague | 6200na | 7345na | | | 0100-0200 | USA, KWHR Naaiehu HI | 17510as | 17555pa | | |
| 0100-0200 | Ecuador, HCJB | 9745na | 21455am | | | 0100-0200 | USA, Voice of America | 7115as | 7205as | 9740as | 9850as |
| 0100-0150 | Germany, Deutsche Welle | 6040na | 6085na | 6145na | 9640na | | | 11705as | 15250as | 15300as | 17740as |
| | | 11810am | | | | 0100-0200 twfha | USA, Voice of America | 17820as | | | |
| 0100-0200 | Germany, Overcomer Minist | 5840na | | | | | | 5995am | 6130am | 7405am | 9445am |
| 0100-0115 | Ghana, Ghana Broadc Corp | 3366do | 4915do | | | | | 9775am | 13740am | | |
| 0100-0130 | Hungary, Radio Budapest | 6120na | 9580na | | | 0100-0200 | USA, WEWN Birmingham AL | 5825eu | | | |
| 0100-0200 | Indonesia, Voice of | 11785as | | | | 0100-0200 | USA, WGTG McCaysville GA | 5085am | | | |
| 0100-0125 | Iran, VOIRI | 6055eu | 9022eu | 9685eu | | 0100-0200 | USA, WHRI Noblesville IN | 5745am | 7315am | | |
| 0100-0110 | Italy, RAI Intl | 6010na | 9675na | 11800na | | 0100-0200 | USA, WINB Red Lion PA | 11950am | | | |
| 0100-0200 | Japan, R Japan/NHK World | 6150af | 11860as | 11870af | 15570as | 0100-0200 | USA, WJCR Upton KY | 7490na | | | |
| | | 15590as | 17810as | 17835sa | 21610pa | 0100-0200 twfha | USA, WRMI/R Miami Intl | 9955am | | | |
| | | 21670pa | | | | 0100-0200 | USA, WRNO New Orleans LA | 7355am | | | |
| 0100-0200 | Liberia, LCN/R Liberia Int | 5100do | | | | 0100-0159 m | USA, WSHB Cypress Crk SC | 9430am | | | |
| 0100-0200 | Malaysia, Radio | 7295do | | | | 0100-0159 | USA, WSHB Cypress Crk SC | 7535na | | | |
| 0100-0125 | Netherlands, Radio | 6020na | 6165na | 9845na | 9855as | 0100-0200 | USA, WWCR Nashville TN | 3215am | 5070am | 5935am | 7435am |
| | | 11655as | 12090as | | | 0100-0200 | USA, WYFR Okeechobee FL | 6065na | 7520as | 9505na | 11550as |
| 0100-0200 | New Zealand, R NZ Intl | 17675pa | | | | 0100-0130 | Uzbekistan, R Tashkent | 5040eu | 5955eu | 5975eu | 7105eu |
| 0100-0130 m | Norway, Radio Norway Intl | 7465na | 7545am | | | | | 7205eu | 9540eu | 9540eu | |
| 0100-0200 vl | Papua New Guinea, NBC | 9675do | | | | 0100-0127 | Vietnam, Voice of | 5940am | | | |
| 0100-0200 | Philippines, FEBC/R Intl | 15450as | | | | 0115-0200 m | USA, WRMI/R Miami Intl | 9955am | | | |
| 0100-0200 | Russia, Voice of Russia WS | 5930na | 7105na | 7345na | 9580na | 0125-0200 | Netherlands, Radio | 9855as | 11655as | 12090as | |
| | | 12030na | 13665na | | | 0130-0200 | Austria, R Austria Intl | 7325na | 9495am | 9870am | |
| 0100-0200 mtwfhfa | Russia, Voice of Russia WS | 5920na | | | | 0130-0150 | Greece, Voice of | 6260na | 7450na | 9420na | 9935na |
| 0100-0130 | Serbia, Radio Yugoslavia | 6180na | 7130na | | | 0130-0200 | Guam, AWR/KSDA | 17645as | | | |
| 0100-0200 | Singapore, SBC Radio One | 6160do | | | | 0140-0200 | Vatican State, Vatican R | 5980au | 7335au | 9650au | |

SELECTED PROGRAMS

Sundays

- 0100 UK, BBC London (am/eu): *Newsdesk*. See S 0000.
- 0100 UK, BBC London (as): *World News*. Broadcast on the hour of 5, 10, or 15 minutes in length.
- 0110 UK, BBC London (as): *Pause for Thought*. Spiritual reflection.
- 0115 UK, BBC London (as): *Health Matters*. Keeps track of new developments in the world of medical science, as well as ways of keeping fit.
- 0130 UK, BBC London (am/eu): *Variable Feature*. Special features and new series.
- 0130 UK, BBC London (as): *World News*. See S 0100.
- 0145 UK, BBC London (am/eu/as): *Sports Roundup*. The latest sports news.

Mondays

- 0100 UK, BBC London (am/eu): *Newsdesk*. See S 0000.
- 0100 UK, BBC London (as): *World News*. See S 0100.
- 0110 UK, BBC London (as): *Pause for Thought*. See S 0110.
- 0115 UK, BBC London (as): *The Farming World*. See S 0815.
- 0130 UK, BBC London (am/eu): *Pick of the World*. Daire Brehan celebrates the diversity and range of BBC output by picking her favorite choice from the previous week for you to hear again.
- 0130 UK, BBC London (as): *World News*. See S 0100.
- 0145 UK, BBC London (as): *Sports Roundup*. See S 0145.

Tuesdays

- 0100 UK, BBC London (am/eu): *Newsdesk*. See S 0000.
- 0100 UK, BBC London (as): *World News*. See S 0100.
- 0110 UK, BBC London (as): *Pause for Thought*. See S 0110.
- 0115 UK, BBC London (as): *Insight*. See M 1645.
- 0130 UK, BBC London (am/eu): *Seven Days*. See M 0615.
- 0130 UK, BBC London (as): *World News*. See S 0100.
- 0145 UK, BBC London (am/eu): *Variable Feature*. See S 0130.
- 0145 UK, BBC London (as): *Sports Roundup*. See S 0145.

Wednesdays

- 0100 UK, BBC London (am/eu): *Newsdesk*. See S 0000.
- 0100 UK, BBC London (as): *World News*. See S 0100.
- 0110 UK, BBC London (as): *Pause for Thought*. See S 0110.

- 0115 UK, BBC London (as): *Insight*. See M 1645.
- 0130 UK, BBC London (am/eu): *Discovery*. See T 0230.
- 0130 UK, BBC London (as): *World News*. See S 0100.
- 0145 UK, BBC London (as): *Sports Roundup*. See S 0145.

Thursdays

- 0100 UK, BBC London (am/eu): *Newsdesk*. See S 0000.
- 0100 UK, BBC London (as): *World News*. See S 0100.
- 0110 UK, BBC London (as): *Pause for Thought*. See S 0110.
- 0115 UK, BBC London (as): *Insight*. See M 1645.
- 0130 UK, BBC London (am/eu): *Omnibus*. See S 1715.
- 0130 UK, BBC London (as): *World News*. See S 0100.
- 0145 UK, BBC London (as): *Sports Roundup*. See S 0145.

Fridays

- 0100 UK, BBC London (am/eu): *Newsdesk*. See S 0000.
- 0100 UK, BBC London (as): *World News*. See S 0100.

- 0110 UK, BBC London (as): *Pause for Thought*. See S 0110.
- 0115 UK, BBC London (as): *Insight*. See M 1645.
- 0130 UK, BBC London (am/eu): *Composer of the Month*. See M 1930.
- 0130 UK, BBC London (as): *World News*. See S 0100.
- 0145 UK, BBC London (as): *Sports Roundup*. See S 0145.

Saturdays

- 0100 UK, BBC London (am/eu): *Newsdesk*. See S 0000.
- 0100 UK, BBC London (as): *World News*. See S 0100.
- 0110 UK, BBC London (as): *Insight*. See M 1645.
- 0110 UK, BBC London (as): *Pause for Thought*. See S 0110.
- 0130 UK, BBC London (am/eu): *Variable Feature*. See S 0130.
- 0130 UK, BBC London (as): *World News*. See S 0100.
- 0145 UK, BBC London (am/eu): *Short Story*. See S 0715.
- 0145 UK, BBC London (as): *Sports Roundup*. See S 0145.

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THANK YOU...

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Joe Brasier/WHRI; Bob Fraser, Cohasset, MA; Glenn Hauser, Enid, OK; *DX Report & WOR*; Jim Moats, Ravenna, OH; Adrian Sandsbury/Larry Van Horn, Brasstown, NC/*Satellite Times*; George Woods/R. Sweden's *Media Scan*; R NZ Intl: BBCMS/World Media; *Cumbre DX*; *DX Ontario*; *NASWA Journal*; Usenet newsgroups.

FREQUENCIES

| | | | | | | | | | | | |
|------------------|-----------------------------|---------|---------|---------|---------|-----------------|----------------------------|---------|---------|---------|---------|
| 0300-0400 | Anguilla, Caribbean Beacon | 6090am | | | | 0300-0330 | UK, BBC African Service | 3255af | 6005af | 6135af | 6190af |
| 0300-0400 | Australia, Radio | 9660pa | 12080pa | 13605pa | 15240pa | | | 9600af | | | |
| | | 15415as | 15510pa | 17750pa | 17795pa | 0300-0330 | UK, BBC Asian Service | 9605as | 15310as | 15360as | 17790as |
| 0300-0400 vl | Australia, VL8K Katherine | 5025do | | | | | | 21660as | | | |
| 0300-0400 vl | Australia, VL8T Tent Crk | 4910do | | | | 0300-0330 | UK, BBC World Service | 5970sa | 5975am | 6175na | 6195eu |
| 0300-0400 | Australia, Defense Forces R | 15635as | | | | | 7325sa | 9410e | 11760me | 11850as | 11955as |
| 0300-0330 mtwhf | Canada, Can Forces Net | 6155ca | 9755ca | 9780ca | | | 12095af | 15280as | 15340as | | |
| 0300-0400 vl | Canada, CBC N Quebec Svc | 9625do | | | | 0300-0400 | Ukraine, R Ukraine Intl | | | 7150na | 7205eu |
| 0300-0400 | Canada, CFRX Toronto | 6070do | | | | 0300-0400 | USA, KAIJ Dallas TX | | | | |
| 0300-0400 | Canada, CFVP Calgary | 6030do | | | | 0300-0400 | USA, KTVB Salt Lk City UT | | | | |
| 0300-0400 | Canada, CHNX Halifax | 6130do | | | | 0300-0400 | USA, KVOH Los Angeles CA | | | | |
| 0300-0400 | Canada, CKZN St John's | 6160do | | | | 0300-0400 | USA, KWHR Naalehu HI | | | 17510as | 17555pa |
| 0300-0400 | Canada, CKZU Vancouver | 6160do | | | | 0300-0400 | USA, Voice of America | | | 6035af | 6115af |
| 0300-0359 twhfa | Canada, R Canada Intl | 6155am | 9755am | 9780am | | 0300-0400 | USA, Voice of America | | | 7415af | 9575af |
| 0300-0329 | Canada, R Canada Intl | 6155am | 9755am | 9780am | | 0300-0330 smtwh | USA, Voice of America | | | 4960af | |
| 0300-0400 | China, China Radio Intl | 9690na | | | | 0300-0400 | USA, WEWN Birmingham AL | | | 5825eu | |
| 0300-0400 vl | Costa Rica, Faro del Carib | 5055do | | | | 0300-0400 | USA, WGTG McCaysville GA | | | 5085am | |
| 0300-0400 | Costa Rica, RF Peace Intl | 7385am | 15050am | | | 0300-0400 | USA, WHRA Greenbush ME | | | 9400me | |
| 0300-0400 | Cuba, Radio Havana | 6000na | 9820na | 9830na | | 0300-0400 | USA, WHRI Noblesville IN | | | 5745am | 7315am |
| 0300-0327 | Czech Rep, Radio Prague | 5930na | 7345na | | | 0300-0400 | USA, WINB Red Lion PA | | | 11950am | |
| 0300-0400 | Ecuador, HCJB | 9745am | 21455am | | | 0300-0400 | USA, WJCR Upton KY | | | 7490na | |
| 0300-0330 | Egypt, Radio Cairo | 9475na | | | | 0300-0400 | USA, WMLK Bethel PA | | | 9465am | |
| 0300-0350 | Germany, Deutsche Welle | 6085na | 6145na | 6185na | 9535na | 0300-0400 | USA, WRNO New Orleans LA | | | 7395am | |
| | | 9640na | | | | 0300-0359 | USA, WSHB Cypress Crk SC | | | 5850na | |
| 0300-0400 | Germany, Overcomer Ministr | 5880na | 7335na | | | 0300-0400 | USA, WWCR Nashville TN | | | 3215am | 5070am |
| 0300-0400 | Guatemala, Radio Cultural | 3300do | | | | 0300-0400 | USA, WYFR Okeechobee FL | | | 6065na | 9505na |
| 0300-0400 as/vl | Italy, IRRS | 7120va | | | | 0300-0310 | Vatican State, Vatican R | | | 6095am | 7305ca |
| 0300-0400 | Japan, R Japan/NHK World | 17685pa | 17825ca | 17855as | | 0300-0400 vl | Zambia, R Zambia/ZNBC 1 | | | 4910do | |
| 0300-0400 vl | Kenya, Kenya Broadc Corp | 4885do | 4935do | 6150do | | 0300-0400 vl | Zambia, R Zambia/ZNBC 2 | | | 6165do | |
| 0300-0400 vl | Lesotho, Radio Lesotho | 4800do | | | | 0300-0400 vl | Zimbabwe, Zimbabwe BC | | | 3396do | |
| 0300-0400 | Malaysia, Radio | 7295do | | | | 0310-0340 | Vatican State, Vatican R | | | 7360af | 9660af |
| 0300-0330 mtwhfa | Mexico, Radio Mexico Intl | 9705na | | | | 0329-0359 sm | Canada, R Canada Intl | | | 6155na | 9755na |
| 0300-0325 | Netherlands, Radio | 9855as | 11655as | | | 0330-0400 | Albania, R Tirana Intl | | | 6140na | 7160na |
| 0300-0400 | New Zealand, R NZ Intl | 17675pa | | | | 0330-0357 | Czech Rep, Radio Prague | | | 7350na | 11600as |
| 0300-0310 | Pakistan, Radio | 7270va | | | | 0330-0355 | Moldova, R Moldova Intl | | | 7500na | |
| 0300-0400 vl | Papua New Guinea, NBC | 9675do | | | | 0330-0400 | Sweden, Radio | | | 9475na | 11665na |
| 0300-0400 | Russia, Voice of Russia WS | 5930na | 6065na | 6150na | 7105na | 0330-0400 | Tanzania, Radio | | | 5050af | |
| | | 7125na | 7260na | 9580na | | 0330-0400 | UAE, Radio Dubai | | | 12005na | 13675na |
| 0300-0400 mtwhfa | Russia, Voice of Russia WS | 5920na | | | | 0330-0400 | UK, BBC African Service | | | 3255af | 6005af |
| 0300-0330 | S Africa, Channel Africa | 5955af | | | | | | | | 9610af | 11730af |
| 0300-0400 | Singapore, SBC Radio One | 6160do | | | | 0330-0400 | UK, BBC Asian Service | | | 9605as | 1595as |
| 0300-0400 vl | Solomon Islands, SIBC | 5020do | | | | | | | | 17790as | 21660as |
| 0300-0400 | Sri Lanka, Sri Lanka BC | 9730as | 15425as | | | 0330-0400 | UK, BBC World Service | | | 5975am | 6175na |
| 0300-0400 | Taiwan, Radio Taipei Intl | 5950na | 9680na | 11745as | 11825as | | | | | 9895am | 11760me |
| | | 15345as | | | | 0330-0400 | Vietnam, Voice of | | | 5905am | |
| 0300-0330 | Thailand, Radio | 9655am | 11905am | 15460na | | 0340-0350 | Greece, Voice of | | | 6260na | 7450na |
| 0300-0400 | Turkey, Voice of | 7300na | 9685me | 17705as | | 0345-0400 | Burundi, Radio Nationale | | | 6140do | |
| 0300-0315 mtwhf | Uganda, Radio | 4976do | | | | 0345-0400 | Tajikistan, Radio Dushanbe | | | 4975as | 9905as |
| | | | | | | 0345-0400 as | Uganda, Radio | | | 4976do | 11620as |
| | | | | | | 0356-0400 | Zambia, Christian Voice | | | 3330af | 6065af |

SELECTED PROGRAMS

Sundays

- 0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0305 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
- 0305 UK, BBC London (af/am/eu): World Business Review. A look back at the previous week's business and a preview of upcoming events.
- 0330 UK, BBC London (af): African Quiz (1). A monthly test of the listener's knowledge of Africa.
- 0330 UK, BBC London (af): Postmark Africa. Expert answers to any question under the sun.
- 0330 UK, BBC London (am/eu): From Our Own Correspondent. BBC correspondents comment on the background to the news.
- 0330 UK, BBC London (as): Global Business. NEW! Roger White presents this weekly series of interviews, features and discussions with the movers and shakers of the international business community.

Mondays

- 0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0305 UK, BBC London (af/am/eu): Write On. See S 0030.
- 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
- 0330 UK, BBC London (af): Network Africa. Breakfast show of news, sport, personalities, music, and listener's comments.
- 0330 UK, BBC London (am/eu): The World Today (Eu). A new two-and-a-half hour breakfast news program (alternative programming for Europe).
- 0330 UK, BBC London (am/eu): Westway. The World Service's first-ever regular drama (soap opera) serial.
- 0330 UK, BBC London (as): Off the Shelf. Daily readings from the

best of world literature.
0345 UK, BBC London (as): Westway Access. See M 0030.

Tuesdays

- 0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0305 UK, BBC London (af/am/eu): World Business Report. See M 0905.
- 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
- 0330 UK, BBC London (af): Network Africa. See M 0330.
- 0330 UK, BBC London (af/am/eu): Off the Shelf. See M 0330.
- 0330 UK, BBC London (am/eu): Insight. See M 1645.
- 0330 UK, BBC London (am/eu): The World Today (Eu). See M 0330.
- 0345 UK, BBC London (as): Westway. See M 0330.

Wednesdays

- 0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0305 UK, BBC London (af/am/eu): World Business Report. See M 0905.
- 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
- 0330 UK, BBC London (af): Network Africa. See M 0330.
- 0330 UK, BBC London (af/am/eu): Off the Shelf. See M 0330.
- 0330 UK, BBC London (am/eu): Insight. See M 1645.
- 0330 UK, BBC London (am/eu): The World Today (Eu). See M 0330.
- 0345 UK, BBC London (as): Science Extra. See S 1501.

Thursdays

- 0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0305 UK, BBC London (af/am/eu): World Business Report. See M

- 0905.
- 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
- 0330 UK, BBC London (af): Network Africa. See M 0330.
- 0330 UK, BBC London (af/am/eu): Off the Shelf. See M 0330.
- 0330 UK, BBC London (am/eu): Insight. See M 1645.
- 0330 UK, BBC London (am/eu): The World Today (Eu). See M 0330.
- 0345 UK, BBC London (as): Westway. See M 0330.

Fridays

- 0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0305 UK, BBC London (af/am/eu): World Business Report. See M 0905.
- 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
- 0330 UK, BBC London (af): Network Africa. See M 0330.
- 0330 UK, BBC London (af/am/eu): Off the Shelf. See M 0330.
- 0330 UK, BBC London (am/eu): Insight. See M 1645.
- 0330 UK, BBC London (am/eu): The World Today (Eu). See M 0330.
- 0345 UK, BBC London (as): The Learning Zone. See S 1515.
- 0345 UK, BBC London (as): Waveguide (4). See S 1515.

Saturdays

- 0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0305 UK, BBC London (af/am/eu): World Business Report. See M 0905.
- 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
- 0330 UK, BBC London (af): Focus on Faith. See F 0230.
- 0330 UK, BBC London (am/eu): Insight. See M 1645.
- 0330 UK, BBC London (am/eu): Weekend (Eu). European magazine program co-produced by European broadcasters.
- 0330 UK, BBC London (as): The Vintage Chart Show. See M 0730.
- 0345 UK, BBC London (am/eu): Off the Shelf. See M 0330.

FREQUENCIES

| | | | | | | | | | | | | |
|-----------------|----------------------------|--|-----------------------------|-----------------------------|------------------------------|------------------|---------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|--|
| 0530-0600 as | UK, BBC World Service | 3955eu 12095eu | 6180eu | 6195eu | 9410eu | 0600-0700 | Swaziland, Trans World R | 4775af | 6100af | 9500af | | |
| 0530-0600 vl | Zambia, R Zambia/ZNBC 1 | 7220do | | | | 0600-0700 | UK, BBC African Service | 6005af | 6155af | 6190af | 7160af | |
| 0530-0600 vl | Zimbabwe, Zimbabwe BC | 5975do | | | | 0600-0700 | UK, BBC Asian Service | 9600af | 11940af | 15420af | 17885af | |
| 0545-0600 | UK, BBC African Service | 7275af | 9710af | | | 0600-0700 | UK, BBC World Service | 7145pa | 9740as | 11955pa | 15310as | |
| 0600-0700 | Anguilla, Caribbean Beacon | 6090am | | | | 0600-0630 | UK, BBC World Service | 15360as | 17760as | 17790as | 21660as | |
| 0600-0700 | Australia, Radio | 9660pa 15240pa | 11880pa 15415as | 12080pa 15510as | 13605as 17750as | 0600-0700 | USA, KAIJ Dallas TX | 3955eu 6195eu 12095eu | 5975am 7325eu 15565eu | 6175am 9410eu 15575as | 6180eu 11760me 17640af | |
| 0600-0700 vl | Australia, VL8K Katherine | 5025do | | | | 0600-0700 | USA, KAIJ Dallas TX | 5810am | | | | |
| 0600-0700 vl | Australia, VL8T Tent Crk | 4910do | | | | 0600-0700 | USA, KTBN Salt Lk City UT | 7510am | | | | |
| 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | | 0600-0700 | USA, KVOH Los Angeles CA | 9975am | | | | |
| 0600-0700 | Canada, CFRX Toronto | 6070do | | | | 0600-0700 | USA, KWHR Naalehu HI | 17555pa | 17780as | | | |
| 0600-0700 | Canada, CFVP Calgary | 6030do | | | | 0600-0630 | USA, Voice of America | 5970af 7170eu 11950af | 5995me 7285af 12080af | 6035af 11805eu 15205eu | 6080af 11825me 15600af | |
| 0600-0700 | Canada, CHNX Halifax | 6130do | | | | 0600-0700 | USA, WEWN Birmingham AL | 5825eu | | | | |
| 0600-0700 | Canada, CKZU Vancouver | 6160do | | | | 0600-0700 | USA, WHRA Greenbush ME | 11565af | | | | |
| 0600-0659 mtwhf | Canada, R Canada Intl | 6050va 11905af | 6150va | 9740af | 9760va | 0600-0700 | USA, WHRI Noblesville IN | 5745am | 7315am | | | |
| 0600-0700 | Costa Rica, RF Peace Intl | 7385am | 15050am | | | 0600-0700 | USA, WJCR Upton KY | 7490na | | | | |
| 0600-0700 | Cuba, Radio Havana | 6180na | 9820na | 9830na | | 0600-0700 | USA, WRNO New Orleans LA | 7395am | | | | |
| 0600-0700 | Ecuador, HCJB | 9745na | 21455am | | | 0600-0659 ft | USA, WSHB Cypress Crk SC | 7535eu | | | | |
| 0600-0650 | Germany, Deutsche Welle | 11915af 17860af | 13790af 21680me | 15185af | 17820as | 0600-0700 | USA, WWCR Nashville TN | 2390am | 3210am | 5070am | 5935am | |
| 0600-0700 | Germany, Overcomer Ministr | 9500au | | | | 0600-0700 | USA, WYFR Okeechobee FL | 5985am | 7355eu | 9985eu | | |
| 0600-0615 | Ghana, Ghana Broadc Corp | 3366do | 4915do | | | 0600-0700 vl | Vanuatu, Radio | 3945do | 4960do | | | |
| 0600-0700 | Guyana, GBC/Voice of | 5950do | | | | 0600-0700 | Yemen, Radio Aden | 9780do | | | | |
| 0600-0700 vl | Italy, IRRS | 3985va | | | | 0600-0700 | Zambia, Christian Voice | 3330af | 6065af | | | |
| 0600-0700 | Japan, R Japan/NHK World | 5975eu 11840as | 7230eu 11850pa | 9835na 17810as | 11740as | 0600-0700 vl | Zambia, R Zambia/ZNBC 1 | 7220do | | | | |
| 0600-0700 vl | Kenya, Kenya Broadc Corp | 4885do | 4935do | 6150do | | 0600-0700 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | | | |
| 0600-0700 vl | Kiribati, Radio | 9810do | | | | 0600-0700 vl | Zimbabwe, Zimbabwe BC | 5975do | | | | |
| 0600-0700 | Liberia, Radio Veritas | 3450do | | | | 0603-0610 mtwhf | Croatia, Croatian Radio | 6025eu | 9830eu | | | |
| 0600-0700 | Liberia, Star Radio | 3400do | | | | 0605-0700 | Swaziland, Trans World R | 9650af | | | | |
| 0600-0700 | Liberia, LCN/R Liberia Int | 5100do | | | | 0630-0700 | Austria, R Austria Intl | 6015na | | | | |
| 0600-0700 | Malaysia, Radio | 7295do | | | | 0630-0700 | Finland, YLE/R Finland | 11945as | 17830as | | | |
| 0600-0700 vl | Malaysia, RTM Kuching | 4895do | 7160do | | | 0630-0700 | Georgia, Georgian Radio | 11805eu | | | | |
| 0600-0700 | Malaysia, Voice of | 6175as | 9750as | 15295au | | 0630-0700 mtwhfa | Malta, VO Mediterranean | 9660eu | | | | |
| 0600-0700 | New Zealand, R NZ Intl | 11905pa | | | | 0630-0700 | UK, BBC World Service | 5975am 9410eu 11760me | 6175am 12095eu 15565eu | 6180eu 15575as 17640af | 7325eu | |
| 0600-0630 | Nigeria, FRCN/Radio | 3326do | 4770do | 4990do | 9570do | 0630-0700 as | UK, BBC World Service | 3955eu | 6195eu | | | |
| 0600-0700 | Nigeria, Voice of | 7255af | 15120af | | | 0630-0645 s | UK, BBC World Service | 6010eu | 9740eu | | | |
| 0600-0700 vl | Papua New Guinea, NBC | 9675do | | | | 0630-0700 | USA, Voice of America | 5995me 15205eu | 7170eu | 11805eu | 11825me | |
| 0600-0700 | Romania, R Romania Intl | 5965eu | 6095eu | | | 0630-0700 as | USA, Voice of America | 5970af 11950af | 6035af 12080af | 6080af 15600af | 7285af | |
| 0600-0700 | Russia, Voice of Russia WS | 5905na 6065na 12055as 15460as 17860as 21790as | 5920na 7175na 15470as | 5930na 9580na 17570as | 6005na 12025as 17795as | 0630-0645 mtwhfa | Vatican State, Vatican R | 4005eu 9645eu 9660af | 5883eu 11740eu 11625af | 6185eu 15595eu 13765af | 7250eu | |
| 0600-0630 | S Africa, Channel Africa | 11900af | | | | 0630-0700 | Vatican State, Vatican R | 7105eu | 9510eu | 9625eu | 11775eu | |
| 0600-0630 | S Africa, Trans World R | 11735af | | | | 0640-0656 | Romania, R Romania Intl | 9755eu | | | | |
| 0600-0610 | Sierra Leone, SLBS | 3316do | | | | 0645-0700 as | Monaco, Trans World Radio | 5875eu | 7260eu | | | |
| 0600-0700 | Singapore, SBC Radio One | 6160do | | | | 0645-0700 | UK, BBC World Service | 9755eu | | | | |
| 0600-0700 vl | Solomon Islands, SIBC | 5020do | | | | 0655-0700 mtwhf | Monaco, Trans World Radio | 9755eu | | | | |

SELECTED PROGRAMS

Sundays

- 0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0615 UK, BBC London (af): Variable Feature. See S 0130.
- 0615 UK, BBC London (am/as/eu): Letter from America. See S 0030.
- 0630 Switzerland, Swiss R Intl: News. See S 0400.
- 0630 UK, BBC London (af): African Perspective. A considered view of life and issues facing the African continent.
- 0630 UK, BBC London (am/eu): A Jolly Good Show. Dave Lee Travis presents your record requests and dedications in his own unique way.
- 0630 UK, BBC London (am/eu): Play of the Week (Am). See S 0530.
- 0630 UK, BBC London (as): Meridian. A topical program about the world of the arts featuring books, a live report about theater, or a special event.
- 0635 Switzerland, Swiss R Intl: Newsnet. See S 0405.

Mondays

- 0600 UK, BBC London (af/as): World News. See S 0100.
- 0600 UK, BBC London (am/eu): Newsday. See S 0200.
- 0615 UK, BBC London (af): Sports Roundup. See S 0145.
- 0615 UK, BBC London (as): Seven Days. Roundup of the week's news, plus sports highlights, finance and the weather.
- 0630 Switzerland, Swiss R Intl: News. See S 0400.
- 0630 UK, BBC London (af): Network Africa. See M 0330.
- 0630 UK, BBC London (am/eu): Omnibus. See S 1715.
- 0630 UK, BBC London (am/eu): Variable Feature. See S 0130.
- 0630 UK, BBC London (as): Jazzmatazz. See S 0730.
- 0635 Switzerland, Swiss R Intl: Newsnet. See S 0405.

Tuesdays

- 0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0615 UK, BBC London (af): Sports Roundup. See S 0145.
- 0615 UK, BBC London (am/as/eu): Insight. See M 1645.
- 0630 Switzerland, Swiss R Intl: News. See S 0400.

- 0630 UK, BBC London (af): Network Africa. See M 0330.
- 0630 UK, BBC London (am/eu): Variable Feature. See S 0130.
- 0630 UK, BBC London (as): Composer of the Month. See M 1930.
- 0635 Switzerland, Swiss R Intl: Newsnet. See S 0405.

Wednesdays

- 0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0615 UK, BBC London (af): Sports Roundup. See S 0145.
- 0615 UK, BBC London (am/as/eu): Insight. See M 1645.
- 0630 Switzerland, Swiss R Intl: News. See S 0400.
- 0630 UK, BBC London (af): Network Africa. See M 0330.
- 0630 UK, BBC London (am/eu): World of Football. See W 0530.
- 0630 UK, BBC London (as): Meridian On Screen. See M 1930.
- 0635 Switzerland, Swiss R Intl: Newsnet. See S 0405.

Thursdays

- 0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0615 UK, BBC London (af): Sports Roundup. See S 0145.
- 0615 UK, BBC London (am/as/eu): Insight. See M 1645.
- 0630 Switzerland, Swiss R Intl: News. See S 0400.
- 0630 UK, BBC London (af): Network Africa. See M 0330.
- 0630 UK, BBC London (am/as/eu): Meridian. See S 0630.
- 0635 Switzerland, Swiss R Intl: Newsnet. See S 0405.

Fridays

- 0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0615 UK, BBC London (af): Sports Roundup. See S 0145.
- 0615 UK, BBC London (am/as/eu): Insight. See M 1645.
- 0630 Switzerland, Swiss R Intl: News. See S 0400.
- 0630 UK, BBC London (af): Network Africa. See M 0330.
- 0630 UK, BBC London (am): Pick of the World. See M 0130.
- 0630 UK, BBC London (am/eu): Variable Feature. See S 0130.
- 0630 UK, BBC London (as): Music Review. See S 0230.
- 0635 Switzerland, Swiss R Intl: Newsnet. See S 0405.

Saturdays

- 0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0615 UK, BBC London (af): Letter from America. See S 0030.
- 0615 UK, BBC London (am/eu): The New Europe. A new program that looks at issues affect European countries in transition to the European union.
- 0615 UK, BBC London (as): Insight. See M 1645.
- 0630 Switzerland, Swiss R Intl: News. See S 0400.
- 0630 UK, BBC London (af): African News. See S 1740.
- 0630 UK, BBC London (am/as/eu): Meridian. See S 0630.
- 0631 UK, BBC London (af): African Quiz (1). See S 0330.
- 0631 UK, BBC London (af): This Week and Africa. See A 0431.
- 0635 Switzerland, Swiss R Intl: Newsnet. See S 0405.

HAUSER'S HIGHLIGHTS CROATIA: ZAGREB

Z98 registrations for Zagreb, 100 kW:

| KHz | UTC |
|------|-----------|
| 5900 | 1600-1900 |
| 6025 | 0600-1200 |
| 6145 | 0400-0600 |
| 7125 | 1200-1800 |
| 7185 | 0800-1200 |
| 9830 | 0500-1600 |

(HFCC via Bob Padula, EDXP)

FREQUENCIES

| | | | | | | | | | | | |
|------------------|----------------------------|---------|---------|---------|---------|------------------|----------------------------|---------|---------|---------|---------|
| 0700-0800 | Anguilla, Caribbean Beacon | 6090am | | | | 0800-0900 | Albania, TWR Tirana | 9685eu | | | |
| 0700-0800 | Australia, Radio | 9660pa | 11880pa | 12080pa | 13605pa | 0800-0900 | Anguilla, Caribbean Beacon | 6090am | | | |
| | | 15240pa | 15415as | 15510as | 17750as | 0800-0830 | Australia, Radio | 5995pa | 9580pa | 9710pa | 11880pa |
| | | | | | | | | 12080pa | 15415as | 15510as | 17750as |
| 0700-0800 vl | Australia, VL8K Katherine | 5025do | | | | 0800-0830 vl | Australia, VL8K Katherine | 5025do | | | |
| 0700-0800 vl | Australia, VL8T Tent Crk | 4910do | | | | 0800-0830 vl | Australia, VL8T Tent Crk | 4910do | | | |
| 0700-0800 | Canada, CFRX Toronto | 6070do | | | | 0800-0900 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0700-0800 | Canada, CFVP Calgary | 6030do | | | | 0800-0900 | Canada, CFRX Toronto | 6070do | | | |
| 0700-0800 | Canada, CHNX Halifax | 6130do | | | | 0800-0900 | Canada, CFVP Calgary | 6030do | | | |
| 0700-0800 | Canada, CKZU Vancouver | 6160do | | | | 0800-0900 | Canada, CHNX Halifax | 6130do | | | |
| 0700-0800 | Costa Rica, RF Peace Intl | 7385am | | 15050am | | 0800-0900 | Canada, CKZU Vancouver | 6160do | | | |
| 0700-0800 | Ecuador, HCJB | 5865eu | 9640pa | 21455am | | 0800-0900 | Costa Rica, RF Peace Intl | 6980am | 15050am | | |
| 0700-0800 as | Eqt Guinea, R East Africa | 15186af | | | | 0800-0857 | Czech Rep, Radio Prague | 9505eu | 11600as | | |
| 0700-0800 mtwhf | Eqt Guinea, Radio Africa | 15186af | | | | 0800-0900 | Ecuador, HCJB | 5865eu | 9640pa | 21455am | |
| 0700-0800 | Germany, Overcomer Ministr | 9500au | | | | 0800-0900 as | Eqt Guinea, R East Africa | 15186af | | | |
| 0700-0715 | Ghana, Ghana Broadc Corp | 3366do | 4915do | | | 0800-0900 mtwhf | Eqt Guinea, Radio Africa | 15186af | | | |
| 0700-0800 | Guyana, GBC/Voice of | 5950do | | | | 0800-0805 s | Ghana, Ghana Broadc Corp | 3366do | | | |
| 0700-0730 vl | Italy, IRRS | 3985va | | | | 0800-0900 | Guam, TWR/KTWR | 15200as | | | |
| 0700-0800 vl | Kenya, Kenya Broadc Corp | 4885do | 4935do | 6150do | | 0800-0900 | Guyana, GBC/Voice of | 5950do | | | |
| 0700-0800 vl | Kiribati, Radio | 9810do | | | | 0800-0900 | Indonesia, Voice of | 11785as | | | |
| 0700-0800 | Liberia, Radio Veritas | 5470do | | | | 0800-0900 fas/vl | Italy, IRRS | 7120va | | | |
| 0700-0800 | Liberia, Star Radio | 3400do | | | | 0800-0900 vl | Kiribati, Radio | 9810do | | | |
| 0700-0715 | Liberia, LCN/R Liberia Int | 5100do | | | | 0800-0900 | Liberia, Radio Veritas | 5470do | | | |
| 0700-0800 | Malaysia, Radio | 7295do | | | | 0800-0900 | Liberia, LCN/R Liberia Int | 5100do | | | |
| 0700-0800 | Malaysia, Voice of | 6175as | 9750as | 15295au | | 0800-0900 | Malaysia, Radio | 7295do | | | |
| 0700-0730 mtwhfa | Malta, VO Mediterranean | 9660eu | | | | 0800-0830 | Malaysia, Voice of | 6175as | 9750as | 15295au | |
| 0700-0800 s | Malta, VO Mediterranean | 9660eu | | | | 0800-0900 s | Malta, VO Mediterranean | 9660eu | | | |
| 0700-0800 | Monaco, Trans World Radio | 9755eu | | | | 0800-0835 a | Monaco, Trans World Radio | 9755eu | | | |
| 0700-0716 mtwhf | New Zealand, R NZ Intl | 11905pa | | | | 0800-0850 s | Monaco, Trans World Radio | 9755eu | | | |
| 0700-0758 as | New Zealand, R NZ Intl | 11905pa | | | | 0800-0820 mtwhf | Monaco, Trans World Radio | 9755eu | | | |
| 0700-0730 s | Norway, Radio Norway Intl | 9590va | 11625va | | | 0800-0900 | Netherlands, Radio | 9720pa | 9820pa | | |
| 0700-0800 vl | Papua New Guinea, NBC | 9675do | | | | 0800-0900 | New Zealand, R NZ Intl | 9795pa | | | |
| 0700-0756 | Romania, R Romania Intl | 11775af | 15365af | 17775af | | 0800-0830 s | Norway, Radio Norway Intl | 11625au | | | |
| 0700-0800 | Russia, Voice of Russia WS | 9875as | 12025as | 12055as | 15460as | 0800-0805 | Pakistan, Radio | 15530eu | 17555eu | 17835eu | |
| | | 17495as | 17795as | 17860as | | 0800-0900 as | Palau, KHBN/Voice of Hope | 9985as | | | |
| | | | | | | 0800-0900 vl | Papua New Guinea, NBC | 9675do | | | |
| 0700-0710 | Sierra Leone, SLBS | 3316do | | | | 0800-0900 | Russia, Voice of Russia WS | 9825au | 9835au | 9875as | 17495as |
| 0700-0800 | Singapore, SBC Radio One | 6160do | | | | | | 17795as | 17860as | | |
| 0700-0800 vl | Solomon Islands, SIBC | 5020do | | | | 0800-0900 f | Seychelles, FEBA Radio | 15540as | | | |
| 0700-0800 | South Korea, R Korea Intl | 9570au | 13670eu | | | 0800-0810 | Sierra Leone, SLBS | 3316do | | | |
| 0700-0735 | Swaziland, Trans World R | 6100af | 9500af | 9650af | | 0800-0900 | Singapore, SBC Radio One | 6160do | | | |
| 0700-0800 | Taiwan, Radio Taipei Intl | 5950na | | | | 0800-0900 vl | Solomon Islands, SIBC | 5020do | | | |
| 0700-0715 | UK, BBC African Service | 6005af | 6190af | 9600af | 11940af | 0800-0805 as | Swaziland, Trans World R | 6100af | 9500af | 9650af | |
| | | 17830af | | | | 0800-0900 as | UK, BBC African Service | 17885af | | | |
| 0700-0800 as | UK, BBC African Service | 17885af | | | | 0800-0810 | UK, BBC Asian Service | 7145pa | 11750as | 11955pa | 15310as |
| 0700-0800 | UK, BBC Asian Service | 7145pa | 9740as | 11955pa | 15310as | | | 15360as | 17760as | 17790as | 21660as |
| | | | | | | | | 17325eu | 17760as | 17790as | 21660as |
| | | | | | | | | 9410eu | 9410eu | 11760me | 12095eu |
| | | | | | | | | 15485eu | 15565eu | 17640eu | |
| 0700-0730 | UK, BBC World Service | 15485eu | 15565eu | 15575as | 17640eu | 0800-0900 | UK, BBC World Service | 15485eu | 15565eu | 17640eu | |
| | | | | | | | | 15575as | | | |
| 0700-0800 | USA, KAIJ Dallas TX | 5810am | | | | 0800-0900 as | UK, BBC World Service | 15575as | | | |
| 0700-0800 | USA, KTBN Salt Lk City UT | 7510am | | | | 0800-0900 | USA, KAIJ Dallas TX | 5810am | | | |
| 0700-0800 | USA, KWHR Naalehu HI | 17555pa | 17780as | | | 0800-0859 s | USA, KHBI N Mariana Is | 15665eu | | | |
| 0700-0800 | USA, WEWN Birmingham AL | 5825eu | | | | 0800-0900 | USA, KNLS Anchor Point AK | 9615as | | | |
| 0700-0800 | USA, WHRA Greenbush ME | 11565af | | | | 0800-0900 | USA, KTBN Salt Lk City UT | 7510am | | | |
| 0700-0800 | USA, WHRI Noblesville IN | 5745am | 7315am | | | 0800-0900 | USA, KWHR Naalehu HI | 11565pa | 17780as | | |
| 0700-0800 | USA, WJCR Upton KY | 7490na | | | | 0800-0900 | USA, WEWN Birmingham AL | 5825eu | | | |
| 0700-0800 | USA, WWCR Nashville TN | 2390am | 3210am | 5070am | 5935am | 0800-0900 | USA, WHRI Noblesville IN | 5745am | 7315am | | |
| 0700-0800 | USA, WYFR Okeechobee FL | 7355eu | 9355af | 9985af | | 0800-0900 | USA, WJCR Upton KY | 7490na | | | |
| 0700-0800 vl | Vanuatu, Radio | 3945do | 4960do | | | 0800-0900 | USA, WMLK Bethel PA | 9465am | | | |
| 0700-0800 | Zambia, Christian Voice | 6065af | | | | 0800-0859 sa | USA, WSHB Cypress Crk SC | 7535eu | | | |
| 0700-0800 vl | Zambia, R Zambia/ZNBC 1 | 7220do | | | | 0800-0859 smtwh | USA, WSHB Cypress Crk SC | 9845pa | | | |
| 0700-0800 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | | | 0800-0900 | USA, WWCR Nashville TN | 2390am | 3210am | 5070am | 5935am |
| 0700-0800 vl | Zimbabwe, Zimbabwe BC | 5975do | | | | 0800-0900 | USA, WYFR Okeechobee FL | 7395na | | | |
| 0703-0710 as | Croatia, Croatian Radio | 6025eu | 9830eu | | | 0800-0900 | Zambia, Christian Voice | 6065af | | | |
| 0715-0730 s | Greece, Voice of | 7430eu | 7450eu | 9425au | 9775au | 0800-0900 vl | Zambia, R Zambia/ZNBC 1 | 7220do | | | |
| | | 11645eu | | | | 0800-0900 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | | |
| 0715-0730 | UK, BBC African Service | 6005af | 6190af | 9600af | 11940af | 0800-0900 vl | Zimbabwe, Zimbabwe BC | 5975do | | | |
| | | 15400af | | | | 0803-0810 mtwhf | Croatia, Croatian Radio | 6025eu | 7185eu | 9830eu | |
| | | | | | | 0810-0900 | UK, BBC Asian Service | 9740as | 11750as | 11955pa | 15310as |
| 0715-0730 | UK, BBC World Service | 9635eu | 11680eu | 11845eu | 13745eu | | | 15360as | 17760as | 21660as | |
| | | 15325eu | | | | | | 4770do | 4990do | | |
| 0717-0800 mtwhf | New Zealand, R NZ Intl | 9795pa | | | | | | 6080as | 9580pa | 9710pa | |
| 0730-0755 | Belgium, R Vlaanderen Int | 7290eu | 9940au | | | | | 12080pa | 15415as | 15510pa | 17750as |
| 0730-0740 s | Greece, Voice of | 7430eu | 7450eu | 9425au | 9775au | 0830-0900 vl | Australia, VL8A Alice Spg | 2310do | | | |
| | | 11645eu | | | | 0830-0900 vl | Australia, VL8K Katherine | 2485do | | | |
| 0730-0800 fas/vl | Italy, IRRS | 7120va | | | | 0830-0900 vl | Australia, VL8T Tent Crk | 2325do | | | |
| 0730-0800 | Netherlands, Radio | 9730pa | 9820pa | | | 0830-0900 | Austria, R Austria Intl | 6155eu | 13730eu | 17870me | |
| 0730-0800 | Switzerland, Swiss R Intl | 9885af | 11860af | 13635af | | 0830-0900 | Georgia, Georgian Radio | 11910eu | | | |
| 0730-0800 | UK, BBC African Service | 6190af | 9600af | 11940af | 15400af | 0830-0900 | Italy, AWR Europe | 7230eu | | | |
| | | 17830af | | | | 0830-0900 | Lithuania, Radio Vlnius | 9710eu | | | |
| 0730-0800 | UK, BBC World Service | 5975am | 6175am | 7325eu | 9410eu | 0830-0900 | Slovakia, R Slovakia Intl | 11990as | 17485au | 21705au | |
| | | 11760me | 12095eu | 15485eu | 15565eu | 0830-0900 | South Korea, R Korea Intl | 9570as | 13670eu | | |
| | | 17640eu | | | | 0830-0900 | Switzerland, Swiss R Intl | 9885au | 13685au | | |
| 0730-0800 as | UK, BBC World Service | 15575as | | | | 0830-0900 | UK, BBC African Service | 6190af | 11940af | 15400af | 17830af |
| 0730-0745 | UK, BBC World Service | 5875eu | 7260eu | | | 0855-0900 | Guam, TWR/KTWR | 15330pa | | | |
| 0735-0800 as | Swaziland, Trans World R | 6100af | 9500af | 9650af | | | | | | | |
| 0740-0800 | Guam, TWR/KTWR | 15200as | | | | | | | | | |
| 0745-0800 | Albania, TWR Tirana | 9685eu | | | | | | | | | |
| 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do | 4915do | | | | | | | | |
| 0759-0800 as | New Zealand, R NZ Intl | 9795pa | | | | | | | | | |

FREQUENCIES

| | | | | | |
|------------------|----------------------------|---------|---------|---------|---------|
| 0900-0920 as | Albania, TWR Tirana | 9685eu | | | |
| 0900-1000 | Anguilla, Caribbean Beacon | 6090am | | | |
| 0900-1000 | Australia, Radio | 6080as | 9580pa | 9770as | 11880as |
| | | 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 | 11755pa | | |
| 0900-1000 | Costa Rica, RF Peace Intl | 6980am | 15050am | | |
| 0900-1000 | Ecuador, HCJB | 9640pa | 21455am | | |
| 0900-1000 as | Eqt Guinea, R East Africa | 15186af | | | |
| 0900-1000 mtwhf | Eqt Guinea, Radio Africa | 15186af | | | |
| 0900-0950 | Germany, Deutsche Welle | 6160pa | 9565af | 12055as | 15205af |
| | | 15410af | 17715as | 17800af | 21600af |
| | | 21680as | | | |
| 0900-0915 mtwhf | Ghana, Ghana Broadc Corp | 3366do | 4915do | | |
| 0900-1000 | Guam, TWR/KTWR | 15330as | | | |
| 0900-0915 | Guam, TWR/KTWR | 15200as | | | |
| 0900-1000 | Guyana, GBC/Voice of | 5950do | | | |
| 0900-1000 fas/vl | Italy, IRRS | 7120va | | | |
| 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 | | |
| 0900-0925 | Netherlands, Radio | 9720pa | 9820pa | | |
| 0900-1000 | New Zealand, R NZ Intl | 9795pa | | | |
| 0900-1000 vl | Papua New Guinea, NBC | 4890do | | | |
| 0900-1000 | Singapore, SBC Radio One | 6160do | | | |
| 0900-1000 vl | Solomon Islands, SIBC | 5020do | | | |
| 0900-1000 | UK, BBC African Service | 6190af | 11940af | 15400af | 17830af |
| | | 17885af | | | |
| 0900-0915 | UK, BBC Asian Service | 6065as | 6195as | 7235as | 9580as |
| | | 9740as | 11750as | 11765as | 11955as |
| | | 15280as | 15310as | 15360as | 17760as |
| | | 17790as | 21660as | | |
| 0900-1000 | UK, BBC World Service | 9410eu | 11760me | 12095eu | 15190sa |
| | | 15485eu | 15565eu | 15575as | 17640eu |
| | | 17705af | | | |
| 0900-1000 | USA, KAIJ Dallas TX | 5810am | | | |
| 0900-0959 | USA, KHBI N Mariana Is | 13840au | | | |
| 0900-1000 | USA, KTBN Salt Lk City UT | 7510am | | | |
| 0900-1000 | USA, KWHR Naalehu HI | 11565pa | 17780as | | |
| 0900-1000 | USA, WEWN Birmingham AL | 5825na | 7465eu | | |
| 0900-1000 | USA, WGTG McCaysville GA | 9400am | | | |
| 0900-1000 | USA, WHRI Noblesville IN | 5745am | 7315am | | |
| 0900-1000 | USA, WJCR Upton KY | 7490na | | | |
| 0900-1000 | USA, WRNO New Orleans LA | 15420am | | | |
| 0900-0959 th | USA, WSHB Cypress Crk SC | 7535eu | | | |
| 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 | | | |
| 0915-1000 | Ghana, Ghana Broadc Corp | 6130do | 7295do | | |
| 0915-0945 | UK, BBC Asian Service | 6065as | 6195as | 7235as | 9580as |
| | | 9740as | 11750as | 11765as | 11955as |
| | | 15280as | 15360as | 21660as | |
| 0915-0945 as | UK, BBC Asian Service | 6065as | 6195as | 7235as | 9580as |
| | | 9740as | 11765as | 11955as | 15280as |
| | | 15360as | 21660as | | |
| 0915-0930 | UK, BBC World Service | 11680eu | 13745eu | 15325eu | 15340eu |
| | | 17695eu | | | |
| 0930-1000 | Austria, R Austria Intl | 15455as | 17870au | | |
| 0930-1000 | Canada, CKZN St John's | 6160do | | | |
| 0930-1000 | Georgia, Georgian Radio | 11910eu | | | |
| 0930-1000 | Netherlands, Radio | 12065as | 13710as | | |
| 0930-1000 | Philippines, FEBC/R Intl | 11635as | | | |
| 0935-0950 s | Albania, TWR Tirana | 9685eu | | | |
| 0945-1000 | UK, BBC Asian Service | 6195as | 9740as | 11750as | 11765as |
| | | 15360as | 21660as | | |
| 0945-1000 a | UK, BBC Asian Service | 6065as | 7235as | 9580as | 11955as |
| | | 15280as | | | |
| 0945-1000 smtwhf | UK, BBC Slow Speed News | 6065as | 7235as | 9580as | 11955as |
| | | 15280as | | | |
| 1000-1100 | Anguilla, Caribbean Beacon | 6090am | | | |
| 1000-1100 | Australia, Radio | 6080as | 9580pa | 11880as | 17750as |
| 1000-1100 vl | Australia, VL8A Alice Spg | 2310do | | | |
| 1000-1100 vl | Australia, VL8K Katherine | 2485do | | | |
| 1000-1100 vl | Australia, VL8T Tent Crk | 2325do | | | |
| 1000-1100 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 1000-1100 | Canada, 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 | 11755pa | | |
| 1000-1100 | Costa Rica, RF Peace Intl | 6980am | 15050am | | |
| 1000-1030 | Czech Rep, Radio Prague | 17485af | 21705me | | |
| 1000-1100 | Ecuador, HCJB | 9640pa | 21455am | | |
| 1000-1100 as | Eqt Guinea, R East Africa | 15186af | | | |
| 1000-1100 mtwhf | Eqt Guinea, Radio Africa | 15186af | | | |
| 1000-1030 | Guam, AWR/KSDA | 7455as | | | |
| 1000-1100 | Guam, TWR/KTWR | 9865as | | | |
| 1000-1100 | India, All India Radio | 11585au | 11735au | 13700au | 15050au |
| | | 17387au | 17840as | | |
| 1000-1100 fas/vl | Italy, IRRS | 7120va | | | |
| 1000-1100 | Japan, R Japan/NHK World | 9695as | 11730as | 11850pa | |
| 1000-1100 | Jordan, Radio | 11690eu | | | |
| 1000-1100 | Liberia, Radio Veritas | 5470do | | | |
| 1000-1100 | Malaysia, Radio | 7295do | | | |
| 1000-1100 irreg | Malaysia, RTM KotaKinabalu | 5980do | | | |
| 1000-1100 s | Malta, VO Mediterranean | 9660eu | | | |
| 1000-1030 | Netherlands, Radio | 12065as | 13710as | | |
| 1000-1100 | New Zealand, R NZ Intl | 9795pa | | | |
| 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, SBC Radio One | 6160do | | | |
| 1000-1100 vl | Solomon Islands, SIBC | 5020do | | | |
| 1000-1030 | Switzerland, Swiss R Intl | 6165eu | 9535eu | | |
| 1000-1100 | UK, BBC African Service | 6190af | 11940af | 17885af | |
| 1000-1100 as | UK, BBC African Service | 15400af | | | |
| 1000-1100 | UK, BBC Asian Service | 6195as | 9740as | 11750as | 11765as |
| | | 15310as | 15360as | 17790as | 21660as |
| 1000-1100 | UK, BBC World Service | 9410eu | 11760me | 12095eu | 15485eu |
| | | 15565eu | 15575as | 17640eu | 17705af |
| 1000-1100 as | UK, BBC World Service | 15190sa | | | |
| 1000-1100 | USA, KAIJ Dallas TX | 5810am | | | |
| 1000-1059 smtha | USA, KHBI N Mariana Is | 15665as | 15725as | | |
| 1000-1100 | USA, KTBN Salt Lk City UT | 7510am | | | |
| 1000-1100 | USA, KWHR Naalehu HI | 9930as | 11565pa | | |
| 1000-1100 | USA, Voice of America | 5985pa | 6165am | 7405am | 9590am |
| | | 11720pa | 15425pa | | |
| | | 1720pa | 7465eu | | |
| 1000-1100 | USA, WEWN Birmingham AL | 5825na | | | |
| 1000-1100 | USA, WGTG McCaysville GA | 9400am | | | |
| 1000-1100 | USA, WHRI Noblesville IN | 6040am | 9495am | | |
| 1000-1100 | USA, WJCR Upton KY | 7490na | | | |
| 1000-1100 | USA, WRNO New Orleans LA | 15420am | | | |
| 1000-1059 mwh | USA, WSHB Cypress Crk SC | 6095na | | | |
| 1000-1059 s | USA, WSHB Cypress Crk SC | 7395am | | | |
| 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 | 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 | | | |
| 1030-1055 | Belgium, R Vlaanderen Int | 9925eu | 15595eu | | |
| 1030-1100 mtwhf | Ethiopia, Radio | 5990do | 7110do | 9705do | |
| 1030-1100 | Guam, AWR/KSDA | 7455as | 9530as | | |
| 1030-1035 | Israel, Kol Israel | 15640eu | 15650na | | |
| 1030-1100 | Netherlands, Radio | 6045eu | 9860eu | 12065as | 13710as |
| 1030-1100 | South Korea, R Korea Intl | 9650am | | | |
| 1030-1100 | Sri Lanka, Sri Lanka BC | 11835as | 15120as | 17850as | |
| 1030-1055 | UAE, Radio Dubai | 13675eu | 15395eu | 21605eu | |
| 1030-1045 mtwhfa | Vatican State, Vatican R | 5883eu | 9645eu | 11740eu | |
| 1040-0920 tw | Kazakhstan, R Aلماتy Intl | 9505eu | 9620eu | 11840eu | |
| 1045-1100 mtwhf | USA, WRMI/R Miami Intl | 9955am | | | |



Your Name in Lights!

... or at least in ink within the *Monitoring Times* Shortwave Guide. Please send us your "best catches" on the worldwide shortwave bands — QSLs, that is — and we will try to use them in future issues of *MT*. Your QSLs will be returned.

FREQUENCIES

| | | | | | | | | | | | |
|-------------------|-----------------------------|------------------------------|--------------------|--------------------|--------------------|------------------|---------------------------|------------------|-------------------|-------------------|-------------------|
| 1300-1400 | Anguilla, Caribbean Beacon | 11775am | | | | 1300-1400 | UK, BBC Asian Service | 5990as | 6195as | 9740as | 11750as |
| 1300-1330 | Australia, Radio | 5995pa 9770as | 6020pa | 6080as | 9580pa | 1300-1400 | UK, BBC World Service | 5965na 9590na | 6195am 11760me | 9410eu 12095eu | 9515na 15220am |
| 1300-1400 vl | Australia, VL8A Alice Spg | 2310do | | | | 1300-1400 | USA, KAIJ Dallas TX | 13815am | | | |
| 1300-1400 vl | Australia, VL8K Katherine | 2485do | | | | 1300-1359 | USA, KHBI N Mariana Is | 9355as | 9385as | | |
| 1300-1400 vl | Australia, VL8T Tent Crk | 2325do | | | | 1300-1400 | USA, KJES Mesquite NM | 11715am | | | |
| 1300-1320 | Brazil, Radio Bras | 15445na | | | | 1300-1400 | USA, KNLS Anchor Point AK | 7365as | | | |
| 1300-1400 vl | Canada, CBC N Quebec Svc | 9625do | | | | 1300-1400 | USA, KTVN Salt Lk City UT | 7510am | | | |
| 1300-1400 | Canada, CFRX Toronto | 6070do | | | | 1300-1400 | USA, KWHR Naalehu HI | 9930as | 11565pa | | |
| 1300-1400 | Canada, CFVP Calgary | 6030do | | | | 1300-1400 | USA, Voice of America | 6160as | 11715as | 15425as | 11705as |
| 1300-1400 | Canada, CHNX Halifax | 6130do | | | | 1300-1400 | USA, WEWN Birmingham AL | 9455na | 11875na | 15745eu | |
| 1300-1400 | Canada, CKZN St John's | 6160do | | | | 1300-1400 | USA, WGTG McCaysville GA | 9400am | | | |
| 1300-1400 | Canada, CKZU Vancouver | 6160do | | | | 1300-1400 | USA, WHRI Noblesville IN | 6040am | 15105am | | |
| 1300-1330 | Canada, R Canada Intl | 9640na | 11855na | | | 1300-1400 | USA, WJCR Upton KY | 7490na | | | |
| 1300-1400 | China, China Radio Intl | 6140as 11675as | 7385pa 11980as | 9945as | 11660as | 1300-1400 | USA, WRMI/R Miami Intl | 9955am | | | |
| 1300-1400 | Costa Rica, RF Peace Intl | 6980am | 15050am | | | 1300-1400 | USA, WRNO New Orleans LA | 7395am | | | |
| 1300-1400 | Ecuador, HCJB | 12005am | 15115am | 21455am | | 1300-1359 tf | USA, WSHB Cypress Crk SC | 9455am | | | |
| 1300-1330 | Egypt, Radio Cairo | 17595as | | | | 1300-1359 smtwha | USA, WSHB Cypress Crk SC | 9430na | | | |
| 1300-1400 | Eq Guinea, R East Africa | 15186af | | | | 1300-1400 | USA, WWCR Nashville TN | 9475am | 12160am | 13845am | 15685am |
| 1300-1400 | Eq Guinea, Radio Africa | 9530as | | | | 1300-1400 | USA, WYFR Okeechobee FL | 5950na | 11830na | 11970na | 13695na |
| 1300-1400 vl | Georgia, Voice of Hope | 9310as | | | | 1300-1400 | Zambia, Christian Voice | 15695na | | | |
| 1300-1330 s | Germany, Universal Life | 9710eu | 12000as | | | 1300-1400 vl | Zambia, R Zambia/ZNBC 1 | 6065af | | | |
| 1300-1400 fas/vl | Italy, IRRS | 7120va | | | | 1300-1400 vl | Zambia, R Zambia/ZNBC 2 | 7220do | | | |
| 1300-1400 | Jordan, Radio | 11690eu | | | | 1315-1400 mtwhfa | Bhutan, Bhutan BC Service | 6165do | | | |
| 1300-1310 | Liberia, LCN/R Liberia Intl | 5100do | | | | 1300-1400 | Australia, Radio | 5030do | | | |
| 1300-1400 | Malaysia, Radio | 7295do | | | | 1300-1400 | | 6020pa | 6080as | 9580pa | 9770as |
| 1300-1400 irreg | Malaysia, RTM KotaKinabalu | 5980do | | | | 1330-1355 | Austria, R Austria Intl | 11660as | 12080as | | |
| 1300-1400 occsnal | New Zealand, R NZ Intl | 6105pa | | | | 1330-1359 | Canada, R Canada Intl | 6155eu | 13730na | | |
| 1300-1330 s | Norway, Radio Norway Intl | 9590eu | 9905as | 13790am | 13800va | 1330-1400 | China, Heilongjiang PBS | 6150as | 9535as | 9640na | 11855na |
| 1300-1400 | Palau, KHBN/Voice of Hope | 9985as | | | | 1330-1400 | Guam, AWR/KSDA | 4840do | | | |
| 1300-1400 vl | Papua New Guinea, NBC | 4890do | | | | 1330-1400 | India, All India Radio | 9650as | 13720as | | |
| 1300-1400 | Philippines, FEBC/R Intl | 11995as | | | | 1330-1400 | Netherlands, Radio | 9545as | 11620as | 13710as | |
| 1300-1356 | Romania, R Romania Intl | 15250eu | 15390eu | 17735eu | 17745eu | 1330-1400 | Sweden, Radio | 9990as | 15585as | | |
| 1300-1400 | Russia, Voice of Russia WS | 7130me 9840me | 7390as 11695as | 9450as 17675af | 9470me | 1330-1400 | UAE, Radio Dubai | 13740as | 15240na | 17515au | |
| 1300-1400 as | S Africa, Channel Africa | 9440af | | | | 1330-1355 | | 13630eu | 13675eu | 15395eu | 17825eu |
| 1300-1400 | Singapore, R Singapore Int | 6155as | | | | 1330-1400 | Uzbekistan, R Tashkent | 21605eu | | | |
| 1300-1400 | Sri Lanka, Sri Lanka BC | 9730as | 15425as | | | 1330-1400 | Vietnam, Voice of | 5060as | 5975as | 6025as | 9715as |
| 1300-1400 | Switzerland, Swiss R Intl | 7230as | 7480as | | | 1335-1345 | Greece, Voice of | 9840eu | 12020as | 15010as | |
| 1300-1330 | Turkey, Voice of | 9630as | 15290as | | | 1345-1400 | Liberia, Radio Veritas | 9375eu | 9590na | 15175na | 15630na |
| 1300-1400 | UK, BBC African Service | 6190af 17810af 21660af | 11940af 17830af | 15105af 17885af | 15420af 21640af | 1345-1400 | Vatican State, Vatican R | 5470do | 13765au | 15540au | |

SELECTED PROGRAMS

Sundays

- 1300 Romania, R Romania Intl: Radio Newsreel. World and Bulgarian news.
- 1300 Switzerland, Swiss R Intl: News. See S 0400.
- 1300 UK, BBC London (af/am/as/eu): Newshour. A comprehensive look at the major topics of the day, plus up-to-the-minute international and British news.
- 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
- 1315 Romania, R Romania Intl: Panorama (Radio Tour). Holiday opportunities, trekking, leisure, picturesque landscape, fun, hunting, fishing, cooking tips, stamp collecting, and hobby land.

Mondays

- 1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
- 1300 Switzerland, Swiss R Intl: News. See S 0400.
- 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
- 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
- 1315 Romania, R Romania Intl: Pro Memoria. History, archaeology, numismatics, treasures, museums, the trail of time and living history.
- 1340 Romania, R Romania Intl: Romanian Itineraries. Tourist attractions in Romania.
- 1352 Romania, R Romania Intl: Sports Roundup. The latest results in Romania matches.

Tuesdays

- 1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
- 1300 Switzerland, Swiss R Intl: News. See S 0400.
- 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
- 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
- 1315 Romania, R Romania Intl: Business Club. Economic agenda, world trade, investments in Romania, legislation, the stock exchange, business opportunities, and market wrap.
- 1325 Romania, R Romania Intl: Inside Romania. An historical perspective of life in Romania.
- 1331 Romania, R Romania Intl: Romanian Literature. Biographical sketch of a Romanian author.

- 1341 Romania, R Romania Intl: Romanian Hits. The latest Romanian pop music.

Wednesdays

- 1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
- 1300 Switzerland, Swiss R Intl: News. See S 0400.
- 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
- 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
- 1315 Romania, R Romania Intl: Society. Everyday life, grassroot people, "why me?" frame of mind, she and he, the third age, and point-counterpoint.
- 1325 Romania, R Romania Intl: Youth Club. Lively topics for younger listeners, music, and letterbox.
- 1353 Romania, R Romania Intl: Sports Roundup. See M 1352.

Thursdays

- 1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
- 1300 Switzerland, Swiss R Intl: News. See S 0400.
- 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
- 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
- 1315 Romania, R Romania Intl: Citizens of the Same Country. What brings us together, destiny, religion, who we are, and identities and standards.
- 1325 Romania, R Romania Intl: Romanian Musicians. Musical selections of the works of a Romanian musician.
- 1335 Romania, R Romania Intl: Partners in a Changing World. An interview with a representative of a visiting country.

Fridays

- 1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
- 1300 Switzerland, Swiss R Intl: News. See S 0400.
- 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
- 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
- 1315 Romania, R Romania Intl: A Time for the Future. No information available.
- 1325 Romania, R Romania Intl: The Skylark. Romanian folk music.

- 1335 Romania, R Romania Intl: Listeners' Letterbox. Mailbag program with taped messages.
- 1352 Romania, R Romania Intl: The Listeners Club. Information about how to join and how it operates.
- 1354 Romania, R Romania Intl: Sports Roundup. See M 1352.

Saturdays

- 1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
- 1300 Switzerland, Swiss R Intl: News. See S 0400.
- 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
- 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
- 1315 Romania, R Romania Intl: World of Culture. A review of cultural activities of the last week.
- 1315 Switzerland, Swiss R Intl: Capital Letters (2/4). See S 0415.
- 1315 Switzerland, Swiss R Intl: Sounds Good (3/5). See S 0415.
- 1315 Switzerland, Swiss R Intl: The Name Game (1). See S 0415.
- 1337 Romania, R Romania Intl: Inside Romania. See T 1325.
- 1348 Romania, R Romania Intl: Bucharest along the Centuries. An historical look at Romania's capital city.

PROPAGATION FORECASTING

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FREQUENCIES

| | | | | | | | | | | |
|-------------------|-----------------------------|---------|---------|---------|---------|------------------|----------------------------|---------|---------|---------|
| 1400-1500 | Anguilla, Caribbean Beacon | 11775am | | | | 1400-1455 as | S Africa, Channel Africa | 9440af | 17675af | 17870af |
| 1400-1430 | Australia, Radio | 5995pa | 6020pa | 6080as | 9770as | 1400-1500 | Singapore, SBC Radio One | 6155do | | |
| | | 11660as | 12080as | | | 1400-1500 | Singapore, R Singapore Int | 6155as | | |
| 1400-1500 vl | Australia, VL8A Alice Spg | 2310do | | | | 1400-1500 | Sri Lanka, Sri Lanka BC | 9730as | 15425as | |
| 1400-1500 vl | Australia, VL8K Katherine | 2485do | | | | 1400-1500 | Switzerland, Swiss R Intl | 9575as | 15265as | |
| 1400-1500 vl | Australia, VL8T Tent Crk | 2325do | | | | 1400-1430 | Thailand, Radio | 9530as | 9655as | 11905as |
| 1400-1500 vl | Canada, CBC N Quebec Svc | 9625do | | | | 1400-1500 | UK, BBC African Service | 6190af | 11860af | 11940af |
| 1400-1500 | Canada, CFRX Toronto | 6070do | | | | | | 17830af | 17885af | 21490af |
| 1400-1500 | Canada, CFVP Calgary | 6030do | | | | | | 21660af | | |
| 1400-1500 | Canada, CHNX Halifax | 6130do | | | | 1400-1500 | UK, BBC Asian Service | 5990as | 6195as | 9740as |
| 1400-1500 | Canada, CKZN St John's | 6160do | | | | 1400-1500 | UK, BBC World Service | 9410eu | 9515na | 9590na |
| 1400-1500 | Canada, CKZU Vancouver | 6160do | | | | | | 15220na | 15485eu | 15565eu |
| 1400-1500 smtwhf | Canada, R Canada Intl | 9640na | 11855na | | | | | 17640eu | 17705eu | 17840am |
| 1400-1500 | China, China Radio Intl | 7160as | 7260as | 7405na | 9535as | 1400-1500 | USA, KAIJ Dallas TX | 13815am | | |
| | | 9700va | 11825as | | | 1400-1459 | USA, KHBI N Mariana Is | 9355as | | |
| 1400-1500 | Costa Rica, RF Peace Intl | 7385am | 15050am | | | 1400-1500 | USA, KTBN Salt Lk City UT | 7510am | | |
| 1400-1430 | Czech Rep, Radio Prague | 13580na | 21700af | | | 1400-1500 | USA, KWHR Naalehu HI | 9930as | 11565pa | |
| 1400-1500 | Ecuador, HCJB | 12005am | 15115am | 21455am | | 1400-1500 | USA, Voice of America | 6160as | 7125as | 7215as |
| 1400-1500 as | Eq Guinea, R East Africa | 15186af | | | | | | 9760as | 11705as | 15205as |
| 1400-1457 | France, Radio France Intl | 5220as | 7110as | 11910as | 12030as | | | 15425as | | |
| | | 15405as | 17560me | | | 1400-1500 | USA, WENW Birmingham AL | 9455na | 11875na | 15745eu |
| 1400-1430 vl | Georgia, Voice of Hope | 9310as | | | | 1400-1500 | USA, WGTG McCaysville GA | 9400am | | |
| 1400-1500 | India, All India Radio | 9545as | 11620as | 13710as | | 1400-1500 | USA, WHRI Noblesville IN | 6040am | 15105am | |
| 1400-1430 | Israel, Kol Israel | 15650na | 17535na | | | 1400-1500 | USA, WJCR Upton KY | 7490na | | |
| 1400-1500 fas/vl | Italy, IRRS | 7120va | | | | 1400-1430 s | USA, WRMI/R Miami Intl | 9955am | | |
| 1400-1500 | Japan, R Japan/NHK World | 9505na | 11730as | 11880af | | 1400-1500 | USA, WRMI/R Miami Intl | 9955am | | |
| 1400-1500 | Jordan, Radio | 11690eu | | | | 1400-1500 | USA, WRNO New Orleans LA | 7395am | | |
| 1400-1500 | Liberia, Radio Veritas | 5470do | | | | 1400-1500 | USA, WWCR Nashville TN | 9475am | 12160am | 13845am |
| 1400-1500 | Malaysia, Radio | 7295do | | | | 1400-1500 | USA, WYFR Okeechobee FL | 5950na | 11830na | 17760ca |
| 1400-1500 vl | Malaysia, RTM Kuching | 4895do | 7160do | | | 1400-1405 | Vatican State, Vatican R | 13765au | 15540au | |
| 1400-1500 irreg | Malaysia, RTM Kota Kinabalu | 5980do | | | | 1400-1500 | Zambia, Christian Voice | 6065af | | |
| 1400-1430 | Mexico, Radio Mexico Intl | 9705na | | | | 1400-1500 vl | Zambia, R Zambia/ZNBC 1 | 4910do | | |
| 1400-1500 | Netherlands, Radio | 9890as | 15585as | | | 1400-1500 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | |
| 1400-1500 occsnal | New Zealand, R NZ Intl | 6105pa | | | | 1415-1420 | Nepal, Radio | 3230do | 5005do | |
| 1400-1430 s | Norway, Radio Norway Intl | 13800as | | | | 1430-1500 | Australia, Radio | 5995pa | 6020pa | 6080as |
| 1400-1500 as | Palau, KHBN/Voice of Hope | 9985as | | | | | | 9770as | 11660as | 9500as |
| 1400-1500 vl | Papua New Guinea, NBC | 4890do | | | | 1430-1500 smtwhf | Canada, R Canada Intl | 9640na | 11855na | |
| 1400-1500 | Philippines, FEBC/R Intl | 11995as | | | | 1430-1500 vl | China, China Radio Intl | 6995as | 8660as | 9880as |
| 1400-1500 | Russia, Voice of Russia WS | 4730as | 4940as | 4975as | 5925me | 1430-1500 | Guam, AWR/KSDA | 7400as | | |
| | | 7115af | 7130me | 7235as | 7245me | 1430-1445 mtwhf | USA, WRMI/R Miami Intl | 9955am | | |
| | | 7390as | 9470af | 9635me | 9725as | 1440-1500 | Myanmar, Voice of | 5990do | | |
| | | 9830me | 9840me | 11500as | | 1450-1500 | Vatican State, Vatican R | 9875au | 11640au | |

SELECTED PROGRAMS

Sundays

- 1400 Switzerland, Swiss R Intl: News. Five minutes of world news.
- 1400 UK, BBC London (af/am/as/eu): News Summary. See S 1100.
- 1401 UK, BBC London (af/am/as/eu): Variable Feature. See S 0130.
- 1401 UK, BBC London (am/as/eu): Variable Feature. See S 0130.
- 1401 UK, BBC London (am/eu/af/as): Newstalk. Robin Lustig and a well-known BBC correspondent offer listeners a chance to air their views on the main issues of the week.
- 1405 Switzerland, Swiss R Intl: Newsnet. Analyses of the main international stories by Swiss-based specialists.
- 1415 Switzerland, Swiss R Intl: Capital Letters (2/4). SRI's bimonthly mailbag and listener contact program.
- 1415 Switzerland, Swiss R Intl: Sounds Good (3/5). Music from Switzerland and the people who make it.
- 1415 Switzerland, Swiss R Intl: The Name Game (1). A chance for you to test your knowledge of Switzerland and win prizes.
- 1430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. A relaxing blend of music and interviews.
- 1430 UK, BBC London (af/as): Variable Feature. See S 0130.
- 1445 UK, BBC London (af): The Farming World. See S 0815.
- 1445 UK, BBC London (am/eu): Letter from America. See S 0030.
- 1445 UK, BBC London (as): Health Matters. See S 0115.

Mondays

- 1400 Switzerland, Swiss R Intl: News. See S 1400.
- 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.
- 1405 Switzerland, Swiss R Intl: Newsnet. See S 1405.
- 1405 UK, BBC London (af/am/as/eu): Outlook. An up-to-the-minute mix of conversation, controversy and color from around the world.
- 1430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 1430.
- 1430 UK, BBC London (af/am/eu): Pop Science. See S 1730.

1430 UK, BBC London (as): Pick of the World. See M 0130.

1430 UK, BBC London (as): Variable Feature. See S 0130.

Tuesdays

- 1400 Switzerland, Swiss R Intl: News. See S 1400.
- 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.
- 1405 Switzerland, Swiss R Intl: Newsnet. See S 1405.
- 1405 UK, BBC London (af/am/as/eu): Outlook. See M 1405.
- 1430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 1430.
- 1430 UK, BBC London (af/am/eu): Multitrack Hit-List. See M 1615.
- 1430 UK, BBC London (as): Discovery. See T 0230.

Wednesdays

- 1400 Switzerland, Swiss R Intl: News. See S 1400.
- 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.
- 1405 Switzerland, Swiss R Intl: Newsnet. See S 1405.
- 1405 UK, BBC London (af/am/as/eu): Outlook. See M 1405.
- 1430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 1430.
- 1430 UK, BBC London (af/am/eu): Megamix. See T 1615.
- 1430 UK, BBC London (as): World of Football. See W 0530.

Thursdays

- 1400 Switzerland, Swiss R Intl: News. See S 1400.
- 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.
- 1405 Switzerland, Swiss R Intl: Newsnet. See S 1405.
- 1405 UK, BBC London (af/am/as/eu): Outlook. See M 1405.
- 1430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 1430.
- 1430 UK, BBC London (af/am/eu): Multitrack X-Press. See W 1615.
- 1430 UK, BBC London (as): Assignment. See H 0230.

Fridays

- 1400 Switzerland, Swiss R Intl: News. See S 1400.
- 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.

- 1405 Switzerland, Swiss R Intl: Newsnet. See S 1405.
- 1405 UK, BBC London (af): Focus on Africa. See S 1705.
- 1405 UK, BBC London (am/as/eu): Outlook. See M 1405.
- 1430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 1430.
- 1430 UK, BBC London (af/am/eu): Multitrack Alternative. Latest developments on the British music scene.
- 1430 UK, BBC London (as): Science in Action. See M 0930.

Saturdays

- 1400 Switzerland, Swiss R Intl: News. See S 1400.
- 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 1405 Switzerland, Swiss R Intl: Newsnet. See S 1405.
- 1405 UK, BBC London (af/am/as/eu): Sportsworld. The weekly sports magazine.
- 1415 Switzerland, Swiss R Intl: Capital Letters (2/4). See S 1415.
- 1415 Switzerland, Swiss R Intl: Sounds Good (3/5). See S 1415.
- 1415 Switzerland, Swiss R Intl: The Name Game (1). See S 1415.
- 1430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 1430.

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FREQUENCIES

| | | | | | |
|------------------|----------------------------|------------------------------|--------------------|--------------------|-------------------|
| 2100-2200 | Anguilla, Caribbean Beacon | 11775am | | | |
| 2100-2130 | Australia, Radio | 5995pa 9770as 2310do | 7240pa 11880pa | 9500as 12080pa | 9660pa 17795pa |
| 2100-2130 vl | Australia, VL8A Alice Spg | 2310do | | | |
| 2100-2130 vl | Australia, VL8K Katherine | 2485do | | | |
| 2100-2200 vl | Australia, VL8K Katherine | 5025do | | | |
| 2100-2130 vl | Australia, VL8T Tent Crk | 2325do | | | |
| 2100-2200 vl | Australia, VL8T Tent Crk | 4910do | | | |
| 2100-2200 | Bulgaria, Radio | 9700eu | 11720eu | | |
| 2100-2115 vl | Cameroon, Radio Cameroon | 4850do | | | |
| 2100-2200 vl | Cameroon, Radio Garoua | 5010do | | | |
| 2100-2200 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 2100-2200 | Canada, 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 | | | |
| 2100-2200 | Canada, R Canada Intl | 5925va 11945va 17820af | 5995va 13650va | 7235va 13690va | 9805va 15150va |
| 2100-2130 | China, China Radio Intl | 5220va 9535af 6950eu | 6950eu 9635eu | 7170af 9920eu | 7180af |
| 2100-2200 | China, China Radio Intl | 6950eu | | | |
| 2100-2200 | Costa Rica, RF Peace Intl | 15050am | | | |
| 2100-2130 | Cuba, Radio Havana | 13605eu | 13615eu | 13715eu | |
| 2100-2127 | Czech Rep, Radio Prague | 5930na | 7345af | | |
| 2100-2200 | Ecuador, HCJB | 12015eu | 21455am | | |
| 2100-2200 | Egypt, Radio Cairo | 15375af | | | |
| 2100-2200 | Eq Guinea, Radio Africa | 15186af | | | |
| 2100-2150 | Germany, Deutsche Welle | 7115as 11785as 5890eu | 9670as 11865af | 9735af 15135va | 9765as |
| 2100-2115 t | Germany, Universal Life | 9835af | | | |
| 2100-2130 | Hungary, Adventist World R | 3975eu | 11700eu | | |
| 2100-2130 | Hungary, Radio Budapest | 7150au | 7410eu | 9910au | 9950eu |
| 2100-2200 | India, All India Radio | 11620eu 6035pa | 11715au 9725eu | 11850pa | 13630na |
| 2100-2200 | Japan, R Japan/NHK World | 4885do | 4935do | 6150do | |
| 2100-2107 vl | Kenya, Kenya Broadc Corp | 3450do | | | |
| 2100-2200 | Liberia, Radio Veritas | 5100do | | | |
| 2100-2115 | Liberia, LCN/R Liberia Int | 7295do | | | |
| 2100-2200 | Malaysia, Radio | 3270do | 3290do | | |
| 2100-2107 | Namibia, NBC | 17675pa | | | |
| 2100-2200 smtwh | New Zealand, R NZ Intl | 11735pa | | | |
| 2100-2106 fa | New Zealand, R NZ Intl | 3326do | 4770do | 4990do | |
| 2100-2200 | Nigeria, FRCN/Radio | 6575eu | 9345eu | 11700na | 13760na |
| 2100-2200 vl | North Korea, R Pyongyang | 4890do | | | |
| 2100-2156 | Papua New Guinea, NBC | 5955eu | 5990eu | 6175eu | 7195eu |
| 2100-2130 | Romania, R Romania Intl | 6100eu | 6185eu | | |
| 2100-2200 vl | Serbia, Radio Yugoslavia | 5020do | | | |
| 2100-2200 | Solomon Islands, SIBC | 3970eu | | | |
| 2100-2130 | South Korea, R Korea Intl | 3985eu | | | |
| 2100-2130 | Switzerland, Swiss R Intl | 9950na | 12085na | 13610na | |
| 2100-2200 | Syria, Radio Damascus | 7200eu | | | |
| 2100-2130 | Taiwan, Radio Taipei Intl | 4976do | | | |
| 2100-2110 | Turkey, Voice of | 6005af | 6190af | 11835af | |
| 2100-2200 | UK, BBC African Service | 3915as 6195as | 5965as 9740pa | 5975pa | 6120as |
| 2100-2200 | UK, BBC Asian Service | 3955eu 7325eu | 5975am 9410eu | 6180eu | 6195eu |
| 2100-2200 | UK, BBC World Service | 5905eu 6080eu | 5940eu 7205eu | 6010eu | 6020eu |
| 2100-2200 | Ukraine, R Ukraine Intl | 13815am 15590am | 15405as | | |
| 2100-2200 | USA, KAIJ Dallas TX | 17555pa | | | |
| 2100-2200 | USA, KATN Salt Lk City UT | 6035af | 6070me | 6095eu | 7415af |
| 2100-2200 | USA, KWHR Naalehu HI | 9595af | 9760eu | 11870pa | 11975af |
| 2100-2200 | USA, Voice of America | 13710af 15580af | 15185as 17725af | 15205as 17735as | 15410af |
| 2100-2200 | USA, WEWN Birmingham AL | 5825eu | 13615na | | |
| 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 | 11950ca | | | |
| 2100-2200 | USA, WJCR Upton KY | 7490na | | | |
| 2100-2130 s | USA, WRMI/R Miami Intl | 9955am | | | |
| 2100-2200 | USA, WRNO New Orleans LA | 15420am | | | |
| 2100-2159 s | USA, WSHB Cypress Crk SC | 11550eu | | | |
| 2100-2159 smwa | USA, WSHB Cypress Crk SC | 13770eu | | | |
| 2100-2200 | USA, WWCR Nashville TN | 5070am | 9475am | 13845am | 15685am |
| 2100-2200 | USA, WYFR Okeechobee FL | 7355eu | 11580af | 15565eu | |
| 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 | | | |
| 2107-2200 fa | New Zealand, R NZ Intl | 17675pa | | | |
| 2115-2145 mtwhfa | Armenia, Voice of | 4810eu | 9965eu | | |
| 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 | 7240pa | 9500as | 9660pa | 12080pa |

| | | | | | |
|---------------|---------------------------|---------|--------|--------|--------|
| 2130-2200 | China, China Radio Intl | 5220va | 6950eu | 9670va | 9920eu |
| 2130-2200 | Ghana, Ghana Broadc Corp | 3366do | | | |
| 2130-2200 | Guam, AWR/KSDA | 9495as | | | |
| 2130-2200 | Iran, VOIRI | 6165pa | 6175pa | | |
| 2130-2145 | Iraq, Radio Iraq Intl | 11785eu | | | |
| 2130-2200 | Malawi, MBC | 3380do | | | |
| 2130-2200 as | Sweden, Radio | 6065eu | 9430eu | | |
| 2130-2145 t f | UK, BBC Calling Falklands | 11680sa | | | |
| 2130-2200 | UK, BBC World Service | 5875eu | 6050eu | 9850eu | |
| 2130-2200 | Uzbekistan, R Tashkent | 7105as | 9540as | | |

2200 UTC

| | | | | | |
|------------------|----------------------------|--------------------|-------------------|--------------------|-------------------|
| 2200-2230 | Albania, R Tirana Intl | 6025eu | 7135eu | | |
| 2200-2300 | Anguilla, Caribbean Beacon | 6090am | | | |
| 2200-2215 mtwhfa | Armenia, Voice of | 4810eu | 9965eu | | |
| 2200-2300 | Australia, Radio | 9660pa | 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 | 5995va 11705as | 7235va 11945va | 9735va 13690va | 9805va 15150va |
| 2200-2300 | China, China Radio Intl | 7170eu | | | |
| 2200-2230 | China, China Radio Intl | 3985eu | | | |
| 2200-2300 | Costa Rica, RF Peace Intl | 7385am | 15050am | | |
| 2200-2245 | Egypt, Radio Cairo | 9900eu | | | |
| 2200-2300 | Eq Guinea, Radio Africa | 15186af | | | |
| 2200-2215 | Ghana, Ghana Broadc Corp | 4915do | | | |
| 2200-2230 | India, All India Radio | 7150au 11620eu | 7410eu 11715au | 9910au | 9950eu |
| 2200-2230 | Iran, VOIRI | 6165pa | 6150pa | | |
| 2200-2225 | Italy, RAI Intl | 6150pa | 9675pa | 11900as | |
| 2200-2215 | Liberia, LCN/R Liberia Int | 5100do | | | |
| 2200-2300 | Malaysia, Radio | 7295do | | | |
| 2200-2225 | Moldova, R Moldova Intl | 7520eu | | | |
| 2200-2300 | New Zealand, R NZ Intl | 17675pa | | | |
| 2200-2215 | Nigeria, FRCN/Radio | 3326do | 4770do | 4990do | |
| 2200-2230 s | Norway, Radio Norway Intl | 7570sa | | | |
| 2200-2300 vl | Papua New Guinea, NBC | 9675do | | | |
| 2200-2215 | Sierra Leone, SLBS | 3316do | | | |
| 2200-2300 vl | Solomon Islands, SIBC | 5020do | | | |
| 2200-2300 | Spain, R Exterior Espana | 6125eu | 11775af | | |
| 2200-2210 | Syria, Radio Damascus | 9950eu | 12085na | 13610na | |
| 2200-2300 | Taiwan, Radio Taipei Intl | 5810eu | | | |
| 2200-2300 | Turkey, Voice of | 6135eu | 7300na | | |
| 2200-2300 | UK, BBC African Service | 11835af | | | |
| 2200-2300 | UK, BBC Asian Service | 5905as 11955as | 5965as | 6195as | 7110as |
| 2200-2300 | UK, BBC World Service | 3955eu 7325eu | 5975am 9410eu | 6110am 9560am | 6175na 9590na |
| 2200-2300 | USA, KAIJ Dallas TX | 9660as 11765am | 9825am 12080pa | 9915sa | 11750sa |
| 2200-2300 | USA, KATN Salt Lk City UT | 13815am | | | |
| 2200-2300 | USA, KWHR Naalehu HI | 15590am | | | |
| 2200-2300 | USA, Voice of America | 17510as 7215as | 17555pa 9770as | 17555pa 15305as | 9890as 11760as |
| 2200-2230 mtwhf | USA, Voice of America | 15185as 17820as | 6035af 13710af | 7415af 11975af | 12080af |
| 2200-2300 | USA, WEWN Birmingham AL | 5825eu | 13615na | | |
| 2200-2300 | USA, WGTG McCaysville GA | 9400am | | | |
| 2200-2300 | USA, WHRA Greenbush ME | 15460af | | | |
| 2200-2300 | USA, WHRI Noblesville IN | 9495am | 13760am | | |
| 2200-2300 | USA, WINB Red Lion PA | 11950ca | | | |
| 2200-2300 | USA, WJCR Upton KY | 7490na | | | |
| 2200-2300 a | USA, WRMI/R Miami Intl | 9955am | | | |
| 2200-2300 | USA, WRNO New Orleans LA | 15420am | | | |
| 2200-2259 sh | USA, WSHB Cypress Crk SC | 7510eu | | | |
| 2200-2259 sw | USA, WSHB Cypress Crk SC | 13770eu | | | |
| 2200-2300 | USA, WWCR Nashville TN | 5070am | 9475am | 13845am | 15685am |
| 2200-2300 | USA, WYFR Okeechobee FL | 11580af | 15565eu | | |
| 2200-2300 vl | Zambia, R Zambia/ZNBC 1 | 4910do | | | |
| 2200-2210 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | | |
| 2230-2255 | Austria, R Austria Intl | 5945eu | 6155eu | 13730af | |
| 2230-2300 | Cuba, Radio Havana | 6000na | | | |
| 2230-2257 | Czech Rep, Radio Prague | 5930na | 7345na | | |
| 2240-2250 | Greece, Voice of | 7480au | 9425au | | |
| 2245-2300 | Ghana, Ghana Broadc Corp | 3366do | 4915do | | |
| 2245-2300 | India, All India Radio | 7410as | 9705as | 9950as | 11620as |
| 2245-2300 mtwhf | USA, WRMI/R Miami Intl | 9955am | | | |
| 2245-2300 | Vatican State, Vatican R | 6160au | 7305au | 9600au | 11830au |

FREQUENCIES

| | | | | | | | | | | | |
|--------------|----------------------------|---------|---------|---------|---------|-----------------|---------------------------|---------|---------|---------|---------|
| 2300-0000 | Anguilla, Caribbean Beacon | 6090am | | | | 2300-0000 | UK, BBC Asian Service | 3915as | 5965as | 6035as | 6195as |
| 2300-0000 | Australia, Radio | 9660pa | 12080pa | 13755pa | 15510pa | | | | | | |
| | | 17795pa | | | | | | | | | |
| 2300-0000 vl | Australia, VL8K Katherine | 5025do | | | | 2300-0000 | UK, BBC World Service | 7110as | 9580as | 11945as | 11955as |
| 2300-0000 vl | Australia, VL8T Tent Crk | 4910do | | | | | | 3955eu | 5875am | 5975am | 6110am |
| 2300-0000 | Bulgaria, Radio | 9485na | 11720na | | | | | 6175na | 6195eu | 9590na | 9825am |
| 2300-0000 | Canada, CBC N Quebec Svc | 9625do | | | | 2300-0000 | USA, KAIJ Dallas TX | 9915sa | 11750sa | 11765am | 15390sa |
| 2300-0000 | Canada, CFRX Toronto | 6070do | | | | 2300-0000 | USA, KTVB Salt Lk City UT | 5810am | | | |
| 2300-0000 | Canada, CFVP Calgary | 6030do | | | | 2300-0000 | USA, KWHR Naalehu HI | 7510am | | | |
| 2300-0000 | Canada, CHNX Halifax | 6130do | | | | 2300-0000 | USA, Voice of America | 17510as | 1755pa | | |
| 2300-0000 | Canada, CKZN St John's | 6160do | | | | | | 7215as | 9770as | 9890as | 11760as |
| 2300-0000 | Canada, CKZU Vancouver | 6160do | | | | | | 15185as | 15290as | 15305as | 17735as |
| 2300-2330 | Canada, R Canada Intl | 5960am | 6040ca | 9535ca | 9755am | | | 17820as | | | |
| | | 11865ca | | | | 2300-0000 | USA, WEWN Birmingham AL | 5825eu | | | |
| 2300-0000 | Costa Rica, Adv World R | 5030am | 6150am | 9725am | 13750am | 2300-0000 | USA, WGTG McCalysville GA | 5085am | | | |
| | | 15460am | | | | 2300-0000 | USA, WHRA Greenbush ME | 15460af | | | |
| 2300-0000 | Costa Rica, RF Peace Intl | 7385am | 15050am | | | 2300-0000 | USA, WHRI Noblesville IN | 5745am | 9495am | | |
| 2300-2330 | Cuba, Radio Havana | 6000na | | | | 2300-0000 | USA, WINB Red Lion PA | 11950am | | | |
| 2300-0000 | Egypt, Radio Cairo | 9900na | | | | 2300-0000 | USA, WJCR Upton KY | 7490na | | | |
| 2300-2350 | Germany, Deutsche Welle | 5975as | 6090as | 7235as | 9690as | 2300-0000 a | USA, WRMI/R Miami Intl | 9955am | | | |
| 2300-2330 | Guam, AWR/KSDA | 11775as | | | | 2300-0000 | USA, WRNO New Orleans LA | 7355am | | | |
| 2300-0000 | India, All India Radio | 7410as | 9705as | 9950as | 11620as | 2300-2359 sw | USA, WSHB Cypress Crk SC | 7510eu | | | |
| 2300-2315 | Liberia, LCN/R Liberia Int | 5100do | | | | 2300-2359 sm | USA, WSHB Cypress Crk SC | 13770am | | | |
| 2300-0000 | Malaysia, Radio | 7295do | | | | 2300-0000 | USA, WWCR Nashville TN | 5070am | 7435am | 9475am | 13845am |
| 2300-2325 | Moldova, R Moldova Intl | 7520eu | | | | 2300-2315 | Vatican State, Vatican R | 7305au | 9600au | 11830au | |
| 2300-0000 | New Zealand, R NZ Intl | 17675pa | | | | 2300-0000 as | Canada, R Canada Intl | 6040am | 9535am | 11865am | |
| 2300-2315 | Nigeria, FRCN/Radio | 3326do | 4770do | 4990do | | 2300-0000 vl | Ghana, Ghana Broadc Corp | 4915af | | | |
| 2300-2357 | North Korea, R Pyongyang | 11335na | 11700na | 13760na | 15130na | 2300-0000 mtwhf | Guam, AWR/KSDA | 11775as | | | |
| 2300-0000 vl | Papua New Guinea, NBC | 9675do | | | | 2300-0000 | Lithuania, Radio Vilnius | 5880na | 5905na | | |
| 2300-2356 | Romania, R Romania Intl | 5955eu | 7195eu | 9570na | 11830na | 2300-0000 | Netherlands, Radio | 6020na | 6165na | 9845na | |
| 2300-0000 | Singapore, SBC Radio One | 6160do | | | | 2300-0000 | Vietnam, Voice of | 9840eu | 12020eu | 15010eu | |
| 2300-0000 | Singapore, R Singapore Int | 6155as | | | | 2335-2345 | Greece, Voice of | 9395sa | 9425sa | 9935sa | 11595sa |
| 2300-0000 vl | Solomon Islands, SIBC | 5020do | | | | 2335-2345 | Sierra Leone, SLBS | 3316do | | | |
| | | | | | | 2345-0000 mtwhf | UK, BBC Asian Service | 3915as | | | |

SELECTED PROGRAMS

Sundays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): East Asia Today. News, analysis, press reviews and reports from BBC correspondents.
 2305 UK, BBC London (am/eu): Science View. See S 0040.
 2310 UK, BBC London (am/eu): Performance. See S 2230.
 2325 UK, BBC London (am/eu): Pop Short. A five-minute popular music program.
 2330 UK, BBC London (am/eu): In Praise of God. See S 0230.
 2330 UK, BBC London (as): Anything Goes. See S 1130.

Mondays

2300 UK, BBC London (am/eu): World News. See S 0100.

HAUSER'S HIGHLIGHTS SWEDEN: R. SWEDEN

Z-98 in English on SW to N. America

| kHz | UTC |
|------|------------------|
| 1130 | 15240, 17870 |
| 1330 | 15240 |
| 0230 | 9495 or 7135 |
| 0330 | 9475 or 11665 |

To As/Au

| | |
|------|-------------------|
| 1230 | 13740, 15240 |
| 1330 | 13740 or 17515 |
| 0100 | 11985 |

To Eu/Af/ME

| | |
|----------|---------------------|
| 1730 Sun | 13855, 15735 and |
|----------|---------------------|

Mon-Sat 6065, 15735
 1930 6065
 2030 Sat & Sun 6065, 13830
 2130 6065, 9430

(via Andreas Volk, BC-DX)

New URL is <http://www.radiosweden.com>

(MediaScan)

2300 UK, BBC London (as): East Asia Today. See S 2300.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2330 UK, BBC London (am/eu): Multitrack Hit-List. See M 1615.
 2330 UK, BBC London (as): Insight. See M 1645.
 2345 UK, BBC London (as): Seven Days. See M 0615.

Tuesdays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): East Asia Today. See S 2300.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2330 UK, BBC London (am/eu): Megamix. See T 1615.
 2330 UK, BBC London (as): Insight. See M 1645.
 2345 UK, BBC London (as): Performance. See S 2230.

Wednesdays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): East Asia Today. See S 2300.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2330 UK, BBC London (am/eu): Multitrack X-Press. See W 1615.
 2330 UK, BBC London (as): Insight. See M 1645.
 2345 UK, BBC London (as): Science Extra. See S 1501.

Thursdays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): East Asia Today. See S 2300.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2330 UK, BBC London (am/eu): John Peel. See M 1130.
 2330 UK, BBC London (as): Insight. See M 1645.
 2345 UK, BBC London (as): Health Matters. See S 0115.

Fridays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): World News. See S 0100.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2305 UK, BBC London (as): Spotlight. See F 1555.
 2310 UK, BBC London (as): Variable Feature. See S 0130.
 2325 UK, BBC London (as): Pop Short. See S 2325.
 2330 UK, BBC London (am/eu): Multitrack Alternative. See F 1430.
 2330 UK, BBC London (as): Insight. See M 1645.
 2345 UK, BBC London (as): Record News. See S 0815.

Saturdays

2300 UK, BBC London (am/eu): Play of the Week (from 2230). See S 1130.
 2300 UK, BBC London (as): News Summary. See S 1100.
 2301 UK, BBC London (as): From Our Own Correspondent. See S 0330.
 2330 UK, BBC London (am/eu): Andy Kershaw's World of Music. See M 1830.
 2330 UK, BBC London (as): Science in Action. See M 0930.

HAUSER'S HIGHLIGHTS

ICELAND: ICELAND RADIO

Z98 assignments for, 10 kW are:

| kHz | UTC |
|-------|-----------|
| 7560 | 1845-1930 |
| 9310 | 1845-2015 |
| 9360 | 1200-1300 |
| | 1400-1445 |
| | 2300-2345 |
| 11575 | 1200-1300 |
| | 1400-1445 |
| | 1930-2015 |
| | 2300-2345 |
| 13805 | 1930-2050 |
| 13815 | 1200-1300 |
| 13830 | 2300-2345 |
| 13860 | 1400-1445 |
| 15640 | 1200-1300 |

(HFCC via Bob Padula, EDXP)
 That's official, but this station has a track record of not adhering to it (gh)

HAUSER'S HIGHLIGHTS

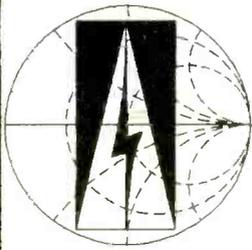
JAPAN: NHK

Z-98 relays via Canada

English to NAM

| UTC | kHz |
|----------------------------|------------|
| 0500-0600 | 6110 |
| 1100-1200 | 6120 (new) |
| 0000-0100 | 11705 |
| Direct from Yamata to NAM: | |
| 0300-0400 | 17825 |
| 0500-0700 | 9835 |
| 1400-1500 | 9505 |
| 1700-1800 | 9535 |
| 2100-2200 | 13630 |

(NHK via Kunitoshi Hishikawa via Karl Leite, radioscutas)



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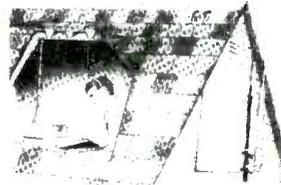
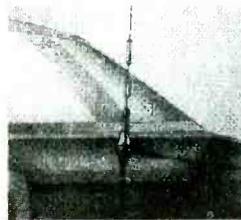


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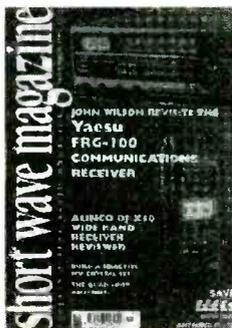
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Carrier Broadcasting

In the article "The Ultimate Longwave Receiving Setup" (MT Dec '97), I alluded to a mode of propagation that is not well known today: carrier current. This method of transmitting an RF signal is many decades old but has been rumored to be making a comeback in North America for certain activities.

The theory is quite elementary: you simply induce a low power RF signal on an existing metallic distribution grid. For example, you induce, or couple, the low power RF AM signal from a small transmitter onto the electrical distribution system of a building, or buildings, for the purpose of broadcasting only to listeners within that discrete electrical network.

The most common use for this system today is for the distribution of a university radio program inside the perimeter of the university compound. No license is required for such an installation and the costs involved are minimal: the electrical distribution system is already in place. Most of the costs are to install RF bypass networks to avoid the impedance mismatch created by transformers and other types of coils and chokes when going from building to building.

In the effort to reach every corner of campus, very often the neighborhood is unintentionally within the broadcast area. In most cases, these low power stations will choose a split channel (for example 675 kHz) in an area of the AM band where there is very little local activity to avoid undue interference.

In order to receive the broadcast it is only necessary to plug your AC operated receiver into the electrical distribution network of the university, or if you use a battery powered receiver, you have to be located within the confine of the campus.

OPTIMUM WORKING FREQUENCIES (MHz) For the Period 15 May to 14 June 1998 Flux=120 SSN=76 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 | 15 | 14 | 14 | 13 | 11 | 12 | 13 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 21 | 21 | 20 | 21 |
| WESTERN EUROPE | 14 | 13 | 12 | 11 | 11 | 11 | 12 | 11 | 10 | | | | | 12 | 14 | 16 | 17 | 17 | 16 | 16 | 16 | 16 | 16 | 15 |
| EASTERN EUROPE (P) | 14 | 14 | 14 | 15 | 15 | 15 | 14 | 12 | | | | | | 13 | 14 | 15 | 15 | 16 | 16 | 16 | 16 | 15 | 15 | 14 |
| MEDITERRANEAN | 17 | 17 | 17 | 16 | 16 | 15 | 14 | 13 | | | | | | 15 | 16 | 17 | 18 | 18 | 18 | 18 | 18 | 17 | 17 | 17 |
| MIDDLE EAST (P) | 15 | 15 | 17 | 17 | 17 | 16 | 15 | | | | | | | 14 | 16 | 18 | 19 | 19 | 18 | 17 | 16 | 15 | 15 | 15 |
| CENTRAL AFRICA | 17 | 17 | 14 | 12 | 10 | 10 | 13 | 12 | | | | | | 16 | 18 | 19 | 20 | 21 | 21 | 21 | 19 | 18 | 18 | 18 |
| SOUTH AFRICA | | 11 | 10 | 9 | 8 | 8 | 12 | 13 | 13 | 13 | | | | 15 | 16 | 18 | 19 | 20 | 19 | 16 | | | | |
| SOUTH EAST ASIA (P) | 19 | 18 | 18 | 18 | 18 | 18 | 17 | 15 | 14 | | 12 | 12 | 11 | 12 | 13 | 14 | 16 | 18 | 19 | 18 | 17 | 16 | 16 | 19 |
| FAR EAST | 18 | 16 | 16 | 16 | 16 | 15 | 15 | 13 | 12 | 12 | 11 | 10 | 10 | 10 | 11 | 13 | 14 | 13 | 13 | 14 | 15 | 16 | 17 | 18 |
| AUSTRALIA | 21 | 22 | 22 | 21 | 20 | 18 | 17 | 16 | 15 | 15 | 14 | 14 | 13 | 13 | 12 | 12 | 12 | | | | | 21 | 21 | 22 |
| TO/FROM US MIDWEST | | | | | | | | | | | | | | | | | | | | | | | | |
| SOUTH AMERICA | 18 | 17 | 17 | 16 | 14 | 14 | 13 | 13 | 13 | 12 | 10 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 19 | 19 | 20 | 19 | 19 | 19 |
| WESTERN EUROPE | 16 | 14 | 13 | 13 | 12 | 12 | 12 | 11 | 11 | | | 13 | 14 | 15 | 16 | 17 | 17 | 17 | 16 | 17 | 17 | 17 | 17 | 17 |
| EASTERN EUROPE | 13 | 13 | 14 | 14 | 15 | 13 | 12 | | | | | 13 | 14 | 15 | 15 | 16 | 16 | 16 | 16 | 16 | 16 | 15 | 14 | 14 |
| MEDITERRANEAN | 17 | 17 | 17 | 16 | 15 | 14 | 12 | | | | | | | 15 | 16 | 17 | 18 | 18 | 18 | 18 | 17 | 17 | 17 | 17 |
| MIDDLE EAST (P) | 14 | 14 | 16 | 17 | 16 | 14 | | | | | | | | 15 | 17 | 18 | 19 | 19 | 19 | 17 | 17 | 16 | 15 | 14 |
| CENTRAL AFRICA | 18 | 17 | 14 | 11 | 10 | 9 | 13 | 13 | | | | | | 16 | 18 | 19 | 20 | 21 | 21 | 21 | 20 | 19 | 18 | 18 |
| SOUTH AFRICA | 11 | 11 | 10 | 9 | 8 | 8 | 12 | 13 | 13 | 13 | | | | 15 | 16 | 18 | 19 | 20 | 21 | 19 | 16 | | | 12 |
| SOUTH EAST ASIA (P) | 17 | 17 | 17 | 18 | 17 | 16 | | | | | 11 | 12 | 13 | 15 | 17 | 18 | 19 | 18 | 18 | 18 | 16 | 16 | 16 | 18 |
| FAR EAST | 17 | 16 | 16 | 17 | 15 | 14 | 12 | 12 | 11 | 11 | 11 | 11 | 11 | 12 | 14 | 14 | 14 | 14 | 14 | 15 | 15 | 16 | 17 | 17 |
| AUSTRALIA | 20 | 20 | 20 | 19 | 18 | 16 | 15 | 14 | 14 | 14 | 14 | 14 | 13 | 13 | 12 | 13 | | | | | | 21 | 20 | 20 |
| TO/FROM US EAST COAST | | | | | | | | | | | | | | | | | | | | | | | | |
| SOUTH AMERICA | 16 | 15 | 14 | 13 | 13 | 12 | 12 | 12 | 11 | 10 | 9 | 11 | 14 | 15 | 16 | 17 | 17 | 18 | 18 | 18 | 17 | 17 | 17 | 17 |
| WESTERN EUROPE | 14 | 13 | 12 | 12 | 11 | 11 | 11 | 10 | 10 | 10 | 12 | 14 | 15 | 17 | 18 | 18 | 18 | 17 | 16 | 16 | 17 | 16 | 16 | 16 |
| EASTERN EUROPE | 13 | 13 | 12 | 13 | 12 | 11 | | | | | 12 | 13 | 15 | 17 | 17 | 16 | 17 | 18 | 18 | 18 | 17 | 16 | 15 | 14 |
| MEDITERRANEAN | 16 | 16 | 15 | 14 | 13 | 12 | 12 | 11 | | | 13 | 14 | 15 | 16 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 16 | 16 | 16 |
| MIDDLE EAST (P) | 15 | 15 | 16 | 15 | 14 | | | | | | | 15 | 16 | 17 | 17 | 18 | 18 | 18 | 18 | 17 | 17 | 17 | 17 | 16 |
| CENTRAL AFRICA | 18 | 17 | 15 | 12 | 10 | 9 | 14 | 14 | 13 | 14 | 15 | 16 | 18 | 18 | 19 | 20 | 21 | 20 | 20 | 19 | 19 | 19 | 18 | 18 |
| SOUTH AFRICA | 11 | 11 | 10 | 9 | 8 | 8 | 12 | 14 | 13 | 13 | 15 | 15 | 17 | 19 | 20 | 21 | 21 | 21 | 19 | 16 | 14 | 13 | 13 | 12 |
| SOUTH EAST ASIA (P) | 17 | 17 | 17 | 15 | | | | | | | 13 | 15 | 17 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 16 | 16 | 16 | 17 |
| FAR EAST | 17 | 17 | 17 | 15 | 14 | | | | 11 | 11 | 11 | 13 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 16 | 17 | 17 | 17 |
| AUSTRALIA | 19 | 19 | 18 | 17 | 15 | 14 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | | | | | | | | | 20 | 19 | 18 |

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

When North America was crisscrossed by numerous landline telegraph systems (before the advent of microwave), one pair of wires was made to carry more than one message by multiplexing the messages on the same line. One method was to use a large number of low power radio frequencies on the same pair. If you used one set of frequencies from point "A" to point "B," it was possible to use a different set of frequencies for "B" to "A" and have a full duplex circuit.

Some of the largest users of carrier current in the LF part of the radio spectrum were (and in some places still are) the power production and distribution companies. Let's face it, you

firm this.

Probably one of the best series of articles on the subject of "carrier-current propagation" can be found in ARRL handbooks and QST issues of the WWII era. At a time when the hams were not allowed to operate on air, some construction projects were designed so that hams did not lose interest in building electronic circuits and continuing the experimentation for which hams have become famous.

Well, now you have in a nutshell the explanation of a "new" method of radio propagation. I have to agree that it is an unusual method, but it is still being used today after over 60 years of obscure history.

already have a large metallic network covering your territory; why not use it for your internal telephone system and also for telemetry between load control centers and production units? (A person tapping such a phone line today, however, had better know what he is doing: some power lines now carry 1.3 MV. Yes, that's 1,300,000 volts!)

One problem arises in the fact that 60 Hz interference and the various induced harmonics at 120, 180 Hz, etc. do not give a quiet, quality transmission. However, the circuits are good enough for controlling purposes using radio frequencies in the 180 kHz range.

New Zealand power utilities are still using this system and it plays havoc with the LF experimenters and aficionados in that part of the world. In North America, I have heard that carrier current is coming back to life in the hydro network, but I have not been able to con-

Eavesdropping on Africa; Part Two: "Into Africa"

Last month, we profiled the programming of the two African broadcasters with adequate power to project beyond continental borders. This month we look at five prominent broadcasters outside Africa with programming specifically geared to the continent. Everyone has their own interests in the area, and listeners would be wise to critically compare both external and internal broadcasters in order to assess the issues and events shaping the region.

Britain's historical relationship with Africa is centered in two regions: western and southern Africa. The most comprehensive range of programming to and about Africa on the international airwaves comes from the BBC, which devotes one of its three programming streams to Africa from 0200 to 2245 daily.

Here's a comprehensive schedule, in time order, of regular BBC programs:

| | | |
|------|-------|--|
| 0330 | Sun. | <i>African Quiz</i> (monthly current events test)[1st Sun.] |
| 0330 | Sun. | <i>Postmark Africa</i> (expert answers to any question)[exc. 1st Sun.] |
| 0330 | M-F | <i>Network Africa</i> (breakfast show w/news, sport, personalities, music) |
| 0430 | Sun. | <i>The Art House</i> (the arts in Africa) |
| 0430 | M-F | <i>Network Africa</i> (breakfast show w/news, sport, personalities, music) |
| 0431 | Sat. | <i>African Quiz</i> (monthly current events test)[1st Sat.] |
| 0431 | Sat. | <i>This Week in Africa</i> (regional events review)[exc. 1st Sat.] |
| 0530 | Sun. | <i>Postmark Africa</i> (expert answers to any question) |
| 0530 | M-F | <i>Network Africa</i> (breakfast show w/news, sport, personalities, music) |
| 0531 | Sat. | <i>Talkabout Africa</i> (discussion of African events and issues) |
| 0630 | Sun. | <i>African Perspective</i> (opinion, comment and discussion) |
| 0630 | M-F | <i>Network Africa</i> (breakfast show w/news, sport, personalities, music) |
| 0631 | Sat. | <i>African Quiz</i> (monthly current events test)[1st Sat.] |
| 0631 | Sat. | <i>This Week in Africa</i> (regional events review)[exc. 1st Sat.] |
| 1030 | Sat. | <i>The Art House</i> (the arts in Africa) |
| 1505 | M-F | <i>Focus on Africa</i> (correspondents' reports from around the continent) |
| 1615 | Mon. | <i>Fast Track</i> (weekly review of African sport) |
| 1615 | Tue. | <i>Money Focus</i> (African business magazine) |
| 1615 | Wed. | <i>Talkabout Africa</i> (discussion of African events and issues) |
| 1615 | Thu. | <i>Jive Zone</i> (contemporary African music) |
| 1615 | Fri. | <i>African Perspective</i> (opinion, comment and discussion) |
| 1705 | Daily | <i>Focus on Africa</i> (correspondents' reports from around the continent) |
| 1740 | Daily | <i>African News</i> |
| 1830 | M-F | <i>Focus on Africa</i> (correspondents' reports from around the continent) |
| 1901 | Sun. | <i>Postmark Africa</i> (expert answers to any question) |
| 1901 | Mon. | <i>Fast Track</i> (weekly review of African sport) |
| 1901 | Tue. | <i>Money Focus</i> (African business magazine) |
| 1901 | Wed. | <i>Talkabout Africa</i> (discussion of African events and issues) |

1901 Fri. *African Perspective* (opinion, comment and discussion)

1930 Sun. *The Art House* (the arts in Africa)

America's interests in Africa seem more sporadic and less focused, since, with the exception of Liberia, it has not had a long-term relationship with the continent. Nonetheless, to its credit, the Voice of America gives special attention to its African listeners, especially in current affairs, sport and music.

0300 M-F *Daybreak Africa* (morning show w/news, sports reports and features)

0430 M-F *Daybreak Africa* (morning show w/news, sports reports and features)

0600 M-F *Daybreak Africa* (morning show w/news, sports reports and features)

1600 S/S *Nightline Africa* (reports, interviews and analyses of African events)

1630 M-F *Africa World Tonight* (African news, sports and weather)

1710 Sun. *Voices of Africa* (interviews w/prominent Africans)

1730 Sun. *Music Time in Africa* (traditional and modern African music)[part 1]

1800 M-F *Africa World Tonight* (African news, sports and weather)

1910 Sat. *Voices of Africa* (interviews w/prominent Africans)

1930 Sun. *Music Time in Africa* (traditional and modern African music)[part 2]

1934 M-F *World of Music* (popular music w/African roots)

2000 M-F *Africa World Tonight* (African news, sports and weather)

2000 S/S *Nightline Africa* (reports on world and African issues)

The importance that Germany places on Africa is demonstrated by Deutsche Welle's seven daily transmissions to the continent in English alone. News bulletins specially prepared for the African service air at 0400, 0600, 0900, 1100, 1600, 1900 and 2100. DW also offers three Africa-specific programs: *Good Morning Africa* features music, gossip and letters to DW and airs Tuesday through Friday at 0430; *African Kaleidoscope* examines recent issues and events in Africa at 0915, 1115 and 2115 on Saturdays; and the daily (Monday through Friday) *Africa Report* provides reports and background on African news, heard at 1130, 1630 and 1930.

The French continue to exert considerable influence in north, east and central Africa roughly north of the equator, where it was the primary colonial power. Many diverse nationality and exile groups from African countries also reside in France. These factors, along with a healthy French suspicion of others' motives on the continent, regularly bring France—willingly and unwillingly—into an active role in many African issues and conflicts.

RFI's 1600 transmission pays special atten-

tion to Africa with a daily half-hour newscast designed to present a complete panorama of African news, issues, sport and current affairs. East Africa gets its own special focus between 1700 and 1730. There are also a few short-form feature programs with an emphasis on Africa. These include: *Echoes from Africa*, on daily life in Africa, broadcast during the 1654 to 1730 block on Mondays, the 1230 to 1257 features block on Tuesdays and the 1630 to 1654 block on Thursdays; *Drumbeat*, a report on African culture and lifestyles, is broadcast during the 1630 to 1654 block on Tuesdays and the 1654 to 1730 block on Wednesdays; *Jumbo*, a weekly report on East Africa, is broadcast during the 1654 to 1730 block on Tuesdays. *Spotlight on Africa*, examining recent African events and issues, is broadcast Saturdays in the 1230 to 1257 feature block and 1630 to 1654 feature block, and on Sundays in the 1654 to 1730 block.

The Netherlands' ties to Africa stem from the Dutch East India Company's settlement of southern Africa, where Capetown was developed during the seventeenth and eighteenth centuries as an important port in the spice trade. Their descendants came to regard themselves more as Africans than Europeans. They are responsible for the development of a strong agricultural economy and the Afrikaans language, but also bear some of the responsibility for the creation and enforcement of apartheid policies only recently repudiated.

Radio Netherlands does not produce any special feature programs for Africa. However, its news bulletins and *Newsline* analysis program to Africa in the 1730, 1830 and 1930 transmissions are specially prepared daily with items of interest primarily for African audiences.

Of course, we have limited ourselves to a review of programs in the English language. An individual conversant in French, for example, would have another range of perspectives available. We can all appreciate the wonderful African music presented by Afrique Numero Un (Africa Number 1) between 0500 and 2300 on either 17675, 15475 or 9580 kHz.

Enjoy and learn about the African continent—available only on shortwave!

(Times and days in UTC. Frequencies for the programs listed can be had by referring to the 'Shortwave Guide' section of this magazine.) 'Shortwave Guide' section of this magazine.)

Air Show Fun

When it comes to aviation, some of the most fun a beginner can experience is to be found at air shows. For that matter, you don't even have to go to an air show to listen in. But, since this is May and we're thinking about getting out of the shack and into the sunlight, we'll talk about monitoring from the flight line.

Air shows have grown in popularity over the last decade or so. Further, since command and control of just about everything from the aircraft to the water fountains is subject to radio communication, monitoring air show activities has also grown. Both the popularity of air shows and the popularity of monitoring them will have an affect on how you carry yourself through the air show experience.

Let's start with the basics: Where do you find air shows? Most air shows are held on military reservations or at small and medium-sized commercial airports. The big commercial air hubs are usually not involved because interrupting the flight line for a day or two is simply not an option.

Start by making a few calls to the airports listed in your local phone book. You can also call the public information desk at nearby military air bases. If you're on the Internet, just point your browser's search engine toward the words "air shows" and you'll come up with plenty of places to go throughout the country. As you read this article you are right in the midst of the prime air show season, so get cracking.

■ Maximize your monitoring

Okay, you've discovered that nearby Wrongway Peachfuzz Air Force Base is holding a show in a few weeks. How do you go about getting ready to monitor activities at the show?

First you need to check out your receiver situation. It is a cruel world, and not all scanners are created equal. First you must determine if your scanner can receive aircraft frequencies and the all important AM mode. Air communication is commonly done in AM because this mode does not have the "capture effect" of FM.

Capture effect is when a strong signal dominates a receiver, eliminating any weaker signals. This is great for a car radio but not good when you're in the air hoping your



emergency or distress communications are being heard by the tower.

The important frequency ranges for air show aircraft monitoring include 108 -137 MHz, the commercial aircraft band and 200-400 MHz, the military aircraft band. Also useful is the 406-420 MHz federal government frequency band, as this is often in use by military ground support operations at air shows.

Within the standard air band one frequency will need to go into a priority position. 123.40 MHz is recognized as the common air show frequency just about everywhere. Another frequency you will want to track down is that of the "Air Boss." This is the person who is running the whole show. If there are last-minute changes this will be where you'll hear about them first.

For example, I was at a show recently where the chatter on the Air Boss frequency told me that there was going to be a previously unscheduled "fly by" of a Korean War era MIG fighter. I not only knew the plane was coming in, but when and from what direction, well ahead of anyone not equipped with a scanner. The Air Boss frequency is usually a regularly assigned airport operation frequency which is set aside for that particular day, but check around to be sure.

Other frequencies you will want to know before you get to the show are the regular tower, ground control, approach control, departure control and air-to-air frequencies used at the airport or air base.

The big performers such as the Blue Angels, the Thunderbirds, or the Golden Knights all have a group of frequencies they use for doing their show. I've included the most recent information I was able to locate. These frequencies do change from time to time, as you can see by comparing this list with this month's cover feature. Also check the military land mobile frequencies between 137 - 144 MHz as these teams often use them for ground and maintenance operations.

■ More than just air

But wait a minute. There are a lot of other neat frequencies to consider besides the ones directly related to the guys (and gals) in the sky. The bigger air shows have been known to attract enough attendees to populate a small city. Tens of thousands of people need a certain amount of support and management. Consequently, many of the local public safety, fire and emergency management assets will also be on hand for the show.

My local ARES/RACES amateur radio group gives support communications to two local air shows each year, so even the ham frequencies in the 2 meter (144-148 MHz) and 70 centimeter (420-450 MHz) bands have high monitoring potential during many air shows. Then there are the various commercial operations to consider, such as the food vendors and such.

Don't roll your eyes and rule out the business band frequencies just yet. Many air show performers are in fact small business people and as such they maintain some level of operations on traditional business frequencies. In my experience it is worth the trouble to keep an ear on the business bands as yet another source of air show monitoring fun.

If you are able to get your hands on a second scanner, a good strategy is to load one up with the stuff pertinent to the flight line and the other with the public safety and business stuff. That way you can keep an ear on the airplanes while still figuring out what is happening at ground level.

U.S. Navy Blue Angels

| | |
|---------|----------------------------|
| 121.900 | Ground Support |
| 241.400 | Air to Air Channel |
| 245.900 | Air to Air Channel |
| 246.600 | Air to Air Channel |
| 250.800 | Air to Air Channel |
| 251.600 | Demonstration |
| 263.350 | Flight Line common |
| 263.500 | Air to Air Channel |
| 275.350 | Comm 1 Lead & Formation |
| 302.100 | Comm 2 Talk Back |
| 302.150 | Comm 3 Solos |
| 307.700 | Comm 2 Formation Talk Back |
| 318.900 | Air to Air Channel |
| 319.800 | Air to Air Channel |
| 345.900 | Air to Air Channel |
| 348.600 | Ground Support |
| 360.400 | Comm Solos |
| 382.500 | Air to Air Channel |
| 384.400 | Air to Air Channel |
| 391.900 | Air to Air Channel |
| 395.500 | Air to Air Channel |
| 395.900 | Air to Air Channel |

U.S. Air Force Thunderbirds

| | |
|---------|---------------------|
| 120.450 | Operations |
| 236.550 | Air to Air |
| 236.600 | Air to Air |
| 241.400 | Air to Air |
| 273.500 | Air to Air |
| 283.500 | Air to Air |
| 294.700 | Air to Air |
| 322.300 | Air to Air |
| 322.600 | Air to Air |
| 382.900 | Air to Air Tactical |
| 394.000 | Air to Air Tactical |
| 413.025 | Ground Support |
| 120.450 | Operations |
| 250.850 | Team Leader |

U.S. Army Golden Knights

| | |
|---------|-----------------------|
| 32.300 | Operations |
| 45.350 | Primary |
| 123.000 | Air to ground support |
| 123.450 | Air to ground support |
| 123.475 | Air to ground support |
| 123.500 | Air to ground support |

■ Equipment savvy

As for antennas, you're going to find yourself in the midst of an RF rich environment. The standard rubber duckies that come with any handheld scanner should do just fine. You may even experience overloading in close proximity to the transmitting equipment. In such cases, do the old poor man's attenuator trick: Just disconnect the duckie and listen in without an antenna attached. You'll be surprised at how well this will work. NASCAR fans have used this trick at race tracks for years.

A set of headphones is nearly essential to scanning at an air show. They cut down on the noise, allowing you to hear the conversations more clearly. If you take up my suggestion of using two scanners, it's easy enough to rewire a set of stereo headphone to allow you to monitor one scanner with each ear. I've used this technique at several air shows and other events with great success.

■ Digging for frequencies

Okay, so where do you unearth these frequencies? If the air show in question has been held for more than a year or two, head first for the internet. A quick search on the air show name coupled with the word "frequencies" is bound to turn up a list of someone else's prior successes. Don't forget to cruise some of the other columns in *MT* before any trip to an air show, especially Jean Baker's *Plane Talk*.

Other resources include books such as Bob Evan's *The Worldwide Aeronautical Communications Frequency Directory*, Tom Kneitel's *AirScan* or Robert A. Coburn's *Aeronautical Frequency Directory* (Grove carries most of these).

Personally, I also like to go to the original sources. I use the United State Government *Flight Information Publications, Airport/facility Directory* for my area. These are updated every eight weeks and can be purchased most anywhere that provides service to private pilots, such as local airports or chart and map stores. Not only will you get a look at important local frequencies with this publication, but you will also get a great deal of information about the airport itself. Unfortunately, this publication does not cover military air fields, but it still is useful for air shows and air monitoring that occurs beyond the government installations. Some larger libraries may also carry the local area books.

Remember, digging around for frequencies is half the fun of the radio hobby. And don't forget, if you come up with something new, please share it with the rest of us.

Okay now, you've got a scanner or two and you've loaded them up with frequencies. You're about to head out to the air show. What else is there?

■ Smart moves

Well, you may be ready to monitor all

those neat signals in the air and on the ground, but if you don't put a little more thought into your preparations you may not enjoy your listening experience to the fullest.

Get prepared for a long day. Most air shows can run from early in the morning until near sunset. Last year's NAS Oceanea, Virginia, Air Show even had an evening presentation. Now tack on to the actual show times an hour or so of traffic and parking delays to get in and out of the show area and you're looking at a full day.

The first obvious point is to have enough battery power for your scanners. Given the current drain of most common scanners, it wouldn't hurt to pack a second set of cells for each receiver. Maybe even some standard alkalines as backup if your rigs allow for it. A "fanny" pack or a small back pack should carry all your radio needs. If you're also carrying a camera, you will want to remember plenty of extra film because you will pay premium prices if you buy supplies from the vendors along the flight line.

While you're considering the energy needs of the scanners, don't forget the energy needs of the scannist as well. Pack along food or plan to buy it on scene. Most air shows have restrictions against coolers but you should be able to pack in a canteen or water bottle because it may be a long walk between water fountains.

If you've never been to a military base before, you will discover that the flight line is usually made up of a lot of nice shiny white concrete, which does a great job of magnifying the hot sun. Dress appropriately and plan to go through a tube or two of sunscreen. A brimmed hat and sunglasses are also important under such conditions.

So now you're all set; head out to the flight line and listen in on some of the best signals that scanning has to offer. Have fun. Keep em' flyin'!

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New Trunk
Tracker Scanners

Q. *Are the elements in the popular Grove Scanner Beam strong enough to be mounted horizontally rather than vertically as specified? (M. Mewes, Oakville, Ont.)*

A. Certainly. The Scanner Beam is custom-made for Grove under contract with Antenna Craft, a leading manufacturer of TV antennas, using conventional TV antenna hardware and elements, and those are made to withstand self-supported, horizontal mounting.

Q. *Why does an AC motor stay at the same speed, yet draw more current, when it is under load? (Mark Burns, Terre Haute, IN)*

A. An AC motor is a transformer with a short-circuited secondary winding (armature) which spins because of the electromagnetic attraction/repulsion effects of the 60 Hz alternating

current. The spinning of the armature winding in the electromagnetic field of the primary (field) winding generates "counter EMF," a voltage which opposes the primary current.

When the armature is spinning freely (no load), synchronized with the 60 Hz field, the relative position of the armature at any instant in time produces maximum counter EMF, so very little current flows. But when a load is placed on the motor, causing the armature to slip (slow down), it is no longer synchronized, so it develops less counter-EMF. This means that more current flows, increasing the strength of the magnetic field, forcing the armature back toward its synchronized position.

Q. *What equipment do I need to monitor 900 MHz digital telephones? (Johnny K., Hinton, WV)*

A. You would need a matching digital telephone. 900 MHz digital phones are

unmonitorable by any consumer receiving equipment. Their signals are digital (broken into tiny, encoded, computerized "bits") and the spread-spectrum signal is transmitted over several megahertz of spectrum. Even if you had the equipment to hear it, monitoring cellular and cordless telephone calls is unlawful.

Q. *Although it is unlawful for anyone in the U.S. to purchase domestically, or even import, cellular-capable scanners, can someone in Canada or any other country order such a product from a U.S. company like Grove Enterprises? (Wm. Mewes, Oakville, Ont.)*

A. Absolutely. Grove Enterprises sells full-coverage scanning receivers to non-U.S. recipients, U.S. government agencies, and cellular service providers as allowable by law.

Bob's Tip of the Month

Digital Frequency Displays for Analog Radios

Many older radios, and most modern, inexpensive ones, have analog (slide rule) dials with dismal frequency accuracy. At one time several entrepreneurial manufacturers offered retrofitted digital displays to upgrade analog radios. But with the advent of digital displays in most medium- and high-end radios, these sources of add-on displays have become virtually extinct.

Reader Frank Shoemaker alerted us to the availability of a digital frequency display that can be added to many of these radios, including the popular GE Superadio and even multiband receivers, to provide much better frequency readout accuracy. Keep in mind, however, that the addition of such a device

requires surgery and should not be attempted by anyone inexperienced in electronics and soldering.

The device is available in two forms: a parts kit which includes all components and a circuit board for \$49.95, and a factory wired unit in a cabinet, ready to attach to the receiver's oscillator stage, for \$169 plus \$6 shipping. For more information contact the builder: Ron Hankins, KK4PK, 555 Seminole Woods Blvd., Geneva, FL 32732; ph. (407) 349-9150.

We know nothing about this individual or his product, so readers are advised to visit his Web site (www.aade.com) or call or write him for more information—and to recommend that he advertise his products in *MT*!

Q. Can I use the AC wiring through my apartment house as a longwire receiving antenna for shortwave listening? (Peter John Das, Reseda, CA)

A. You sure can, but with some precautions. First, you don't want to be electrocuted (bad), cause an electrical fire (also bad), or burn out your equipment (even worse!), so the 120 volts must never come into contact with the equipment.

The simplest way to isolate the signal from the line voltage is by connecting a capacitor between the wall plug and your receiver's antenna connector. Visit Radio Shack and get one rated at least 600 volts, with a capacitance of approximately 0.005 microfarad (μF). Actually, anything from 0.001 to 0.01 will work just fine, but the voltage requirement is important to prevent failure.

The "hot" (AC line) connection must be enclosed; a convenient replacement appliance plug from Wal-Mart, your friendly hardware, or snipped off an old appliance, is ideal for this. Any visible AC wiring must be covered by a layer of PVC electrical tape.

The upside of the AC line antenna is that it's already there and probably intercepts plenty of signal voltage; the downside is that everyone's electrical and electronic appli-

ances (including fluorescent lights, heater thermostats, and SCR dimmer controls—yuk!) are connected to it, and the electrical noise may be staggering. But you will never know unless you try.

Make-do antennas have always been popular among cliff dwellers. Many shortwave listeners (SWLs) have employed telephone wiring (also use the aforementioned capacitor, but you can get by with a 200 volt rating), bedsprings, flagpoles, rain gutters and downspouts, fire escapes, porch railings, and other metal extensions and contrivances.

Q. How well do the new "atomic clocks," available from companies like Zeit, work? (Jose Fernandez)

A. So far as we can tell, quite well. We have been trying unsuccessfully to get an evaluation sample of their new line to review for our readers. The clocks contain a tiny VLF receiver which picks up the time signals from WWVB, Ft. Collins, Colorado, on 60 kHz. Now that the power of WWVB has been increased, the usable area for such automatic-resetting clocks has increased over most of North and Central America.

Q. If I moved my Kiwi loop antenna from the basement to an upstairs location, will my signals improve? (Phil Davis, Troy, IL)

A. You betcha—assuming, of course, that the new location isn't near a source of electrical interference that wasn't present at the lower location. Move around, experiment with different locations for best performance.

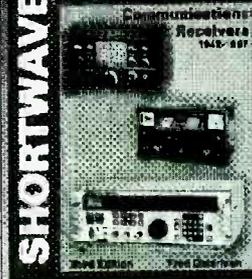
Questions or tips sent to "Ask Bob," c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bgrove@grove.net. (Please include your name and address.)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

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Hams on Longwave?

From time to time we've discussed the possibility of a licensed LF ham band in North America. Until recently, conventional thinking held that such a band would automatically be placed in the Part 15 (license-free) "Lowfer" (low frequency experimenters) band at 160 to 190 kHz. This has begun to change, however. The factors driving this are many, but perhaps the most significant is the fact that several European countries have approved bands well outside this range. This has strong implications for the hope of transcontinental distance reception (DX).

This month, John H. Davis of the Longwave Club of America shares his views on the subject. I urge readers to consider the issue seriously, and send their comments to the Federal Communications Commission (FCC) and the American Radio Relay League (ARRL) Section Manager for their area. (Refer to QST magazine or the League's web site at: <http://www.arrl.org/>)

A GUEST EDITORIAL
BY JOHN H. DAVIS (GA)

For most of this century, the name "amateur radio" was nearly synonymous with "shortwave" (HF). Recently, the two meter band and higher frequencies have been identified with ham radio. But longwave? Not since the very earliest years of this century, when ever-increasing pressure for commercial spectrum moved amateurs first to mediumwave, then to HF.

Until now.

Half a dozen European nations will have adopted the Council of European Postal and Telecommunications (CEPT) administrations' recommendation for a narrow ham band at 136 kHz before you read this. New Zealand, Australia, and Papua New Guinea already have amateur activity in the 160-190 kHz range. And our own ARRL may again be rousing itself to action.

What shape might an LF ham band take in North America, and what about the impact on existing experimental activity? As the Longwave Club of America's Part 15 beacon editor, I'm deeply concerned about that question.

Many Lowfer enthusiasts have engaged in a lively online dialog this past winter. One of the key questions is, why change anything? Some view a ham band as encroachment of new limitations and requirements into a relaxed

"One assumption about an LF ham band needs to be questioned at the outset—that it will automatically be at 160-190 kHz."

environment. Others don't want to see high power commercial rigs and idle rag-chewers take over, as on some ham bands. Ironically, these concerns are voiced less by the non-ham inhabitants of 1750M than by holders of licenses most likely to qualify for the new band.

Clearly, there is something unique about the challenge of a one-watt transmitter and a 15-meter antenna at LF. Amid the QRM and QRN (radio noise), nature awards DX grudgingly. It's a true test of skill to transmit or receive beyond a few miles, so multi-hundred mile contacts (QSOs) are a rare treat indeed. These challenges have prompted inexpensive implementation of advanced modulation methods, such as coherent Morse code (CW) and binary phase shift keying (BPSK).

But at some point, advancement of the radio art requires more signal-to-noise ratio. Some suggest raising Part 15 power or antenna limits, but the FCC places low priority on proposals that benefit so few people. Furthermore, Part 15 has no allocation status whatsoever, and will never receive the same consideration as a licensed service. In that sense, the freedom of license-free operation is also its biggest drawback.

Among amateur radio's objectives are development of circuitry and operating techniques for all kinds of radio propagation. It will not be hard to demonstrate that an LF ham band is consistent with this end. Thus, if international activity piques enough interest domestically, there will eventually be an LF ham band. The best approach, probably, is to be in the forefront, helping shape the final outcome.

One assumption about an LF ham band needs to be questioned at the outset—that it will automatically be at 160-190 kHz. About two years ago, the National Telecommunications and Information Administration (NTIA) mentioned this band in a proposal for additional amateur spectrum, and much discussion has gravitated toward it.

There's nothing magic about this choice. It's little used by critical services, so less engineering study would be needed than for other slots. And it's the widest chunk of spectrum one is likely to find at LF.

However, it's not necessarily the best place for a ham band. It might not be available in Alaska or large parts of Canada, due to aero-

nautical fixed service allocations north of the 60th parallel. There's absolutely no chance for transatlantic DX, given the megawatt longwave broadcasters (LWBC) there.

To avoid LWBC, one must look below 148.5 kHz. As it turns out, 130-160 kHz is allocated to similar services as 160-190. Avoiding ship assignments might make for a narrower band, but would still leave room for serious experimentation.

A longwave ham band would be valuable to experimenters. It might also attract new blood to the hobby, particularly if available to Technician Plus licensees. (There's lots more hands-on appeal to LF gear than a handie-talkie full of tiny surface mount components!)

Simultaneously, though, there is considerable benefit in preserving the challenge of Part 15 Lowfering. These two uses need not be mutually exclusive, whether through band sharing or two separate bands. This may be a rare opportunity to have our cake and eat it, too; but it will take thought and planning, both by amateurs and other users of this unique chunk of spectrum. [End quote]

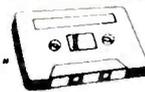
■ Transmitter Project Update

The overwhelming vote was "YES!" to the question of whether or not to present a construction project here for a simple LF transmitter. I am working on two approaches—a homebrew design, and a ready-to-build kit. I plan to present the homebrew design next month.

I'm happy to report that with only minor changes, the homebrew circuit can be easily adapted to work on 136 kHz. This will be of interest to many European amateurs who are looking for a low power transmitter for the new LF ham band available in many countries.

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Skip Time

Finally, it's May! Even in the North, spring is here (barring any truly nasty surprises — when I lived in Wisconsin, I *did* see it snow in May). Things are getting noisy on the AM band, though it's still a good idea to keep checking the expanded band channels. But this is also the time of year the FM and TV channels start getting busy.

Sporadic-E skip is at its best beginning in mid-May. Look for signals on channels 2-6 beginning in mid-morning (around 9:00 a.m.), and again in early evening (beginning around 6:00 p.m.). Skip signals appear on the lowest channels first, and can be quite strong. On some evenings, I've been able to watch the entire early newscast on KIII-TV channel 3, over 850 miles from my location. Incidentally, if you find TV skip signals on channel 6, it's time to check your FM radio.

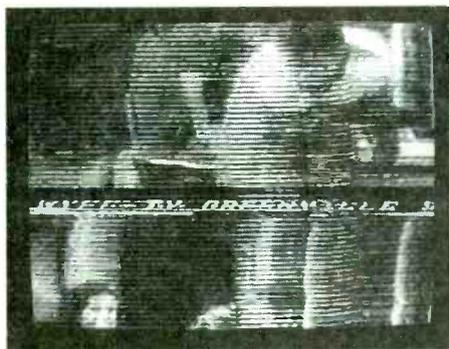
In the South, tropospheric propagation can happen all winter long. In northern climates, the tropo season is just getting started. Tropo DX doesn't go quite as far (stations more than 400 miles distant are quite rare), but all TV channels can be affected. The best openings are likely when cold, stable high-pressure systems are about to be pushed off by an approaching low. The best tropo signals are in the early morning, right around sunrise. But if (like me) you aren't a morning person, there's often also good DX in the evening.

Expanded-Band News

Two more stations appeared with little notice in February, and a third is expected any day now. WPHG is on 1620 from Atmore, Alabama, and carries a program of Southern Gospel music. This station has already been heard in Europe and is now the loudest X-band operation at my location near Nashville. KRIZ is also on 1620 in suburban Seattle with light urban music. Internet reports suggest KRIZ isn't all that strong and may be using 1 kW full time, instead of the 10 kW day power authorized for all expanded-band stations.

Finally, KKSL-1640 is expected to come on the air in suburban Portland, Oregon, by the time you read this. Oregon and Washington are tough states to log here in the East. KKSL and KRIZ should be popular loggings. WTDI-1670 in Wisconsin has *not* yet appeared on the air.

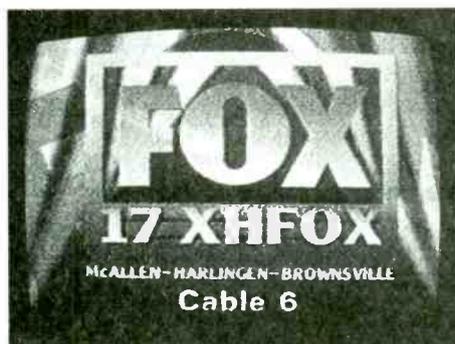
There have been changes to each of the two original X-band stations, too. 1310 kHz in



This photo shows E-skip reception of channel 4 in South Carolina, as received in Shreveport, Louisiana. WYFF-TV (and many other stations) transmits their call letters and city continuously in the "vertical interval." This identification is visible by intentionally misadjusting the vertical hold control.



Here's a picture of Cuban station Tele Rebelde, received on channel 2 in Shreveport. Danny Oglethorpe sent all the TV DX photos in this month's column.



The identification slide may list three Texas cities, but XHFOX channel 17 is actually located at Reynosa, Mexico. This UHF station was received by tropospheric propagation.

Oakland was the longtime home to soul station KDIA. In February, 1310 changed calls to KMKY. The legendary KDIA calls are now on the former KXBT-1640.

In the NYC area, the first X-band station, WJDM-1660, had been carrying the Radio Aahs children's network. Radio Aahs went out of business in February. WJDM (and the other former Aahs affiliates) has been carrying a rather exotic variety of music from the former Aahs headquarters in Minneapolis. Overnight (6pm-6am Central Time), they've been carrying the programming of "Beat Radio." Beat Radio was originally a pirate operating on 97.7FM in Minneapolis. They were "busted" by the FCC, but have now found a legitimate way onto the air. Beat Radio programs a dance music format.

Bits and Pieces

A few months ago, I reported a situation in Asheville, NC, that had two licensed stations competing for use of the same FM frequency. Zebulon Lee had won a permit for the use of 96.5 MHz in three hearings. But before a final hearing could be held, the FCC's hearing rules were overturned in court. Lee, who felt he'd legitimately won the license, refused a suggestion he enter into a partnership with the other applicants. He applied for call letters and put WZLS on the air himself.

Shortly thereafter, the FCC awarded the frequency to the other applicants, and granted them call letters. They built another station — also on 96.5FM — and put it on the air. Both stations operated on the same frequency for 24 hours, before a temporary court order shut down Lee's operation.

Now, WZLS has been returned to the air. Shortly before Christmas, a U.S. Appeals Court in Washington ruled the FCC acted improperly in granting the competing application. The Commission announced they would not challenge the ruling and would undo the changes.

We've had some interesting early-season E-skip openings already in 1998. Here's hoping there will be plenty more as you read this! Let us know what you're seeing and hearing. Send your loggings, news, and DX photos to: American Bandscan, Box 98, Brasstown NC 28902, or via the Internet at my new address: w9wi@bellsouth.net

FM Micropirate Growth Creates Controversy

The number of local pirates operating in the 88-108 MHz FM broadcast band has been skyrocketing in the United States. FCC Chairman Bill Kennard has estimated that several hundred are currently active. The low powered "micropirate" phenomenon is probably the biggest news of the year in unlicensed pirate broadcasting. Every month our readers send in several articles in newspapers across the USA that discuss local FM pirate operations.

For instance, Artie Bigley of St. Louis and Mike Jaeger of Des Moines found stories about **Radio Tejas**, a right-wing "clandestine" station on 95.9 kHz in Missouri, and **Iowa City Free Radio** on 88.7 MHz in Iowa. Maury Midlo found information on Texas pirates using 95.9 MHz from Austin and 105.9 in San Marcus.

The situation in my hometown of Cleveland is a good illustration. Five pirates are consistently active on a daily basis. The oldest, **Grid Radio**, transmits continuous dance music on 96.9 MHz from a night club located in the warehouse district of downtown Cleveland. Four other pirates are all commercial stations (!) with a Puerto Rican Hispanic format, using transmitters located in neighborhoods on Cleveland's near west side.

WSPL on 90.7 MHz is the oldest of Cleveland's Hispanic stations. It programs salsa music with DJ's, as do its competitors **Radio Coqui** on 91.9 MHz and **Radio Sabor Latino** on 93.7 MHz. **Radio Maranatha** also airs salsa tunes on 89.9 MHz, but its broadcasts are dominated by Spanish language religious programming.

Personnel from licensed broadcast stations in northeast Ohio have complained to the FCC about the pirates, citing interference claims. So far the FCC has not acted to close down the microbroadcasters. A similar situation prevails in cities across the United States. If you haven't scanned through the FM broadcast band lately, you could be missing some highly unusual pirate activity.

Rodger Skinner of TRA Communications Consultants, Inc. advises that he has filed a Petition for Rulemaking to create a low power FM broadcast service that would emphasize local ownership of the stations. If you'd like to view the text of his petition, given number RM-9242 by the FCC, [http://](http://www.concentric.net/~radiotv)



Radio
Neehentchrin

Radio Neehentchrin "pirated" R. Nederlands' logo in this QSL.

www.concentric.net/~radiotv has the material on the internet (see p. 4 for more).

■ Shortwave Pirate Frequency

Despite concern in pirate circles that the main 6955 kHz pirate frequency might be used at times by licensed shortwave broadcasters, such out-of-band SWBC transmissions had not materialized by our magazine's press time. Thus, if you're trying to hear pirates, the area between 6945 and 6970 kHz is still the best place to look. About 95% of all shortwave pirate activity remains in this area of the 43 meter band.

There have been experiments on other frequencies lately. **WREC** has been moving to 6850 kHz at times. Some broadcasts by **Jerry Rigged Radio** have been widely heard on 9965 kHz. With sunspot activity slowly increasing and with the return of longer spring and summer daylight hours, it's likely that some stations will operate just below the 19 meter broadcast band between 15010 and 15090 kHz. Sometimes the stations have given announcements on 6955 kHz before they move to unusual frequency ranges.

The most widely heard shortwave pirate remains **Radio Metallica Worldwide**. Dr. Tornado and Señor El Niño use a very powerful 10,000 watt transmitter, so they have been heard throughout North America and other world regions. Most operations are in the area around 6955 kHz, usually using AM modulation. Occasionally Dr. Tornado fires up the upper sideband mode of his transmitter. If you hear Metallica, reception reports (including three first class USA stamps for return postage) are welcome via PO Box 109, Blue Ridge Summit, PA 17214.

■ New Pirate Web Sites

A couple of pirate stations send word that they are operating new pirate web sites. You can find **Trans Atlantic Radio** at <http://home.wxs.nl/~trans> from Europe, while <http://www.angelfire.com/ne/actionradio> is

the site for **Action Radio** in the USA.

Many dozens of pirates maintain internet web sites, with audio from their broadcasts on a few of them. An excellent place to find references to pirate internet activity

is the Free Radio Network site using the <http://www.frn.net/> URL. Another interesting "grassroots" free radio networking site is found at <http://www.radio4all.web.net> from the A-Infos Radio Project.

■ New Maildrop

An unusual new station, **Radio Neehentchrin**, is the first client of a new pirate maildrop for reception reports. PO Box 344, Bremen, IN 46506 has joined the ranks of the more established drops. QSLs have already materialized from the new station, as we see here, so this address has been verified. The other major maildrops used by North American pirates remain PO Box 452, Wellsville, NY 14895; PO Box 28413, Providence, RI 02908; Blue Ridge Summit (see above), 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: Radio Animal, Pittsburgh, PA; Shawn Axelrod, Winnipeg, Manitoba; Artie Bigley, St. Louis, MO; Ranier Brandt, Hofer, Germany; Dean Burgess, Manchester, MA; Pete Carron, Easton, PA; Jerry Coatsworth, Merlin, Ontario; Ross Comeau, Andover, MA; Joe Filipkowski, Providence, RI; Harold Frodge, Midland, MI; Nick Grace, Washington, DC; Frank Grelle, Mt. Carmel, CT; William Hassig, Mt. Prospect, IL; Mike Jaeger, Des Moines, IA; Rich and Talea Jurrens, Katy, TX; Kevin Klein, Neenak, WI; David Krause, Eastlake, OH; Greg Majewski, Oakdale, CT; Bill McClintock, Minneapolis, MN; Maury Midlo, Wimberley, TX; Don Moore, Davenport, IA; Kevin Nauta, Grand Rapids, MI; Gary Neal, Sugar Land, TX; Dick Pearce, Brattleboro, VT; Robert Ross, London, Ontario; Hank Schott, Newtown Square, PA; Lee Silvi, Mentor, OH; Niel Wolfish, Toronto, Ontario; and Andrew Yoder, Blue Ridge Summit, PA.

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FR-465 Cherokee

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| | | |
|-------|-------------------------------|---------|
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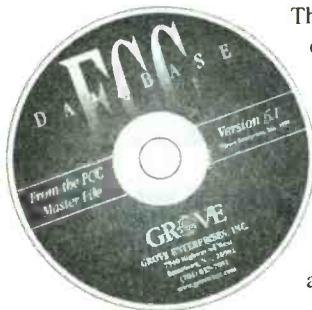
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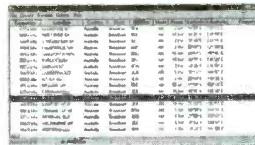
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Making the Case for Novice

There are many advantages to obtaining and using a Novice license in preference to a "No Code" Technician ticket. Unfortunately too many amateur Elmers, in their zeal to add new calls to the ranks, stress the No Code ticket as being the best way to go.

I do like the No Code ticket for several reasons. First, it does provide easy access to allow technically adept people to experiment with radio and learn more about the hobby. The No Code is also ideal for the wife or kids who want to keep in touch with dad, but are not interested enough in ham radio (at the moment) to take on the burden of learning the code.

But, the Novice offers advantages beyond the ability to get on the air and chat with locals or to hope for DX in the off chance six meters opens up.

When the Novice ticket first became available in the early 50s it allowed the new ham to operate 80 meter CW, 11 meter CW, and 2 meter phone/CW. The novice transmitter was allowed 75 watts power input and had to be crystal controlled. In addition, the license was good for only one year; at the end of that year the novice had to have passed a test for technician or higher grade of license or he was off the air!

The new Novice license is a vast improvement over the original: It is now a five year renewable license, allows CW on 80, 40, 15 and 10 meters, and FM on 222 MHz with power of 200 watts, VFO controlled.

As a Novice you can expect to work transcontinental and international stations. Typical daytime range on 80 is 3 to 400 miles; 40 extends this to 1000 miles or so; and 15 and 10 meters permit contacts almost anywhere on earth. Nighttime range on 80 extends from coast to coast. International contacts on this band are fairly rare, as many countries outside the U.S. and Canada are not allowed within the Novice bands.

At night 40 meters does permit some intercontinental contacts, but such contacts are rare due to interference from SW broadcast stations near these frequencies. Fifteen and 10 meters will usually close down a few hours after sundown, except during periods of high sunspot activity (coming soon!). 222 MHz is of course limited to local contacts most of the

time with occasional openings of a thousand miles or so in distance.

To obtain a Novice license you need to pass a very basic theory test. Typical study time of a week or less is required to obtain the knowledge to pass the Novice theory exam. There is a five word per minute code test required which on the average will take a month or two of concentrated study to pass—a small price to pay for what you will receive in return.

There are many aids to learning the code. Several different computer programs are available that will really ease the way for you. There are many code training programs on tape, although the computer is really preferred as a code teacher. Many ham clubs offer code and theory training. And, of course, there is always the individual Elmer.

If you can find a personal Elmer, so much the better, as one-on-one teaching can be very rewarding. Typically, the Elmered ham will have a leg up, since this personal coach will most likely offer use of his station while you are in the training period. He will help you overcome the fear of making that first contact, as well as showing you proper operating techniques — which few of the other methods offer.

After receiving your Novice ticket, a few months of regular operation and study will see you on the way to a General or higher class license with all of the attending privileges.

Compare this to typical VHF operation wherein normal contacts are local (i.e., a hundred miles or less) and there is little opportunity to work DX greater than a few hundred miles except during periods of exceptional conditions on six meters.

A Novice station can include almost any of the transceivers being offered today as they usually are limited to 200 watts or less. Or you can cheapen things up by going for used gear at your local hamfest. Expect to spend from \$200 dollars up for used gear and \$450 and up for new. Remember, this gear will be usable after you get your general, advanced, or extra class license, too.

Don't shortchange yourself: take advantage of what the Novice ticket offers. Elmers, take note and encourage the newcomers to go for the Novice and help themselves to more fun!

■ Six Meter AM

Remember the column a few months back, encouraging six meter operators to use AM mode if they have it? I have been monitoring AM on 50.4 MHz almost daily and am happy to report hearing several AM contacts each week since February. Happily, they are rag chew contacts — some lasting over an hour.

Most stations were located in the northeastern part of the USA, although I did hear several stations in the fourth call area one night. This is something I hope catches on big time. AM is a nice mode, sort of relaxing after running SSB with the vox kicking in and out.

Springtime and the E skip season will soon be upon us, so gear up for a lot of fun on six meters. Please be sure to send me your six meter reports for possible use in an upcoming column.

73 de Ike, N3IK

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Cherokee's Terrific Family Radio Service FR-465

The new Cherokee FR-465 from Wireless Marketing offers just about everything you might want in a Family Radio Service handi-talkie, and all of it executed with spit, polish, and innovation.

To begin, the FR-465 is scarcely bigger than a deck of playing cards: less than 4" tall (excluding antenna), less than 2-1/2" wide and less than 1" thick. At about 8 oz. weight, this radio is truly small and light enough to drop in a pocket and forget that it is there. Everyone who has seen the FR-465 has commented on its high quality look and feel. The entire body of the handi-talkie is covered in a rubberized silicone material of the same type that you'll find on extremely high-end binoculars.

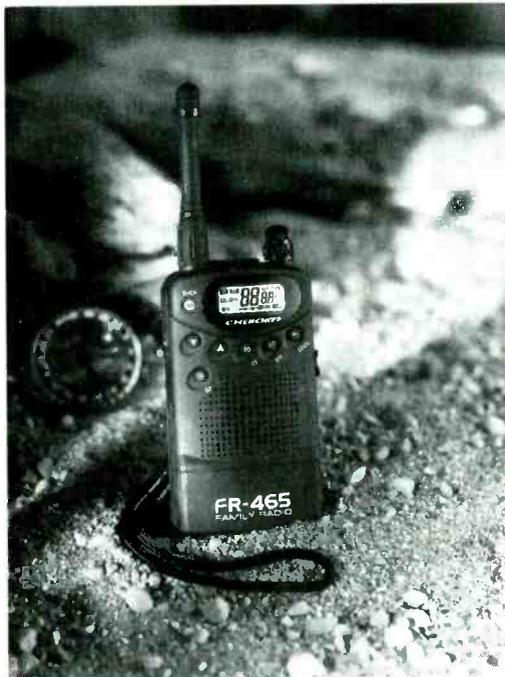
On the front of the FR-465 are seven well-spaced soft rubber pushbuttons, a liquid crystal display, and an opening for the speaker and microphone. On the top of the radio are the antenna, an on/off/volume knob, and a rubber flap, under which you'll find connectors for an external speaker microphone. On the right side is connector for an external power supply with a protective rubber flap. On the left side you'll find a push-to-talk button and a function button.

On the back there is a belt clip and hand strap as well as a panel that slides away to provide access to five AAA batteries. On the bottom of the handi-talkie is a lock for the battery compartment and three connectors for a drop-in battery charger.

In designing the operating software for the Cherokee FR-465, the folks at Wireless Marketing have really struck a happy balance between simplicity and sophistication. On the one hand, a novice can simply turn on the hand-talkie and use the arrow buttons to change channels and the push-to-talk button to transmit. The auto-squelch takes care of the noise. This is the soul of easy operation.

On the other hand, by using the function button in combination with the seven buttons on the face of the radio, an advanced user can access a wide variety of sophisticated options to meet a range of communications needs. For example, the FR-465 has the ability to set CTCSS tones for either transmit and receive (or both), so that members of a group will only hear those transmissions that are intended for them.

In addition, unlike some competing FRS



The Cherokee FR-465 delivers top-gun FRS performance in a pint-sized package.

rigs, the FR-465 can set a CTCSS tone for one channel and not for another. This radio even has the capability to set different tones for different channels, and tones can be set for a channel and then turned on and off without going through the entire tone programming sequence — very handy!

One feature allows dual watch monitoring of two different channels. There are also scanning and memory features as well as the capability to set a transmit time-out limit, a feature that disables the transmit function while receiving a signal, a power save feature, and a programmable call channel.

Another slick feature makes this tiny transceiver ring like a telephone when a call is received. Press two buttons, the FR-465 changes from displaying channel and tone numbers to displaying channel and tone frequencies. All of the capabilities of the Cherokee FR-465 are explained in an extremely well written instruction booklet that never leaves the reader lost.

But aside from its good looks and wealth of features, the performance of the FR-465 is top-notch. The receive audio is loud and clear, and no other FRS radio offers greater transmit range (although some are its equal). And best

of all, it's in a package that can be slipped into a pocket on a moment's notice and used anytime.

During my testing of the FR-465, I took advantage of its easy portability. My wife had sprained her back and was confined to bed for about three days. While I tried to maintain the household and look after our son, an FR-465, carried in my shirt pocket, was my constant companion. My wife had its twin in bed with her. When she needed something, she could key the microphone and communicate with me instantly anywhere in the house or yard or even while I was running an errand to a nearby store. Once you start exploring their possibilities, new uses for FRS radios keep popping up all the time!

The folks from Wireless Marketing have really done their homework on thinking about the FR-465 as part of a radio system. There are a whole host of accessories and options for this radio, including Nickel metal hydride batteries, a drop-in charger, a cigarette lighter powercord, a waterproof speaker microphone, a voice-activated headset microphone, and a variety of cases to protect the radio. I have tested many of the accessories, and they all live up to the high standard set by the FR-465 itself.

The suggested retail price for the FR-465 is \$179.95 (Grove has it for \$139.95), \$59.95 for the metal hydride battery pack, and \$89.95 for the drop-in charger. For additional information, contact Wireless Marketing at 1-800-259-0959.

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You Need dB Aware of Decibels

This month let's take a look at decibels. Perhaps we can even learn something about antennas and radio communications in the process.

■ First Things First

The "deci" in decibel refers to the fact that a decibel is just 1/10 of a bel. The "bel," a relative measure obtained by comparing two power levels, is named in honor of Alexander Graham Bell. The decibel (dB) scale is based on logarithms, and handles the range of values encountered with human hearing better than linear scales do.

For this reason bels and decibels are utilized extensively in telephone, audio and radio work where the electrical signals measured are to be converted to sound waves. Bel and decibel values can be obtained from voltage, current or power levels, but the equations in each case are constructed such that we are always comparing of two levels of power.

Let's have an example. The S-meter on your receiver indicates the relative power received from the incoming signal to which it is tuned. The basis of the S-unit scale is the decibel. Although there is not complete agree-

ment on the definition of an S-unit, one S-unit is generally accepted as equal to six dB. To be useful, all S-meters should give comparable measurements in comparable situations. Thus the S-9 level on all S-meters is calibrated to represent a value of 50 microvolts of received signal. Received signal strengths are then understood to be scaled on the S-meter as compared to the 50-microvolt level of S-9.

However, decibels are a comparison of power levels, so let's talk about watts. A 50-microvolt signal will yield 50 microwatts of power at the 50-ohm input resistance of your receiver. Let's say we receive a signal which measures 3 dB over S-9. On the decibel scale a 3 dB value represents a twofold change in power. So 3 dB higher than S-9 is twice 50 microwatts, or 100 microwatts received power. We report that as "S-9 plus 3 dB."

When the received signal power is decreased twofold as compared to S-9 it would be 3 dB (one-half S-unit) below S-9. A fourfold decrease compared to S-9 would be 6 dB (1 S-unit) below S-9. Of course we'd just report that as "S-8."

Luckily, we don't have to worry about changing watts to dB to use an S-meter. We

| ANTENNA | GAIN dBi | GAIN dBd |
|----------------|----------|----------|
| ISOTROPIC | 0.0 | -2.1 |
| QUARTERWAVE | | |
| GROUND PLANE | .3 | -1.8 |
| DIPOLE | 2.1 | 0.0 |
| 5/8 WAVE | | |
| GROUNDPLANE | 3.3 | 1.2 |
| 2-ELEMENT QUAD | 9.0 | 7.0 |
| 3-ELEMENT YAGI | 10.1 | 8.0 |

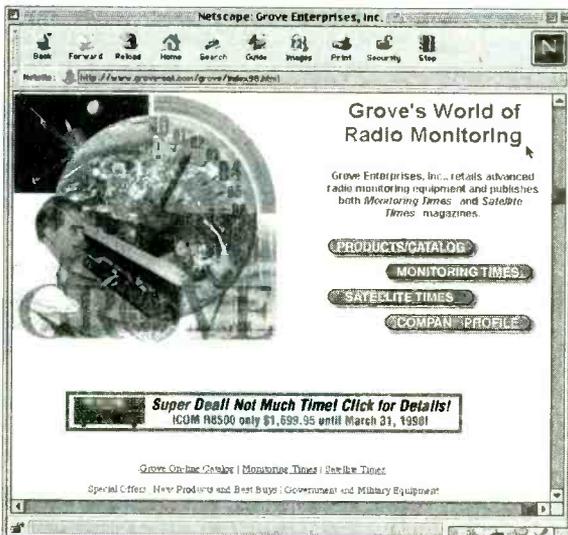
just read its face value and report it.

■ Antenna Gain

"Gain" is a term used to indicate the relative response of a receiving antenna to an incoming signal, or the relative strength of the field created when a signal is transmitted by that antenna. Gain indicates how the antenna under test compares to another antenna receiving or transmitting the same signal in the same direction, and at the same vertical angle.

Two standard antenna designs are generally used for comparison to measure antenna gain. One standard is our old friend the

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halfwave dipole. If you see an antenna gain measure reported as "3 dBd" the last "d" in "dBd" means that the antenna whose gain was measured was compared to a dipole. The 3 dBd value means that the tested antenna had twice the received power a halfwave dipole would in the same situation. If the comparison of the dipole and the tested antenna indicated a negative gain of -3 dB the tested antenna would have only half the gain of the standard.

The other standard comparison antenna is the "isotropic" antenna. The isotropic antenna exists only in theory. It is said to be a point source of radio waves with no directional properties, transmitting equally well in all directions, or receiving equally well from all directions. Gain values relative to the isotropic antenna are reported in "dBi."

Buyer Beware

Table One gives some typical values of gain for several common antenna designs. It is important to understand that these gain figures are typical values, and that in each individual installation the antenna's gain may be somewhat different than the value given in the table. But the values do provide an indication of the relative performance of the antenna designs listed.

One thing to keep in mind when evaluating gain figures is that they represent the antenna's performance in the direction, and at the vertical elevation angle, at which the antenna gives the best performance. So gain for beam antennas is given for their performance in the direction, and at the vertical angle, at which they have the highest gain. It is up to the operator to orient the antenna to utilize that gain as they desire. The beam radiation and reception pattern may have this gain only at this one orientation, and may have very low gain, or even negative gain, in other directions. On the other hand, an omnidirectional antenna has essentially the same gain in all directions.

As shown in Table One the dipole has 2.1 dBi gain as compared to the isotropic antenna. Obviously then, the dipole has more gain than an isotropic antenna. Many operators feel that using the dipole as the standard for comparison is more useful because they have a good idea of the dipole's typical performance. However, in engineering it is often preferable to use the isotropic reference antenna.

For our purposes suffice it to say that, when buying an antenna, you should be careful to notice which reference antenna is indicated in its claimed gain figures. Remember that reported gain figures given in dBi are 2.1 dB higher than gain for the same antenna reported in dBd. Thus, if an antenna's gain is stated in dBi it "looks" 2.1 dB better on paper

than it would if reported in dBd. Just subtract 2.1 dB from dBi gain figures to convert them to dBd gain levels. If you want to convert from dBd to dBi just add 2.1 dB to dBd gain figures.

RADIO RIDDLES

Last Month:

I said that "the term 'propagation' refers to the traveling of a radio signal from a transmitting antenna to a receiving antenna. Does either of these antennas help in determining the propagation path which the signal takes between the two antennas?"

Well, different antenna designs can have different vertical signal-launch angles (VSLAs). With transmitting antennas the VSLA at which the signal is launched affects the angle at which the signal strikes the F-layers of the ionosphere. Obviously then, the VSLA is instrumental in determining the length of the hop the signal makes. Antennas with high VSLAs give good short-skip performance whereas antennas with low VSLAs favor long skip distances.

So yes, the VSLA of the propagation path can be affected by the transmitting antenna. But can the transmitting antenna affect the compass direction utilized to reach the receiving antenna?

Ordinarily we think of communication over only the shortest great-circle route between stations because this is the most direct straight line between the transmitting and receiving antennas. But with a directional antenna it is possible to turn the launch direction 180 degrees from the direct route, and communicate via the long-path, great-circle route when that path is open to propagation.

Another application in which an antenna can affect compass direction of a propagation path is when we aim our signals north to utilize aurora reflection, and then work signals east or west of us. We can also sometimes point a UHF or VHF beam at a large building

or cliff, and use this to reflect signals between stations in an angular path rather than the direct, straight-line path we usually think of at these frequencies.

This Month:

Scatter propagation might well have been mentioned above as an application where the transmitting antenna affects the route of the signal to the receiving antenna. Why? What is scatter propagation?

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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Revisiting the Hombrew Computer

If you ever hankered to build your own IBM-PC/compatible computer, this may be the time. Prices have never been lower and information has never been easier to get, and the satisfaction is indescribable.

Refer to my four-part *MT* series (Nov-95 to Feb-96) on rolling your own PC. If you don't have those issues, you can get reprints (\$3 each) from *MT*. That series is the foundation of this month's update. Details have changed since then, but the mechanics and principles of building your own PC remain sound.

The Changes

The 80486 CPU and low end Pentiums, P60 through P120, are obsolete and unavailable now. The Pentium 133 is headed for obsolescence and may be gone by the time you read this. Industry sources say the entry level CPU is now the Pentium 166, so that's your clue to buy or build nothing less than a P200 MMx.

While 8-MB (even 4-MB) was adequate for 486's on MS-DOS or Windows 3.1, there is no escaping the absolute minimum of 16MB now and 32MB, if you're smart. Frankly, 64MB isn't overkill. Fortunately, RAM prices have dropped. A pair of 72-pin/60-ns/16-MB SIMMs (32-MB total) goes for \$60 or less.

You need a large hard disk drive. Anything under a gigabyte should only be a slave drive. The basic master drive (C:) should be 2.1GB, cost of which is a bit over \$100. Cheer up! In 1983, Radio Shack's 5MB hard disk cost a whopping \$2500. Five or six years ago, a 345-MB drive was \$400.

Two years ago, I suggested a 486 for economy and ease of construction. The Pentium was just coming on strong. Now I recommend building for all the power your budget can handle; that is, put a little more in and get a lot more out. I don't recommend building in the bargain basement anymore because by the time it's built, it's outdated with little resale and growth value. The sweet spot for home-brew seems to be right in the

FIG-1: TYAN TOMCAT IV (S1564s)

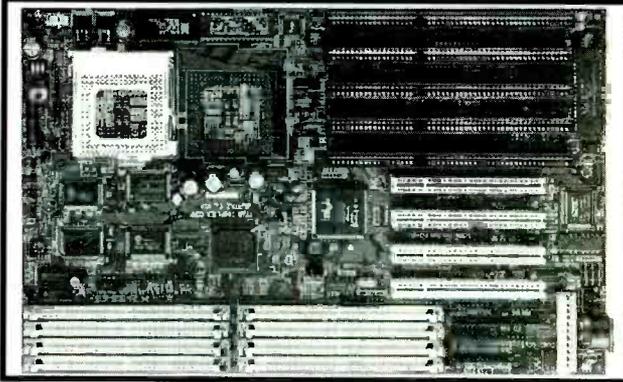
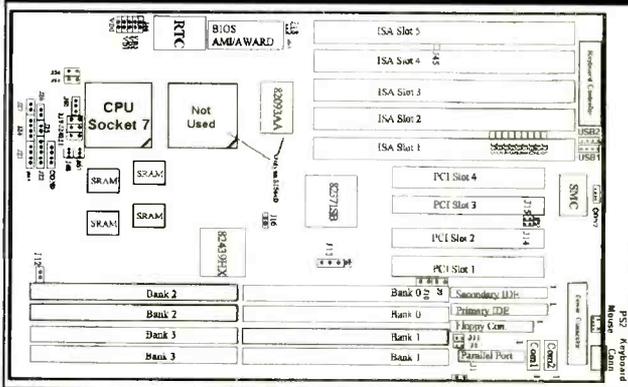


FIG-2: LAYOUT & LEGEND FOR FIG-1



middle of the technology curve. Stay away from the bottom because of poor value, and avoid the avant-garde top because you'll pay too much. A middle-of-the-road Pentium 200MMx computer will be very powerful and competitive for the next two or three years.

Prices on CD-ROMs, network, sound, and video cards have tumbled, but steer clear of the innovative leaders, if "bang for the buck" is important. A 16x CD-ROM, 16-bit sound card, and 2-MB video accelerator are all in the neighborhood of \$50 or less. There is little to be gained with the latest 34x CD-ROM and superwhizbang sound and video cards. Be conservative with add-on cards.

Yet, be liberal with the case, power supply, CPU, hard disk, and RAM. Mini-tower and desktop cases can be stifling. Undersized disks and RAM are a disservice. The power supply should be 225-watts or greater, though anything over 300-watts is probably overkill. A large, full-size tower case is ideal for those

who crawl in and out of their computers all the time. (Like me.) Look with a jaundiced eye at those ultra-modern, sleek "designer" cases with racing stripes and exhaust flames. Stick to the beige plain-jane mid or full size tower cases if you are an experimenter. You need room in which to work.

Forget 5-1/4" floppy drives; they're outmoded. A combo 3-1/2"/5-1/4" floppy drive (both drives in a unit) is fine if 5-1/4" disks are still in your picture. Otherwise, a cheap 3-1/2" floppy will do.

The Motherboard

The motherboard is the heart and soul of a PC. Get a good one; not a cheapo. You stand a good chance of not going wrong if the motherboard comes with one or two Universal Serial Bus (USB) ports.

I know, Windows 95a doesn't support USB (Windows 95b and Windows 98 do!) and few peripherals are available yet, but USB is the coming thing to replace the archaic serial I/O comport. USB will be commonplace in two years. If your motherboard is equipped with USB and an Intel

430HX "chipset," you will probably be okay. Watch the cache, though! Some boards come with 256kB cache, but that's not enough. Insist on 512kB external cache memory. 1MB is probably overkill and costly.

Figures 1 and 2 show what I think to be representative of a good quality motherboard. The Tyran Tomcat IV comes with 512kB cache, an Intel 430HX chipset (best all-round chipset to date), and support for Cyrix, AMD, and Intel CPU speeds of 75 MHz through 233 MHz. Also standard on-board are four 32-bit PCI slots; five 16-bit ISA slots; two PCI bus-master enhanced IDE ports for four hard disk drives plus an EIDE CD-ROM; on-board I/O with IR; dual floppy drive port; two 16C550 high speed serial ports; one ECP/EPP high speed parallel port; two USB ports rev 1.2; one IR port; and a PS/2 mouse port. The Tomcat IV comes with cables and choice of Award or AMI BIOS. The price is roughly

\$140. Add RAM and CPU to round out the board.

If I'm talking over your head here, relax — just check the specs of the prospective motherboard to ensure that their jargon matches mine. Understanding this stuff isn't as important as having it.

■ The Peripherals

A great computer for radio starts with a good case, power supply and motherboard, with a middle-of-the-road CPU and plenty of RAM. And you can almost stop there, since the rest of the stuff is so cheap that even if you make a mistake, it won't be a catastrophe. Still, there is a bit to know.

For instance, there are two kinds of prices on hard drives, CD-ROMs, sound, video, and network cards. One price is for the retail consumer and comes in a shrink-wrapped box stuffed with promo literature and books that never get read. For example, a Soundblaster AWE64 in the box costs roughly \$100. But the OEM version (same thing) without box and frills is under \$70. If you'll settle for off-brand, you can get the same thing for under \$20. I am very impressed with a no-name \$15 sound card I snagged from Fry's Electronics.

Brand-names are not too important for sound, network, and video cards. I would stick to name brands for hard disk drives, though, including Western Digital, Maxtor, Seagate, Fujitsu, Quantum, and IBM.

■ Price Guide

Table 1 shows a sampling of prices you can expect if you "roll your own." Where possible, I listed ranges. If you see prices much higher, beware: they're too high. You might find lower prices — I tried to not low-ball my guide. I just want to keep you from paying too much.

From Table 1, it can be seen that a do-it-yourself Pentium PC can cost about \$800, less monitor, if you have to go out and buy everything. This might not be much of a deal! Fry's Electronics offers a ready-to-run Supercom Pentium 200MMx with 16-MB RAM; 2.1-GB HD; 24x CD-ROM; Diamond

| ITEM | NOTES | PRICE RANGE |
|--------------------------------|------------|-------------------|
| Case & Power Supply | Mid/full | \$22 - \$80 |
| Motherboard | | \$100 - \$175 |
| Pentium 200 MMx | | \$120 - \$140 |
| RAM (memory) | 32MB EDO | \$60 - \$70 |
| Hard disk drive | 2.1GB EIDE | \$110 - \$130 OEM |
| 3.5" floppy disk drive | | \$25 |
| CD-ROM | 16x/up | \$50 - \$80 |
| Video card, 2 MB | PCI | \$40 - \$100 |
| Sound Card, 16-bit | ISA | \$15 - \$30 |
| Speakers | Stereo | \$15 - \$30 |
| Microphone | Stereo | \$10 |
| Modem/internal | 56kB/sec | \$39 - \$129 |
| Keyboard | Windows | \$20 |
| Mouse | PS/2 | \$10 |
| Network card | PCI | \$19 - \$79 |
| Monitor | 17"/.28 | \$500 |

This is only a guide — your mileage may vary.

Stealth 2-MB video; 16-bit full duplex sound card; 56-kB/s modem; speakers, keyboard, mouse, and Windows 95, all for \$850, less monitor. I bought one for a client because I couldn't beat the price and provide Windows 95, too!

You can beat the price if you have any surplus parts. Even a case, power supply, keyboard, and mouse are a good start to saving money when rolling your own. Every little bit helps! Maybe it's time to recycle those old 286/386/486 computers into a cost-effective upgrade...

■ Other Clues

Don't count on older RAM. Pentium computers require 72-pin (or 144-pin) RAM rated at 60-ns or faster. Older RAM isn't likely to be useful. Don't even think about a primary disk drive smaller than 512-MB. Get a larger, faster, more reliable drive for your valued programs and data.

Monitors have dropped in price. A 17" SVGA is the sweet spot now. I have a 15"

| DESCRIPTION | WEB SITE ADDRESS |
|----------------------------------|---|
| Motherboard Manufacturers Sites | |
| Tyan | http://www.tyan.com/ |
| Shuttle | http://www.spacewalker.com/ |
| Giga-Byte | http://www.giga-byte.com/ |
| EFA | http://www.efacorp.com/ |
| Asus | http://www.asus.com/ |
| SuperMicro | http://www.supermicro.com/ |
| Hardware and Other Support Sites | |
| Tom's Hardware Guide | http://sysdoc.pair.com/ |
| Need drivers? | http://www.drivershq.com/ |
| System Optimization | http://www.sysopt.com/ |
| Misc Hardware | http://www.venus.it/homes/spumador/ |

These sites have links to other great references!

Trinitron™ that impresses me, but your eyesight and yen for value should focus on 17" monitors.

Motherboard "chipsets" are very important and Intel's 430HX is the best yet for the Pentium 133-233MMx CPUs. Insist on the 430HX unless you know exactly what you want!

Table 2 lists a few power-breakfast resources to support your PC-building adventure. Don't buy a book on this subject — computer books go out of date too quickly now.

■ Networks

If you have two or more PC's, you should network them for the tremendous values of synergy and experience. Anyone can put up a small local area network now. I'll get into the nitty-gritty of LANs next month so watch your topknot and stay tuned; cool stuff is coming down!

■ Support Notes

If you can't hit my published Internet sites, go to <http://ourworld.compuserve.com/homepages/bcheek> where the current addresses for my better Web and FTP sites will always be posted. You can e-mail me for current addresses, too.

I'm happy to freely provide e-mail support for all my articles and projects. Make questions pertinent and focused and I'll always respond.

E-mail: bcheek@san.fr.com
 WWW: <http://204.210.9.135>
 FTP: <ftp://204.210.9.135>
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Making a Station Engineering Manual

This month we will be looking at ways to make life a little easier around the shack by documenting *exactly* what is in the shack in an engineering manual.

The idea of compiling all the technical data for everything in a facility is not new. In the US Air Force, we had Facility Training Manuals that detailed everything about our technical control facility. Microwave and ground radio maintenance, flight facilities, inside/outside plant maintenance and AUTOVON/AUTODIN maintenance all had their FTMs.

Broadcast stations where I've worked had similar volumes dedicated to how the station was wired, what cable pairs went where, how to tune the transmitter, and even how to turn it on and power it down. Why should an SWL/ham shack be any different?

Organization is one major reason for creating a station engineering manual. A reference source on how everything in the shack is interconnected can help you solve problems quickly when they arise. I know for a fact that big gun contesters and DXers all have station engineering manuals where the operator can go to find out how the antenna rotors are wired, coaxial cable routings, mic/headset pinouts, rig schematics/manuals, etc.

This month, we are going to embark on the technical documentation of my station at K7SZ, to give you an idea of how to how compile a station engineering manual. This will be a good exercise for me as well, since it has been over three years since I have updated my documentation, and a lot has changed in



The current line-up at K7SZ, L-R from the top: Dentron MT3000A tuner, Drake MS-4 speaker, Drake TR4C HF SSB/CW transceiver. 2nd shelf: amplified speaker, Wilderness Radio Sierra, Ten-Tec Century-22 and Yaesu FT301D HF transceivers. The Ten-Tec 1208 6m is off camera. Note the Alpha Delta four-position RF switch which controls the antennas.

those ensuing years. My wife says that I change radio gear faster than most women change shoes!

I enjoy buying and/or trading gear. I have a special place in my heart for tube-type ("boatanchor" or BA) gear. Restoring BAs has become one of the true pleasures of my radio pastime. I also like low power (QRP) equipment and selected shortwave gear. Therefore, my shack tends to change a lot as I restore a piece, use it for a few months, and trade it off for another piece. Still, this is no excuse for not having an up-to-date engineering manual.

Start at the signal

Where do you start? Start at the antenna and work backward to the AC outlet. Figure

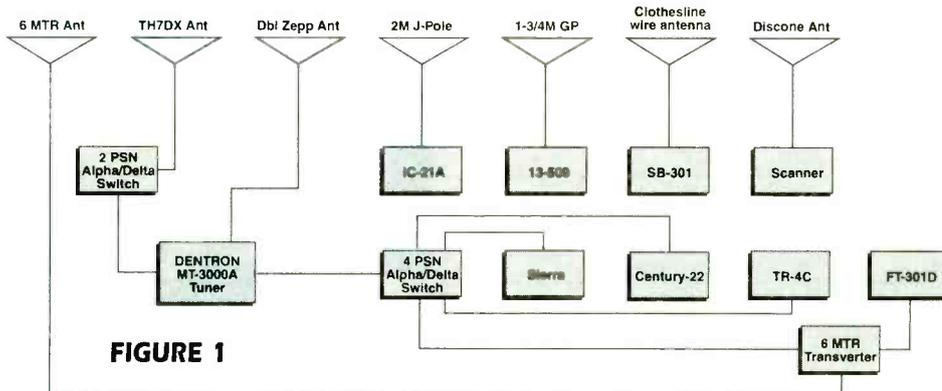


FIGURE 1

I shows how my antennas are arranged. For HF I use three primary antennas: a HyGain TH7DX 7 element Yagi-Uda type beam antenna for 20/15/10 meters, and an extended double-Zepp for 160/80/40/30 meters. A three element 6 meter beam by MFJ sits above the TH7 to give me directional capabilities on the "magic band."

Notice that I have also included an end-fed wire (my clothesline antenna, actually) along with omnidirectional antennas for 2 and 1.75 meters. In addition, there is a Lakeview VHF/UHF discone omni attached to the 35 foot point on my tower which is used by the scanners. This makes a total of seven antennas in use at K7SZ. The extended double-Zepp does double duty as a SW antenna.

Coaxial cables from the antennas are sequentially numbered and noted in the engineering manual. Notice that the Zepp antenna is fed with 450 ohm ladder line which is not easily confused with coaxial cable. While the coax cables enter the shack through a 3 inch pipe/feedthrough near the ceiling, the Zepp's ladder line and the end-fed "clothesline" wire antenna come in at the bottom of the shack window. The end-fed wire is connected directly to the Heathkit SB-310 shortwave receiver.

The TH7DX triband beam antenna cable is connected to a dual position Alpha-Delta antenna switch. The other position of this switch is left unterminated. The output of this switch is routed to a Dentron MT-3000A antenna tuning unit. This ATU has a built in 300 watt dummy load, forward/reflected power metering and antenna switching for 3 coaxial lines, one end-fed wire, and balanced feedline. In addition, it is a *big* tuner, capable of handling 3 kilowatts! The ladder line from the Zepp antenna is also connected to the Dentron ATU at the "Balanced Line" input port.

The output of the Dentron MT-3000A is routed to another Alpha-Delta coaxial switch, this one having four outputs. Each output port is connected to an HF radio in the following order: Radio 1 - Wilderness Sierra multi-band QRP CW transceiver; Radio 2 - Ten-

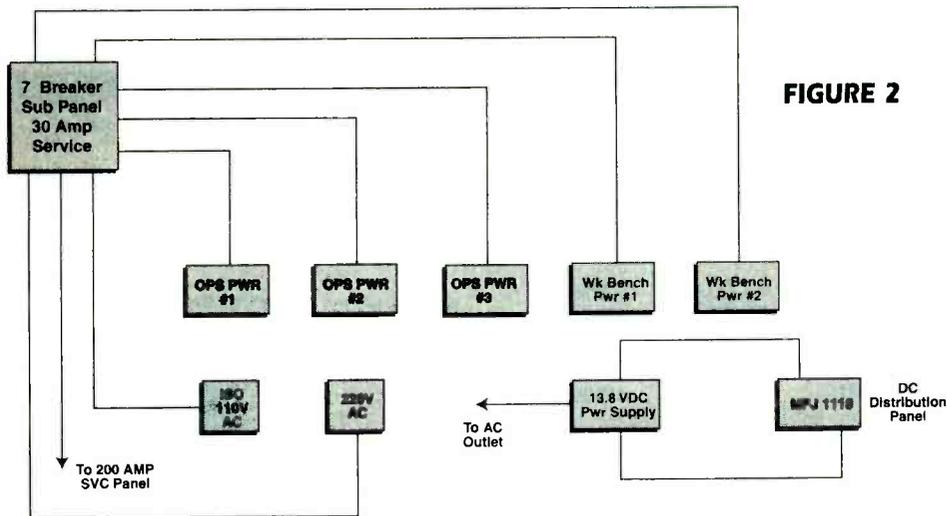


FIGURE 2

Tec Century-22 CW transceiver; Radio 3 - Drake TR-4C SSB/CW transceiver; Radio 4 - Yaesu FT-301SD QRP SSB/CW transceiver.

Note the Ten-Tec Model 1208 6 meter transverter in line with port four of the antenna switch. The 6 meter beam antenna is connected directly to the transverter. Switching between the HF and 6 meter antennas is done at the transverter.

This antenna switching arrangement allows me to switch any one of the four HF rigs between the Zepp and beam antennas, providing great flexibility. All antenna switches and the Dentron tuner are grounded to the station ground buss, and the two Alpha-Delta switches also provide lightning and static discharge protection via their patented Arc Plug (™).

The other four antennas are routed directly to their respective radios. Lightning protection is provided by disconnecting the coax or wire and connecting it to station ground.

I have diagrammed the rotor cable pinout on the HyGain/Telex HAM-IV rotor to show which color wires go to which terminals on the rotor control box. This saves time and hassles in the event you have to work on the rotor control box or a wire comes off of a terminal.

Power Sources

So much for the RF end of things. Now we proceed to the power distribution for the shack. Figure 2 shows the various power connections available at K7SZ. Eventually, all the AC and DC power supplies will be replaced with solar charged batteries, enabling the entire shack to be run off of 12 Volts DC with the exception of the Drake TR-4C, SB-310, the rotor control box, and the shack computer.

When I remodeled the

third floor rear bedroom into a radio shack, I over-engineered the power requirements to the room. With the help of Joe Balutski, N3IKP, a master electrician, I ran a 30 amp service from the main service panel in the house up to the new shack. It is terminated in a seven breaker subpanel to provide power split-out to the operating and workbench areas.

The AC going to the operating area terminates in three groups of four dual 110 volt AC receptacles. Each of the four sets of receptacles is fused on its own 20 amp circuit breaker. The workbench area has two groups of five receptacles, both of which are separately protected by individual breakers on the subpanel.

A new station ground was installed using a continuous run of #4 copper wire from the subpanel directly to the AC service ground of the house. In addition, a separate, isolated ground and isolated outlets were installed for the computer to reduce noise and interference from the computer.

Finally, in the event I ever obtained a high power linear amplifier for HF, a separate 220 volt AC receptacle and circuit breaker was installed.

Twelve volt power is obtained for all the transistor equipment from a 15 amp regulated power supply, housed beneath the operating position. A separate 12 volt supply is used at the workbench. DC power distribution is pro-

vided by an MFJ 1118 DC power distribution box. This unit provides two high current (up to 30 amps) taps for transceivers and an additional six low current taps for accessories. Voltage is monitored via an analog meter on the DC distribution box. The MFJ 1118 is wired to the output of the DC power supply via a length of #8 AWG wire.

Wired for Audio

Microphone audio connections for HF are done via a series of adaptor cables made to interface a Shure 444D mic to the Drake TR-4 and the Yaesu FT-301SD transceivers. The Icom IC-21A 2 meter (146 MHz) and Midland 13-509 1.75 meter (220 MHz) rigs have their own mics which plug into their respective jacks on the radios.

For quick reference, I have included these jack/plug pinouts in Figure 3. In addition, I have included the basic wiring for the Shure 444D mic and the various adapter cables. Eventually, I am adding a Heil boom mic with dual HC-4/5 elements which will be directed via a multiposition switch to one of the four transceivers.

Receive audio from each rig can be patched to one of two Radio Shack DSP filter units which allows additional audio filtration. I can't say enough good things about these small, inexpensive DSP units from Radio Shack. Unfortunately, they are no longer manufactured, so your best bet is to find one at a flea market or hamfest. Going rate is \$20 to \$25, and they are worth every penny.

The output from the DSP filter is passed to one of two Radio Shack Minimus Seven speakers. In the past, I have experimented with running receiver audio through a Sony stereo equalizer prior to the DSP units, but found that this additional step of audio conditioning was not really worth the effort.

Operations and service manuals for each piece of gear in the shack are also included in the engineering manual. This includes schematic diagrams, modification sheets, plus any correspondence with the factory or supplier.

There are several ways to store all this newly accumulated information. I have used large three-ring binders, accordion files, and file folders in a filing cabinet. Of these methods, I like the filing cabinet idea best, since I have a lot of gear and three ring binders can get very cumbersome.

Thus concludes the overview of how I have my station arranged. I realize that your station may be much simpler or much more complex than mine, so use your imagination and plan your installation with flexibility and convenience of operation in mind.

Have fun and remember to **Keep It Simple.**

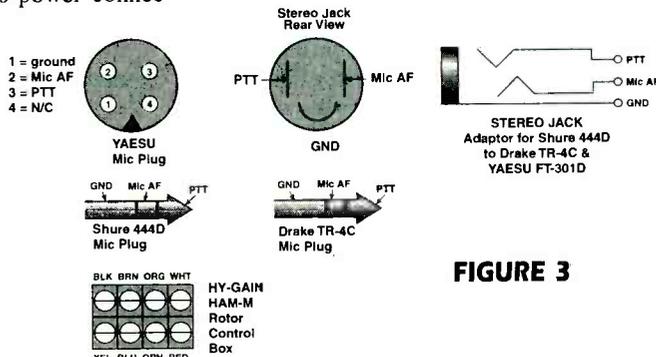


FIGURE 3

Data Frequencies in the Fed Bands

One of our monthly contributors, Ken Windyka, up in Springfield, Mass., writes to inform us of a very interesting Web Page. It is <http://www.ntia.doc.gov>. This is the web page of the National Telecommunications and Information Administration (NTIA) which performs the same function for the federal government that the FCC does for the private sector. This NTIA website provides a lot of information on federal government frequencies and the latest decisions of the government regarding telecommunications use.

One interesting item of note on the above website is the 1996 edition of the *NTIA Manual of Regulations and Procedures for Radio Frequency Management*, which is the bible for federal frequency management, federal communications systems planning and construction. Chapter 4 in this manual has a list of the "splinter" frequencies in the 162-174 and 406-420 MHz range. There are currently 78 such frequencies now available for all federal government agencies to use with an absolute minimum of coordination.

These are data channels only and no voice is authorized on any of these frequencies. Also note these frequencies have very low powered devices on them that are only capable of 5 to 10 kHz bandwidths.

Obviously, the typical scanner is not going to be able to enter a frequency like 162.803125 down to the last digit, but your scanner can come close. For example, you will have no problem hearing a signal transmitting on 162.590625 MHz even if you can only enter 162.590 or 162.595 into your scanner.

162-174 MHz Splinter Frequencies

| | | |
|------------|------------|------------|
| 162.590625 | 162.593750 | 162.596875 |
| 162.803125 | 162.806250 | 162.808375 |
| 163.390625 | 163.393750 | 163.396875 |
| 163.603125 | 163.606250 | 163.609375 |
| 163.790625 | 163.793750 | 163.796875 |
| 164.003125 | 164.006250 | 164.009375 |
| 164.840625 | 164.843750 | 164.846875 |
| 165.803125 | 165.806250 | 165.809375 |
| 166.415625 | 166.418750 | 166.421875 |
| 166.653125 | 166.656250 | 166.658375 |
| 167.190625 | 167.193750 | 167.196875 |
| 167.803125 | 167.806250 | 167.809375 |
| 171.215625 | 171.218750 | 171.221875 |
| 171.403125 | 171.406250 | 171.409375 |
| 173.190625 | 173.193750 | 173.196875 |

406-420 MHz Splinter Frequencies

| | | |
|------------|------------|------------|
| 406.265625 | 406.268750 | 406.271875 |
| 406.278125 | 406.281250 | 406.284375 |
| 408.490625 | 408.493750 | 408.496875 |
| 408.503125 | 408.506250 | 408.509375 |
| 408.965625 | 408.968750 | 408.971875 |

| | | |
|------------|------------|------------|
| 408.978125 | 408.981250 | 408.984375 |
| 409.865625 | 409.868750 | 409.871875 |
| 409.878125 | 409.881250 | 409.884375 |
| 416.790625 | 416.793750 | 409.796875 |
| 409.803125 | 409.806250 | 409.809375 |
| 419.990625 | 419.993750 | 419.996875 |

All of the splinter frequencies shown above are shared by all United States government agencies.

More Shared Frequencies

The splinter frequencies mentioned previously aren't the only shared frequencies in the government spectrum. Just as in the civilian VHF/UHF spectrum, the government has eight itinerant or multi-user frequencies that various agencies share.

The frequencies 163.100, 416.050 and 418.575 MHz are authorized for use by all U.S. government agencies and are there for intermittent wide area requirements of a transient nature. These frequencies do not require prior NTIA coordination.

Just above the 11-meter CB band are two more interesting government frequencies—27.575 and 27.585 MHz. These two allocations are used for intermittent, short distance, low power radio communications, signalling, and the radio control of objects and other devices by a variety of government agencies.

Finally, we have 168.350, 408.400, and 418.075 MHz. These frequencies can also be used by any government agency. They are authorized for use when the communications need by a particular agency does not justify the full coordination of an exclusive government frequency assignment.

These eight government itinerant frequencies should be loaded in every federal monitor's scanner. You just never, ever know what you're going to hear on these neat frequencies.

National Interagency Fire Center

Some discussion on the FedCom list server regarding the National Interagency Fire Center (NIFC) reminds me it may be time to clarify the mission and purpose of this federal agency.

The NIFC was formerly known as the Boise Interagency Fire Cache. The name was changed in 1993 to more accurately reflect the center's national mission. The old BIFC was organized several years ago to make better nationwide use of resources, including na-

tionwide radio frequencies, when fighting a large forest fire. The initial use of the program was for fires on federally owned lands,



such as national parks and national forests. This mission has now been expanded to include fires anywhere in the country; hence the redesignation of the NIFC name.

Here's an example of what can happen with a common cache—and of the kind of activity you may be able to monitor. A few years ago during an extremely high fire season in New Hampshire, the NIFC sent a large tanker airplane to stand by in Manchester. Although it was never used in the New Hampshire area, it did see service in Massachusetts. In addition, part of the radio frequency cache that was located in Maine had been requested to a fire in southern New Hampshire. Although the fire had been expected to last quite a while, it was contained quicker than expected and the radios arrived after the fires were extinguished.

Here are some of the reported frequencies for the NIFC:

| | |
|-------------|-------------------|
| F-1 166.725 | Simplex |
| F-2 166.775 | Simplex |
| F-3 168.250 | Simplex |
| F-4 168.400 | Simplex |
| F-5 168.400 | Input to 166.6125 |

Command net

| | | |
|-----|---------|--------------|
| C-1 | 170.975 | Repeater in |
| | 168.700 | Repeater out |
| C-2 | 170.450 | Repeater in |
| | 168.100 | Repeater out |
| C-3 | 170.425 | Repeater in |
| | 168.075 | Repeater out |
| C-4 | 172.250 | Repeater in |
| | 169.875 | Repeater out |
| C-5 | 171.500 | Repeater in |
| | 169.175 | Repeater out |

Incident Command Channel

| | | |
|-----|---------|--------------|
| C-1 | 411.825 | Repeater in |
| | 417.300 | Repeater out |
| C-2 | 411.850 | Repeater in |
| | 417.350 | Repeater out |
| C-3 | 411.875 | Repeater in |
| | 417.500 | Repeater out |
| C-4 | 411.925 | Repeater in |
| | 417.800 | Repeater out |

Division of Fire, Aviation, and Safety

| Channel | Frequency | |
|---------|-----------|---------------------|
| 01 | 168.550 | Air calling simplex |
| 02 | 168.625 | Air guard simplex |

| | | |
|----|---------|------------------------|
| 03 | 166.675 | Air tactics simplex |
| 04 | 169.150 | Air tactics simplex |
| 05 | 169.200 | Air tactics simplex |
| 06 | 167.950 | Air to ground |
| 07 | 172.600 | Safety |
| 08 | 170.050 | Command Repeater input |
| | 166.725 | Command Repeater out |

Division of Law Enforcement
(Input/Output frequency pairs)

| | |
|-----------------|------------------|
| 166.975/166.375 | 167.075/166.4875 |
| 168.525/169.400 | 168.475/168.975 |
| 169.325/168.425 | 167.900/168.425 |
| 167.825/168.225 | 169.225/168.300 |
| 169.025/169.775 | 169.775/167.175 |
| 168.300/166.750 | 167.000/166.2625 |

There are radio control links which link remote repeater sites using these frequencies:

| | | | |
|---------|---------|---------|---------|
| 408.425 | 408.475 | 408.575 | 408.625 |
| 408.775 | 411.625 | | |
| 412.225 | 412.250 | 412.375 | 414.575 |
| 414.875 | 415.075 | | |
| 415.150 | 417.275 | 417.375 | 417.850 |
| 419.675 | 419.875 | | |

■ **Pantex Plant and other Reader Input**

We previously addressed the frequencies used by the Department of Energy in the transportation of nuclear materials to their final destination of Amarillo, Texas, at the Pantex Facility. This the plant which is operated by the contracting firm of Mason and Hanger, Inc. and which disassembles the thermonuclear weapons.

One of our loyal contributors, Chris Parris of Texas, happened to be in the vicinity of the Pantex plant for a few days recently. Here is a list of his intercepts:

| | |
|----------|--|
| 164.225 | Simplex |
| 164.250 | Simplex |
| 164.275 | Main Security, both simplex and repeater operations. Many alarm checks |
| 164.325 | Simplex |
| 164.350 | Tone and voice plant paging |
| 167.825 | Simplex |
| 173.2375 | Data/telemetry. Lots of sensors around the plant. |
| 416.250 | Simplex with telephone access |

While we're in the area, Rob (KC5IMN) passes along the following intercepts from Tyler, Texas:

| | | |
|----------|---|--------------|
| 167.7625 | FBI | Repeater out |
| 418.9500 | DEA | Repeater out |
| 418.6750 | DEA | Simplex |
| 418.2250 | IRS Criminal Div. | |
| 163.2000 | U. S. Marshals Service (Heavy use of cellular telephones) | |
| 164.6500 | Secret Service | Simplex |

■ **More Reader Reports**

Tom Filecco (KA2UCP) sent in these intercepts for the New York area:

| | |
|----------|--|
| 165.2375 | Customs |
| 166.9500 | National Park Service. FDR Residence, Hyde Park, NY. The p/l tone is 136.5 Hz. |
| 164.5000 | VA Hospital paging |
| 176.4125 | FBI Repeater output |

Moving out to the midwest, Dale Urban submitted the following frequencies for the state of Kansas:

Immigration and Naturalization Service

| | |
|---------|--------------|
| 163.625 | Simplex |
| 162.900 | Repeater out |
| 163.675 | Simplex |
| 163.725 | TAC 1 |
| 163.775 | TAC 2 |
| 163.650 | Simplex |
| 163.750 | Simplex |

U.S. Marshal Service

| | |
|----------|--------------------|
| 163.200 | OPS 1 Repeater out |
| 163.8125 | Repeater in |
| 164.100 | Simplex |
| 164.600 | Simplex OPS 3 |
| 162.7125 | Simplex OPS 6 |
| 162.7875 | Simplex |
| 170.750 | Court Security |
| 170.850 | Court Security |

Over in the Roanoke, Virginia, area Peter Vieth submitted the following information regarding the FBI. The main frequency used is 170.900 MHz. The p/l tone is the normal FBI tone of 167.9 Hz. One side of the conversation was in the clear; the other side was digitally scrambled. Much encryption was heard on this frequency, usually in conjunction with 167.5875. Both frequencies appear to be repeater outputs.

■ **South Florida Activity**

Some new federal frequencies have appeared in the South Florida area. The DEA is using 418.9, 418.75, 419.325 very heavily (Ft. Lauderdale and Miami). Up in the West Palm Beach area, DEA has started using 411.125 MHz as a simplex frequency. This comes from our resident monitor in Jupiter/Tequesta, Florida. Many thanks to "Lokutis" for this info.

The 411.125 MHz channel is used in the Miami as a simplex base station frequency. DEA is also using a repeater pair of 413.975 input and 419.225 output in Miami. The HIDTA (High Density Drug Traffic Area) frequencies are showing some use in South Florida. The following frequencies are showing some life:

| | |
|----------|--|
| 414.025 | Simplex |
| 414.05 | Simplex |
| 414.125 | Repeater input paired with 414.450 repeater output |
| 414.600 | Simplex |
| 416.375 | Simplex |
| 417.0375 | FEMA |
| 418.075 | Government itinerant frequency |
| 418.775 | Repeater out |
| 418.925 | Repeater out |
| 419.200 | Repeater out |
| 419.525 | Paired with 414.125 input |

Several Secret Service frequencies have been heard testing in the digital mode in the South Florida area. They are:

| | | |
|----------|---------|--|
| 164.65 | TANGO | Channel 4 repeater out (p/l tone 103.5 Hz) |
| 165.2125 | MIKE | |
| 165.375 | CHARLIE | |
| 166.400 | GOLF | The common repeater input to 165.375. This repeater is located |

163.4125

near Homestead Air Force Base.
Miami Field Office

The U.S. Customs Office of Export Control has a repeater at Miami International Airport. Traffic has been noted on it. They use these frequencies:

| | |
|---------|----------------|
| 410.875 | Repeater out |
| 416.175 | Repeater input |

To conclude this month, the frequency of 164.550 MHz is a most interesting channel to monitor down in South Florida. It is a U.S. Coast Guard intelligence frequency, but a variety of agencies have been heard on it, including IRS, Customs, Florida Highway Patrol, and FBI. This frequency bears watching (or listening).

And finally, when the Attorney General Janet Reno came back to town to visit her family (yes, she is from here), the following protection frequencies were monitored:

| | |
|---------|-------------------------------------|
| 166.525 | Treasury units with ID of DELTA 300 |
| 166.750 | Same as above |

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Tools of the Trade: Radar

Welcome aboard! Today we shall continue with our look at air traffic controllers' ("tracon") tools of the trade. The radar room is somewhat more exotic looking than the tower cab we discussed last month, but does offer essentially similar equipment, except for the windows.

Controllers in this setting employ a strip printer for information about arriving and departing aircraft. They have telephones linked to the tower, to the center, to the National Weather Service, and to other airport operations; dedicated VHF bands and the shared UHF band, emergency frequencies; wind indicators; the altimeter setting; the RVR indicator; and current weather information hook-ups. The major difference between the tower and tracon is the presence of the radar scopes.

Terminal Radar - This system has a range of 60 nautical miles and completes an antenna rotation (that is, it updates the picture) about every five seconds.

Transponder and Interrogator - The transponder is the part of the radar system that is carried on board the aircraft. The other half is an interrogator, which is usually attached to the radar antenna on the ground. The ground equipment interrogates the transponder on board the aircraft, which responds with a signal that is set to one of 4,096 possible codes. For example, if a pilot is told to dial in (squawk) 2016 on his transponder, the equipment will reply to the interrogator with a signal that will be interpreted as 2016. In most operational transponders, part of the signal to the ground will include the aircraft's altitude in hundreds of feet as well.

Computer Data Blocks - The target derived from the transponder signal overlies the primary target so that they are almost indistinguishable. The computer identifies the discrete transponder code 2016 as one assigned to a specific aircraft (say, Delta 124), and generates a data block for DL 124. The aircraft's position is identified by a position symbol indicating which controller is working the plane. A short leader line connects the data block with the position symbol. The full data block contains the aircraft identification, its altitude, and its ground speed, which is calculated by the computer based on target movement.

Trackball - Controllers have a computer input device known as a trackball at each

console. The plastic sphere that spins beneath the controller's fingers and acts like the familiar computer "mouse." Rotating the trackball moves the cursor on the radar scope to a target or piece of information the controller wants to identify to the computer.

This is one of several ways that information is sent into the computer. Data can also be identified by using the aircraft's identification number or computer number in the data block. A keypad is also at each control position for controllers to use to key information into the computer system.

When a departure aircraft reaches a predetermined point after take-off the computer initiates an automatic handoff to the center. When the handoff is accepted by the center computer and control of the aircraft is accepted by that facility, the data block drops off the departure scope. Inbound aircraft are handed off to the approach controller from the center in a similar fashion.

Automated Radar Terminal System (ARTS) III - Major facilities employ the ARTS III. It uses primary radar returns created by bouncing the radar single off the surface of the aircraft, and secondary radar signals generated by a transponder in the aircraft.

ARTS III Software - The ARTS III software incorporates two significant enhancements. The first is conflict alert. It warns the controller that aircraft are about to lose separation; that is, to move too closely to each other. In the terminal area, aircraft operate so close together that the parameters for this software program are set virtually at the minimum. Therefore, when the alert goes off, it is usually too late to maintain the legal separation, but the warning allows sufficient time for the controllers to avert a potentially dangerous situation.

The second enhancement to the ARTS III



The radar controller's window is his radar screen.

software is the minimum safe altitude warning system. It sounds an alarm when the aircraft descends below the minimum safe altitude for the terrain in question.

Video Map - An integral part of any terminal radar system is the video map. It features a series of solid, dashed, and curved lines, boxes, and circles. Each symbol means something to the controller. After a little orientation, it is possible to identify the primary and secondary airports, the runway center lines, and the aids to navigation serving the airport and the local area. Also seen are the boundary of the facility's airspace and subdivisions of that airspace, which play a part in the segregation of traffic, as well as prominent landmarks used as reporting points by Visual Flight Rules (VFR) aircraft. The video map seems as real to the controller as the picture seen out of windows.

That's all for now. Next month, we'll finish up on the tools of the trade subject and have readers' input. Until then, 73 and out.

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WHAT'S NEW?

TELL THEM YOU SAW IT IN MONITORING TIMES

Sony Enters the Scanning Market!

Sony is showing its confidence in the scanner market by releasing two handheld scanners, the SC-1 and ICF-SC1PC (the same scanner but with computer interface). Features shared by both scanners are phase locked loop (PLL) triple conversion circuitry, 25 to 1300 MHz coverage (less cellular), 300 channel memory, AM and narrow/wide FM reception, 10 "in-



telligent" scannable memories for storing signals continuously active for 5 minutes or more.

A variety of scanning options include lock-out of up to 100 frequencies to be skipped during scanning, one-button access to nine preprogrammed service bands (police, weather, marine, aircraft VHF/UHF, fire/emergency, FM broadcast, TV VHF/UHF sound), protection against accidental operation, and choice of bands, memories or priorities to be scanned. The non-computer capable SC-1 is slated to retail for \$329.95.

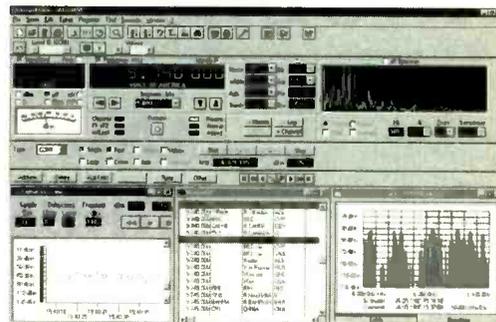
The SC1PC with computer interface uses screen icons as a user-friendly assist to perform custom searches, scanner control and programming, and creation and management of data files. A CD-ROM of FCC-licensed frequencies is provided along with

the bi-directional interface cable and PC software. The list price for the computer version is \$419.95.

Sony's new entries are expected to be available in April, and will be carried by your favorite radio dealers, including Grove Enterprises, which is advertising the SC-1 at \$269.95 and the SC1PC at \$329.95. For more information or to order call 1-800-438-8155, email order@grove.net, or visit www.grove-ent.com

VisualRadio

One more entry into the brave new world of computer/radio partnership is VisualRadio, a Win-



dows based control software for computer-capable scanners and receiver/transceivers from AOR, ICOM, Kenwood, Racal and Yaesu, plus the WinRADIocard. Rhode & Schwartz and Watkins Johnson models are supported by the PRO version. The PLUS version of VisualRadio enables use of two other valuable radio accessories: the AOR SDU-5000 spectrum display unit and the Opto-electronics Scout frequency

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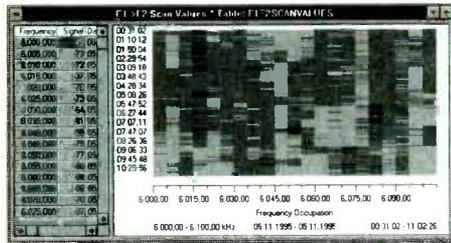
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Besides radio control via the screen-based virtual radio, VisualRadio's strength lies in database management. The German-based company designed the program to work especially well with the Klengenfuss Super Frequency List on CD-ROM (see What's New? Feb 98), though it will import any number of Microsoft Access compatible databases.

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any field, timer-controlled scanning, and much more.

VisualRadio Ver 2.03 is \$122, or \$212 for the PLUS version (includes postage, so slightly less to Europe). To enquire about pricing for the PRO version or to learn more about VisualRadio, email VisualRadio@compuserve.com, visit the website at <http://ourworld.compuserve.com/homepages/visualradio/> or contact general distributor Difona Communication GmbH, Att: Mr. Asmus. Sprindlinger Landstrasse 76, D-63069 Offenbach, Germany.



Visual Radio signal analysis.

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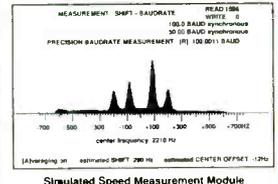
There are some well known CW/RTTY Decoders but then there is CODE-3. It's up to you to make the choice, but it will be easy once you see CODE-3. CODE-3 has an exclusive auto-classification module that tells YOU what you're listening to AND automatically sets you up to start decoding. No other decoder can do it on ALL the modes listed below - and most more expensive decoders have no means of identifying ANY received signals! Why spend more money for other decoders with FEWER features? CODE-3 works on any IBM-compatible computer with MS-DOS with at least 640kb of RAM, and a CGA monitor. CODE-3 includes software, a complete audio to digital FSK converter with built-in 115V ac power supply, and a RS-232 cable, ready to use. CODE-3 is the most sophisticated decoder available for ANY amount of money.

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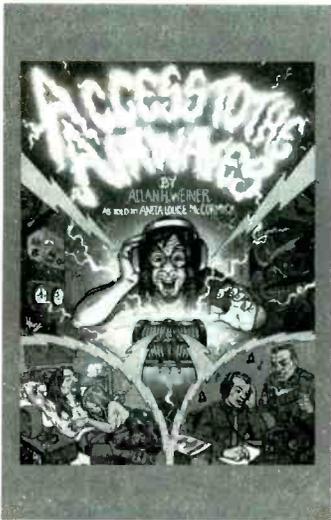
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Throughout his life, from early childhood through adult confrontation with bureaucracy, Weiner has fought tirelessly for unfettered personal freedoms. But free speech on the airwaves was always his dominant theme. *Access to the Airwaves* is a personal chronology of Weiner's life as seen through his own eyes, and as told to Anita Louise McCormick.

McCormick is an accomplished writer and shortwave hobbyist, and her easy-to-read style combined with Weiner's liberal, sometimes counter-culture life style makes for compelling reading, unusual in an often predictable hobby niche like shortwave listening.

Access to the Airwaves is \$17.95 plus \$4.95 shipping from Loompanics Unlimited, PO Box 1197, Port Townsend, WA 98368.

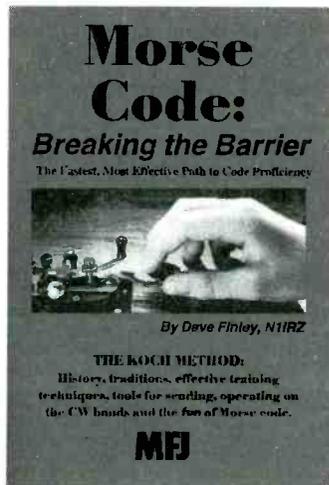
Morse Code: Breaking the Barrier

Another way of gaining access to the airwaves is through an amateur radio license. But, learning the Morse code has always been the turnoff point for most would-be hams. The attitude of many licensees seems to be, "I learned it, so you should, too!" Whether you feel that the Morse code is an antiquated relic of an obsolete era, or the most fun a radio hobbyist can encounter, the fact remains that, at present, to be a world-class amateur licensee, you must learn it.

Dave Finley's 100-page book, *Morse Code: Breaking the Barrier*, is essentially a history of Morse code through the ages—a retrospective, illustrated look at the services and vintage equipment which utilized this mode in the past. Later on, there is an extensive section showing and describing more recent ham Morse equipment and accessories.

The part telling how to master the code is in the middle, roughly a dozen pages describing the Koch method of learning to recognize groups of dots and dashes rather than memorizing their individual sounds.

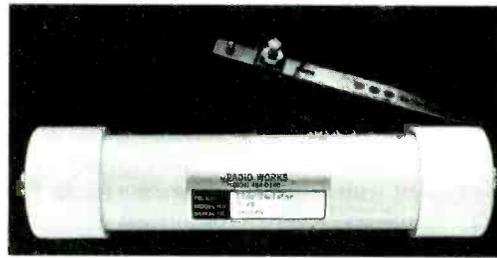
Morse Code: Breaking the Barrier is available for \$14.95 plus shipping from MFJ dealers or directly from MFJ Publishing Company, Starkville, MS 39759; [mfj@mjjenterprises.com](mailto:mjf@mjjenterprises.com).



Line Isolator

The Radio Works' new T-4G Line Isolator™ is an unbalanced, current-type device to reduce stray RF on a coaxial cable's shield. This unwanted stray RF is often the result of antenna imbalance or direct pickup from the antenna. Line isolators remove stray RF without affecting the signal carried by the coax.

Technically, the T-4G, a grounded line isolator, achieves the maximum possible isolation by providing a direct path to ground for stray RF traveling



along the outer surface of the shield of coaxial feedlines. With the T-4G, stray RF on the coax does not see a secondary path to your station equipment because of the extremely high inductive reactance of the line isolator's windings.

If a direct earth ground is not available and the copper ground strap is not needed, the T-4 is available. The T-4 is inserted in series with coaxial cable connecting your transmitter to your linear and between your linear and your transmatch.

RF in the radio room can cause TVI, RFI, and RF feedback problems and the installation of line isolators is often the best and sometimes the only solution to these problems.

The introductory price of the T-4G is \$33.95 and the T-4 is \$29.95. Complete information is available on the World Wide Web at www.radioworks.com.

To request the paper version of the free Radio Works' General Catalog, email jim@radioworks.com or call 1-800-280-8327. You can also write or call the Radio Works at Box 6159, Portsmouth, VA 23703; phone 757-484-0140 or fax 757-483-1873.

Antennas West: the legend lives on

Owner Jim Stevens recently announced the closing of Antennas West, familiar to many readers for such wire antennas as the G5RV, TNT Windom, PicoJ, and TigerTail. However, the legend of these antennas will live on...

"One of the employees, Wayne Smith has retained the building and some of the stock, and is forming his own company," says

Allen Lowe of Arrow Antenna. "He will be selling several brands of antennas including Arrow Antennas." The address to contact is Antennas & More, 1038 South

350 East, Provo, UT 84606; 801-373-8426 phone/fax.

Lowe goes on to say, "Arrow Antenna has bought out most of manufacturing equipment and material and will be manufacturing some (not all) of the wire antennas that were made by Antennas West... All of the VHF and UHF aluminum antennas shown in Antennas West Catalog have been made by Arrow Antenna for almost five years, including the corner beams (corner reflector), the walking stick, the solid yagis, the rooftop J, the tracking antennas, including the satellite antenna, and the fox hunt attenuator."

Contact Allen Lowe N0IMW, Arrow Antenna, 1803 S. Greeley Hwy. #B, Cheyenne, WY 82007; 307-638-2369 phone, 307-638-3521 fax, for more information on these intriguing antenna designs or visit <http://Members.aol.com/Arrow146/index.html>

Books and equipment for announcement or review should be sent to

"What's New?"

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P.O. Box 98,

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**Press releases may be
faxed to 704-837-2216 or**

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mteditor@grove.net.

The MFJ-418 Pocket Morse Code Tutor

Review by Skip Arey WB2GHA

Recently I had the opportunity to teach a ham radio license class. I was gratified to discover, despite common belief, that folks are still interested in learning International Morse Code. To get beyond the basic Technicians class license and to get access to amateur radio's HF bands, you still need the code. But many folks, including myself, find it hard to find the time to practice. The folks at MFJ Enterprises have come up with a device to make it possible to take code practice wherever you go.

The MFJ-418 is a diminutive, microprocessor-controlled box full of CW fun. Regardless of your skill level, this unit can serve to improve your overall code operating skill. Measuring just 2-1/4 by 4 by 1 inches, the unit fits easily into pocket or purse. The MFJ-418 is powered by one 9 volt battery. Audio gain is adjustable, and there is a headphone jack for private listening.

All aspects of the device's use are controlled by the power switch/volume control and three push buttons. From these simple controls you can set code speed from 3 wpm through 60 wpm. The speed can be adjusted "on the fly" without altering other settings during your practice. A series of simple menus allow you to set overall speed, Farnsworth style code practice (separate adjustment of character and spacing speeds), and tone.

You can set the learning style to suit your needs, from beginners to advanced to custom settings. The unit will send characters, groups, QSOs, words, call signs and combinations. All of these audio features are further supported by the addition of a two-line scrolling LCD display that allows you to see what is being sent. It can be set to display the letters prior to sending the audio (good for initial



learning) or audio first followed by the lettering. Included is an 18 page, detailed manual and MFJ's 12 month warranty.

I've been carrying this little box around with me for the last several weeks

and I've had a ball with it. I keep it in my briefcase and grab about fifteen minutes of practice every day at lunchtime. My goal is to push for 35 WPM so I can start to hang with the big dogs on the bottom end of 20 meters. Meanwhile, my son borrows the unit for a few minutes each night to prepare for his Novice test. Now that's versatility!

I recommend the MFJ-418 for anyone who wants to learn and then go on to fully master the International Morse Code. It's \$79.95 from MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759, (601) 323 5869, Fax (601) 323-6551.

Techtoyz Micro RF Detector

Review by Haskell Moore, kb5wix@aol.com

The Techtoyz RF Detector is the third in a line of new, innovative electronic products housed in a pager-style enclosure from Optoelectronics. The previous two products include a DTMF decoder capable of storing 2000 digits and a frequency counter with a signal filter and three memories.

The RF Detector is a full featured electronic instrument in a very small, discreet package. In addition to displaying the signal strength of near field signals, it has several very useful options. For example, it may be configured with one of two beep modes, either sounding intermittently or continuously, when the adjustable threshold has been attained.

Depending on the user's preference, one of two display modes may be selected. In the digital mode, the ambient signal level, signal (audible beep) threshold, and



maximum signal level are displayed simultaneously as standard numeric digits. In the bargraph mode, two 24-segment bars are used to display the information.

Finally, it also has the ability to keep track of the number of times (up to 250) that the signal strength exceeds the preset threshold.

Potential uses for the RF Detector include transmitter calibration, antenna tuning and placement, tracking stuck transmitters, electronic counter-surveillance (i.e., bug detection), RF safety monitoring (by using

the audio alert function as an RF detector), radiation and emissions measurement (i.e., computer RF shielding), and coax leakage detection.

Specifications:

| | |
|------------------|---|
| Frequency Range: | 10MHz - 2GHz |
| Beeper Alarm: | Continuous or resettable |
| Hit Counter: | 250 maximum |
| Signal Level: | Displays maximum signal level attained |
| Display: | Relative RF level (numeric or bargraph) |
| Dynamic Range: | 30 dB minimum |
| Power: | 1.5V AA Alkaline Battery (Approx. 15 hour run time) |

The Techtoyz RF Detector sells for \$149.00 (US). The optional, but highly-recommended external antenna is an additional \$9.00. The full line of Techtoyz are available from Optoelectronics, 5821 NE 14th Avenue, Ft. Lauderdale, FL 33334 (800-327-5912 or 954-771-2050).

Radio Shack PRO-2050 Trunk Tracking Scanner

The 300 channel Pro-2050 is Radio Shack's first base scanner which can selectively follow conversations in 800 MHz Motorola trunked radio systems. Uniden manufactures the PRO-2050 in Philippines for Radio Shack.

Feature-for-feature, the PRO-2050 is comparable to the portable Uniden BC235XLT Trunktracker, but has slightly less frequency coverage (see measurements table) and more powerful audio output.

As in the PRO-26 and PRO-67, the designers censored frequencies adjacent to the cellular phone bands so our PRO-2050 will not receive 823.9625 MHz. This frequency is licensed to local and state governments in Illinois, New Jersey, Texas, and other states.

■ Conventional Features

The PRO-2050 operates "like a Bearcat" and lacks the Program key and Monitor memories of other Radio Shack models. You program a conventional frequency by merely pressing the frequency digits then the Enter key. AM and NFM modes are factory set and not selectable. Its 300 channels are distributed among 10 banks and a 2 second rescan delay may be programmed on a per channel basis. A query feature identifies duplicate memory channels.

Various combinations of banks may be scanned and our PRO-2050 scans a mixture of frequencies at 78 channels/sec., skipping over empty channels. Individual channels can be locked out from memory scanning, and a simple keystroke sequence unlocks all nonempty channels in all banks.

One channel per bank can be designated a priority channel and sampled every 2 seconds. A single pair of frequency limits can be programmed for searching up or down, but searching and priority cannot be used simultaneously. Up to 50 frequencies may be locked out from a limit search versus 20 frequencies in the BC235XLT.

A single pair of limits may be programmed for a limit search. There is no Direct key or direct search facility, as found in GRE-made models. Factory preprogrammed frequencies for police, fire/emergency, commercial air, public service, and weather can be scanned by pressing the SVC key.



Radio Shack's trunk tracking base model.

Oddly, Radio Shack replaced the excellent marine service bank found in Uniden models with a "public safety" bank of 140 preprogrammed frequencies in the 800 MHz band. Many of them carried data transmissions in my area. Up to 20 frequencies can be skipped during a service scan, except weather frequencies.

Data Skip jumps over unmodulated and constant tone or data signals if they are strong enough. It is disabled when scanning AM aircraft or using priority scan.

■ Trunk Tracking

The PRO-2050 is designed to follow conversations in Motorola Type I, Type II, and Hybrid 800 MHz analog trunk systems. It will not track GE (Ericsson), E. F. Johnson, 400 MHz, or 900 MHz trunked systems, which must be scanned in the conventional mode. The PRO-2050 defaults to Motorola Type II systems, which divide a large number of users into several groups called talk groups. We programmed three public safety Type II trunked systems by entering their frequencies using the same procedure as a BC895XLT and BC235XLT.

The PRO-2050 skips over telephone calls and conversations on talk groups designated as private.

Each of the PRO-2050's 10 banks can be programmed with the frequencies for a single trunked system or with frequencies for conventional use, but you cannot follow trunked conversations and scan conventional systems at the same time. A Trunk key selects between trunking and conventional operation.

Talk group and fleet numbers, not frequencies, are dis-

played while searching or scanning in the trunked domain. Fortunately, Uniden designed the PRO-2050's rescan delay, hold, and lockout facilities so operation is very similar in both trunk and conventional domains, like the other TrunkTracker models.

You can search or scan for active talk groups in the trunked domain and lock out up to 100 uninteresting talk groups. You can program up to five lists per bank with talk group numbers for scanning. Each list can hold up to 10 group IDs, though there's no warning of duplicate group numbers. See March 1997 *MT* for a more detailed description of the trunk tracking features in the BC235XLT, which work the same way.

■ Usability and Performance

The LCD display is easy to read and brilliantly backlit by an incandescent bulb through an orange filter. The lighting scheme is simple yet effective — the same as in the PRO-2040. We prefer it to the PRO-2006-type electroluminescent panel which wears out with use and is expensive to replace.

The volume and squelch knobs are too close together and it's difficult to adjust one knob without a finger bumping into the other knob. The rubber keypad has a good feel and a keypress confirmation beep can be enabled or disabled via a power on procedure. The tiny keytop lettering of the center keys has us squinting. The Manual key is perhaps the most important key in any scanner, but it is small and the same color and shape as most other keys on PRO-2050's central dashboard.



The PRO-2050 is lightweight because there is no chassis and the case is entirely plastic. Power is furnished by an included 12 VDC wall wart. Components are surface mounted on a main printed circuit board and a second board located behind the front panel. We connected a CTCSS display to the discriminator using the solder pad shown here, though this may void the warranty.

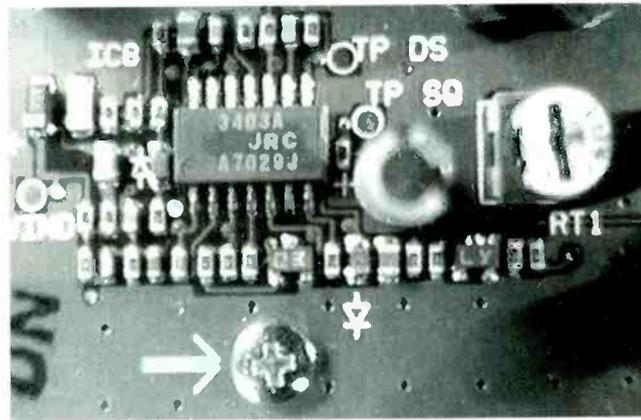
The triple conversion PRO-2050 employs IFs (intermediate frequencies) near 380.7, 10.85 and 0.450 MHz and the image rejection on our test unit is excellent at the frequency we measured. Our PRO-2050 reception is starkly "cleaner" than most of the other middle priced scanners we tested. It isn't plagued by intermod or image problems in the 160 MHz railroad band nor most of the spectrum while using an outdoor antenna.

We find relatively few birdies in our PRO-2050. Harmonics of the crystal controlled 10.4 MHz local oscillator are responsible for birdies at 31.2, 41.6, and 52 MHz, though they are weaker than the same birdies in our BC235XLT.

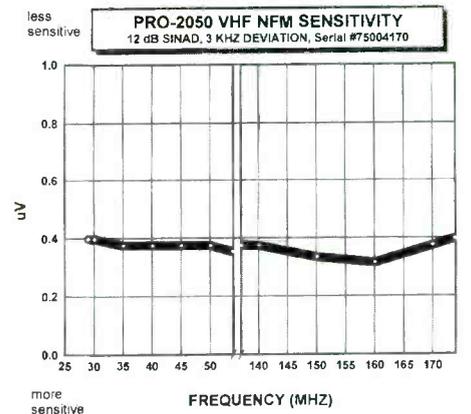
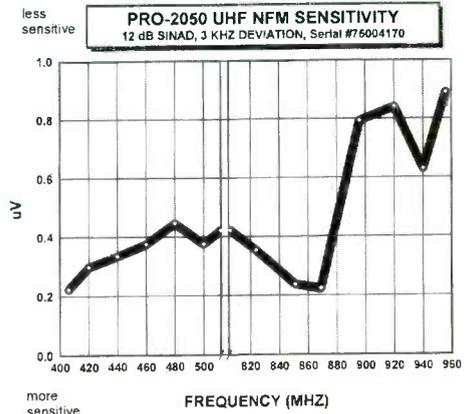
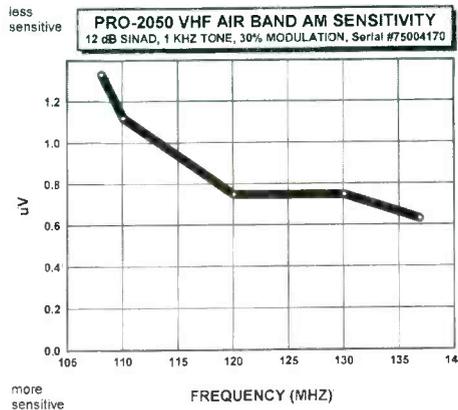
Audio output is crisp. Monaural headphones or an external speaker can be connected through a 1/8" jack on the front panel, but there is no Tape output jack.

Finale

Though its front panel could be better, our PRO-2050's reception is excellent. The PRO-2050 is a fine match for the person who wants "meat and potatoes" trunk tracking and conventional scanning without frills or a lot of intermod.



Baseband audio connection at pad labeled TP DS.



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MEASUREMENTS

Radio Shack PRO-2050 Scanner S/N 75004170

Frequency coverage (MHz):

- 29 - 54 (5 kHz steps)
- 108 - 136.975 (AM, 12.5 kHz steps)
- 137 - 174 (5 kHz steps)
- 406 - 512 (12.5 kHz steps)
- 806 - 823.9375, 851 - 868.9875, 896.1125 - 956 (12.5 kHz steps)

FM modulation acceptance: 14 kHz

Image rejection due to 1st IF:
63 dB at 155 MHz

Audio output power, measured at headphone jack:
0.86 W @ 10% distortion

Practical memory scan speed: 78 channels/sec.
Search speed, Turbo: 267 steps/sec.
Search speed, regular: 97 steps/sec.

Intermediate Frequencies:
380.7 (approx), 10.85, and 0.450 MHz

You are Not Alone! Check out our Club Lists!

To find other radio hobbyists, consult <http://www.grove-ent.com> for a listing of radio clubs and nets worldwide, or send an SASE for free list (NA only) to Club Circuit, PO Box 98, Brasstown, NC 28902. No local club? Join a managed email list (see p. 2) for your area of interest.

For hamfests in your area, visit <http://www.arrl.org/hamfests.html> or call the ARRL at 860-594-0200.

Drake's R8B: Is It Really the Best?—Part I

With the Drake R7 and R8, the first production units had problems that were corrected in subsequent manufacturing runs. So, with the R8B we decided to let Drake go through a number of production cycles so they could make any circuit adjustments that might be appropriate. As it turns out, our concern was unnecessary—Drake tells us that no “debugging” has been needed.

So, here is the first of two columns on our latest findings with this, the most popular tabletop shortwave receiver on earth. We've especially compared it with elder Drake models to see whether it is, in fact, the hottest thing ever to emerge from Drake's laboratories.

■ Clobbers pre-1979 Drake models

To clear the deck, the R8B runs circles around virtually any Drake receiver made before 1979, such as the R-4 series, SSR-1, SW-4A and SPR-4. (We can't compare it to the DSR/MSR series, as we've never tested them.) To a lesser extent, it is a genuine step forward over the original R8 and R8A, as well as the current SW8.

This leaves only the ca. 1979-1985 Drake R7, R7A, R77 and R4245—the immediate predecessors of the R8 series—as serious contenders. The popular R7 and R7A are virtually identical, whereas the relatively rare R4245 (the R77 reportedly is identical) differs in performance from the R7/R7A only because it has a more stable tuning system. So we'll just refer to these models collectively as “R7” except where tuning stability is concerned.

■ Inboard multi-voltage power supply

The R8B tabletop communications receiver is virtually the same as the R8A, but with better selectable-sideband synchronous detection, more (1000) memory presets and faster scanning. It uses an inboard power supply, an improvement over some other tabletop models which, alas, use “wall-wart” AC adapters. The R8B works off 90-110, 108-132, 180-220 and 216-264 VAC, 50-60 Hz, as well as from 11-16 VDC through a connector on the rear panel. The necessary separate fuses for AC



and DC are both inboard, a nice touch.

However, to run the R8B from 180-264 VAC requires that a resistor first be removed from the bowels of the receiver—a task Drake recommends be done by a trained service technician. Presumably going from 180-264 VAC to 90-132 VAC requires reinstallation of that resistor. Whatever, it is an amateurish and peculiar procedure unworthy of Drake.

The R7's inboard power supply covers the same voltages, but doesn't require anything other than the flipping a couple of switches. Score one for the R7. However, the R7 requires an inline outboard fuse when powered by DC, so...

■ Excellent tuning system and display

The R8B comes with all manner of well-thought-out tuning and scanning features. These include two VFOs; those (count 'em!) 1000 memory presets, which store just about every receiver operating parameter and also allow station name to be displayed; keypad and multi-speed knob tuning; up/down slewing in 100 kHz increments; all-mode squelch; and a variety of sophisticated scanning options. The R7 has nothing but a humble single-speed tuning knob, and in fact is one of the clunkiest receivers ever designed for “getting there from here.” If you're into frequency hopping, there's no contest: the R8B gets an “A,” the R7 a “D minus.”

The R8B's tuning is, of course, fully synthesized. It tunes and displays in 10 Hz increments, and our tests show the frequency readout to be accurate to within 20 Hz. There is virtually no chugging, and stability is to within 40 Hz from startup. Unlike the original R8, the R8B can display frequency in kilohertz,

including with the appropriate decimals, or megahertz if you so choose.

The R7, on the other hand, is tuned by a non-synthesized electromechanical PTO that can drift a whole kilohertz—1,000 Hz—from startup (the quasi-synthesized R4245 can drift up to 200 Hz). And the R7's frequency display is only in 100 Hz increments. So here, too, it's the R8B—no contest.

■ Features, features, features

The R8B and R7 both have two selectable antenna inputs. However, unlike the R8B, the R7 also has a converter port which acts as a deep-isolation third antenna input. Additionally, the R7 comes with an inboard splitter which allows either antenna #1 or antenna #2 to serve two receivers at the same time with negligible signal loss. On the other hand, the R8B handles both low- and high-impedance antennas, whereas the R7, in principle more than in practice, requires an outboard balun for high-impedance antennas to work at optimum efficiency. Here, it would appear to be a coin toss between the R8B and the R7, but in practice those with two receivers will almost certainly prefer the R7's setup.

For decades, Drake has been famous for its unsurpassed passband tuning circuits, which they now call passband offset (PBO). The R8B continues in this tradition, putting to shame comparable circuits in Japan Radio and other competing gear. Nevertheless, the tuning range of the R8B's PBO is greater than can be sensibly utilized, even on mediumwave. This wide tuning sweep makes it much fussier to tune than that of the R7, whose PBO is as close to perfect as you're going to get this side of the pearly gates. Here, give the R8B an “A minus”...an “A plus” for the R7.

Also included in the R8B are a tunable audio (AF) notch filter, a two-width noise blanker, two 24-hour clocks, a timer, an attenuator, a switchable shortwave preamplifier, an accurate analog signal-strength meter, a front-panel-display dimmer, plus an RF gain control. The large LCD indicates the status of just about every receiver variable. To tilt the receiver to a com-

portable angle for operation, the R8B comes with a flip-down elevation rod that's Gibraltar sturdy, but a fingernail-breaker to pull down.

The tunable AF notch filter works quite well, being deep, as in earlier versions, and to our pleasant surprise it is no longer difficult to tune. However, it won't kill hets of less than 500 Hz, which especially in the tropical bands can be a disappointment. The tunable IF notch filter on the R7 knocks out hets of a bit less than 500 Hz although, at some point, tuning it too low kills off the carrier. On the other hand, the R8B's AF notch zaps higher-frequency hets not reachable because of the R7's IF-based design. Again, a coin-toss.

The R8B's noise blanker in the "narrow" position is simply outstanding for coping with local electrical interference. However, the blanker on the R7 is also in the same league. As with all noise blankers available today, blanking action takes place only when the electrical noise is above the threshold of the received signal. Thus far, no manufacturer has attempted to produce a receiver with blanking that acts on noise more or less independently of that threshold—a pity, given the increased prevalence of electrical pollution.

■ Sophisticated clocks and timers

The R8B's two 24-hour digital clocks display seconds separately, a boon for DXers waiting for station IDs at the hour. (Why is it that not a single shortwave receiver with two clocks allows one to be in 12-hour "AM/PM" format for local time, the way normal people are used to it? At least the inexpensive MFJ-108B dual-time accessory clock gets it right.)

The clocks are easy to set, and come with 30-minute power backup. However, the clock display is shared with the frequency readout, even though Drake has cleverly designed this to be as painless as possible. On our receiver, the clock usually accurate to within better than a few seconds.

The R7's clock? Simple: there isn't one, much less two. Instead, I use a 1969 Tymeter 24-hour mechanical-digital desk clock with a synchronous motor. It is absolutely accurate day after day, week after week, so long as the electricity doesn't fail.

The R8B's clocks second as a pair of on-

RADIO DATABASE INTERNATIONAL WHITE PAPER® reports contain virtually everything found during exhaustive tests of premium shortwave receivers and outdoor antennas. For a complete list, please send a self-addressed stamped envelope to RDI White Papers, Box 300M, Penn's Park PA 18943 USA; or go to www.passport.com.

off timers, which also trigger a DIN socket so as to turn on and off a tape recorder or similar device. Well, in principle, anyway: you may have a fruitless search if you hope to find a recorder that actually functions with this scheme. However, the R8B has no less than two line outputs for feeding tape recorders, RTTY demodulators and the like, along with an RS-232C PC port. No IF output, though—not much of a loss, as the R8B's 50 kHz IF won't readily interface with everyday 455/450 kHz devices, anyway.

Next month, the conclusion of the fascinating R8B story!

Japan Radio NRD-545 in the wings.

Although the forthcoming fully synthesized Japan Radio NRD-545 receiver has not yet been officially released here, it should be on dealers' shelves about the time you read this. Its street price in Japan is 178,000 yen, or about \$1,400.

Japan Radio apparently has been passing out early samples to selected individuals and organizations. We are not among these, and past experience has shown that there is almost invariably a good reason why a manufacturer wishes to keep our traditionally grouchy re-

views from making early impressions. The disappointing Japan Radio NRD-345 was just such a model, but of course we can't know how the '545 will fare until we actually put it through our full laboratory and hands-on paces.

Although comments circulating to date are predictable—"the best receiver ever" and such—there are signs that the flaws which one of *Passport to World Band Radio's* review team noted at an exhibition in Tokyo last year may not have been corrected. Even one of JRC's "optimistic" reviewers is now indicating that the synthesized audio sounds robotic and un-lifelike.

We'll see. As always, we will get our mitts on this receiver when it goes on sale to the public, then after running it through our chamber of horrors we'll lay out our findings in this column.

This equipment review is performed independently by Lawrence Magne and his colleagues in accordance with the policies and procedures of International Broadcasting Services, Ltd. It is completely independent of the policies and procedures of Grove Enterprises, Inc., its advertisers and affiliated organizations.

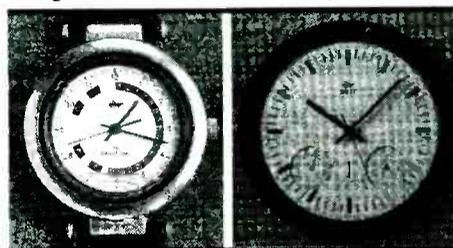
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How Suite It Is!

A Look at WiNRADiO's Digital Suite Product

If you have been following us the last few months you'll remember that we have been visiting the world of PC based receivers. We started with ICOM's new IC-PCR1000 and then went back to take another look at Rosetta Lab's WiNRADiO 1000i. Since the WiNRADiO's first review a few years ago by a major communications publication (that's us!), the software has gone through a number of major changes. To the company's credit, all updates have been available free-of-charge to WiNRADiO Customers via their Web Site (<http://www.winradio.com>)

About 16 months ago we looked at Rosetta Labs' first add-on program for the WiNRADiO, WinDatabase. This time we'll try Rosetta Labs Digital Suite, which is a dedicated add-on to WiNRADiO to provide decoding of digital signals and more. What modes does it decode? Is it equally useful across the wide frequency spectrum of the WiNRADiO receivers? What hardware/software does it require? How well does it do its job? Can it mix me a martini? Hold on! Let's take the questions one at a time.

■ Sophisticated Computer Requirements

In my estimation WiNRADiO 1000i is a great product. Its performance and price are hard to beat. But, for me, another feature that sold me on WiNRADiO 1000i is its very modest computer requirement. It runs great on a ham-show-bargain 486-66DX2 computer, with just 8 MEG of RAM and Windows 3.1. We even had it running in DOS mode on a Compaq 286. The simple, inexpensive computer requirements just add to the versatility of WiNRADiO's concept. But now — enter Digital Suite!

I opened the Digital Suite manual and read that the recommended computer was a Pentium 133 or higher with a sound card, and it would only run under Windows 95! I was disappointed. A quick check of WiNRADiO's website showed that these requirements were,



Figure 1 - Digital Suite's WeatherFAX capability.

indeed, clearly stated. I guess I looked right passed them, assuming the simpler WiNRADiO 1000i requirements. Even the absolute minimum requirements list a Pentium 100MHz, sound card and Win 95. Humph. Well, get a cup of coffee and I'll move WiNRADiO into a Pentium 166 MMX machine running Win 95.

...OK, I'm back. Installing Digital Suite was a snap. Within a few minutes the software was loaded. Prior to turning the computer on, the single connection from the sound card line input to WiNRADiO audio output was made via the included cable. When WiNRADiO's software is started a new command line will appear in the Main Menu — Digital Suite. This is how all functions of Digital Suite are accessed. And, as with all decoding packages, setting the audio input level is a key factor to successful operation.

■ Leveling the "Playing" Field

Using Win 95's Volume/Recording Controls (accessed from the Programs/Accessories/Multimedia menu), Line-In is enabled and its volume is set to near

maximum. Now the Audio Scope/Spectrum Analyzer function of Digital Suite is required. This is similar to a software product that we reviewed many years ago. I think it was called Pro Audio Spectrum Analyzer. It was one of the first useful PC instrumentation applications. Digital Suite's Scope can also be used as a stand-alone instrument.

Using an off-air signal, the volume control on the WiNRADiO panel is now adjusted. The WiNRADiO's volume is increased until the "clipping light," on the Audio Scope just begins to flash. I found that setting it a bit lower, so that no indication was observed, gave the best results. However, the best setting will be a function of your specific system and sound card.

Remember to use the Windows Volume Control to set the speaker volume, *not* WiNRADiO's volume as you normally would.

■ What Can It Do?

With that level setting procedure behind us, let's look at the modes that Digital Suite can decode. There are eight featured items listed in the manual, but only three are actual "message" modes. These are FAX, ACARS and Packet.

The FAX mode supports decoding from HF sources and directly from satellite in the

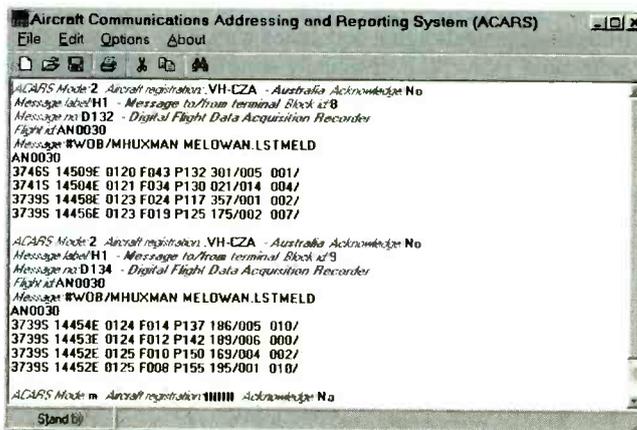


Figure 2 - Digital Suite's ACARS Screen

137 MHz band. It would also decode APT transmissions on 1691 and 1694.5 MHz, but the WinRADiO 1000i does not tune that high.

Operation of the FAX mode was quite easy but required greater attention to input level setting. Using a longwire and a bit of patience, clear, clean maps were copied. FAX signals on HF are not as common as they were just a year ago.

In many ways Digital Suite's FAX mode reminded me of Software Systems Consulting's FAX products, which I rate as one of the best in the add-on market. There are lots of options and user-controlled parameters which make this FAX decoder very versatile, yet easy to use.

■ Swing Low, Suite Chariot

Moving to the VHF aircraft band, WinRADiO was tuned to 130.025 MHz. ACARS is a digital mode, similar to Packet, which the airlines use for position, aircraft status, weather reporting and special passenger requests. You never know exactly what you'll read on ACARS!

Digital Suite copied ACARS as well as any program I have used. Weak signals, from aircraft over 100 miles away and descending to approach altitudes, still resulted in pretty clean copy. The ACARS screen is presented in a nice, simple, yet comprehensive manner. See Figure 2.

■ Still Higher to 2 Meters

Hams use packet on both HF and VHF. HF conditions were quite poor from my location when I ran Digital Suite. Therefore I decoded two meter (144 MHz) Packet signals. Capture of newly tuned Packet signals was quite quick with very little noticeable loss of copy. Screen scrolling was very fast. The ability to look at Packet signals with the scope is very interesting. You can almost tell which Packet station you are tuned to from its "signal print." To summarize: the Packet decoder works as well as any I've used.

■ It That All There Is?

So far we have covered four of the eight functions of Digital Suite (counting the scope function). Yes, I know, "It's not really a decode mode." Well, neither are the next two functions: CTCSS and DTMF. These are audio tone decoders and are very useful when

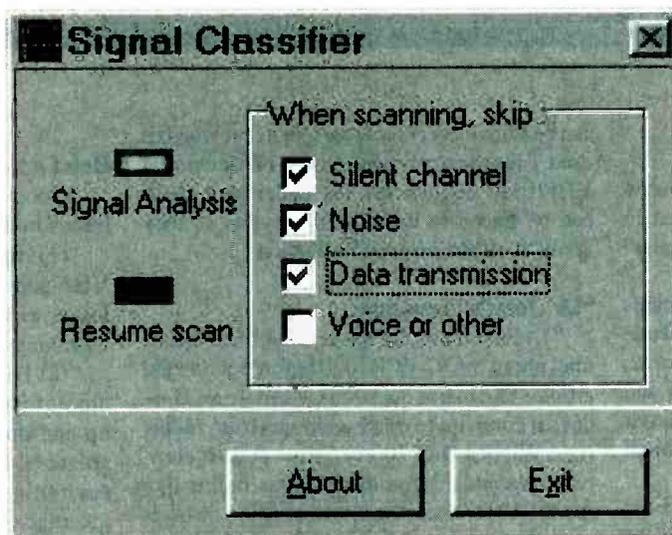


Figure 3 - "Intelligent Scanning" Signal Class Selection Screen

monitoring VHF/UHF remotes and repeaters which can be accessed via tones. But they are not digital message decode modes.

Another function of Digital Suite is its squelch controlled recorder. When the squelch is "broken" by a signal the Recorder feature is enabled. The resulting audio is recorded in a *.wav file. Very useful in a scanner environment. Well, that still leaves only three decode modes. Is that all there is?

No. Life is suite-r than that. First of all, advertising suggests that more modes are to come and, per the company's practice so far, these will be made available free of charge online to Digital Suite owners. Secondly, to my mind, Digital Suite, is a misleading title which detracts from the truly unique and powerful concept the program introduces: scanning based on signal analysis and classification.

We all know that some scanners can tell the difference between data and voice. But these are very crude methods based on how fast a resistor/capacitor network charges. Digital Suite uses the power of its Spectrum Analyzer (and I suspect, correspondingly fast hardware) to analyze and compare the spectral components of the signal. It *knows* the modulation content of the monitored signal.

■ Life Without Squelch - Almost

As the manual says, "... it is possible to implement 'intelligent scanning' ..." The user can select which class of signal should be bypassed. See Figure 3. This is the first time I have ever seen this implemented in a nondedicated surveillance receiver. For the first attempt it works quite well, and it is very useful in its present form in the VHF/UHF range.

The choices are limited to silent channel,

noise, data, and "other," including voice. Although not completely unnoticeable, the excluded signals were smoothly passed over. Think of the future scanner receiver: No more squelch circuits which remove weak, but desired, signals along with the noise; voice print access replacing tone access... The possibilities surpass science fiction.

■ Suite Final Analysis

Real nice product, regardless of the name. In its present form Digital Suite is not an extensive suite of digital signal decoders as the title implies. If that is what you are looking for you would do better with other programs, including freeware/shareware products.

But, if you are looking for a program which will make using your WinRADiO a great scanner, with powerful advanced features, then look to Digital Suite, or should I say Digital Scanner Sweet. It's available for \$99.95 USD (plus \$15 shipping to the USA or \$5.50 if you order from Grove). Check www.winradio.com or www.grove-ent.com.

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Nigerian Scam?

Sue Wilden of Columbus, Indiana, sends a cautionary note about a scam ring based in Indianapolis asking for investors in "excess" oil profits in Nigeria.

"Letters are being sent to various businesses in the state and they are being signed by Tude Davies, Tome Adah, Peter Zik, Aliv Fawaz, Taribo Jaja, Degba Udeh, Godwin Uzoka and Dabo Jubril. Anyone who receives such a letter is asked to immediately contact the United States Secret Service.

"I am sending this because Voice of Free Nigeria is using an Indianapolis address for QSL requests and this may be a front for the scammers. Those who QSL this station need to be careful."

Uniden BC780XLT— No such thing?

"Contrary to a statement by me [and also Rich Barnett] based upon a news release from the Consumer Electronics Show (CES), Uniden officially denies that there is a product under development called a BC780XLT, nor any other number since the BC895XLT.

"While new product discussions are always topical with the company, they assert nothing matching the description is under development at this time."

—Bob Grove

PCR-1000: A discussion of methodology

Dave White of Hermitage, TN, wrote John Catalano asking for some clarification on his review of the ICOM PCR-1000 in the March issue of *MT*. Following is an "email round robin" between Dave, John, and Bob Grove:

"1.) Is this unit designed, or marketed, as a portable?...Is this really the way the typical potential user of the device is going to use it?"

"2.) John seems surprised to find that 'the signals above 108 MHz were nowhere to be found using the HF tuned dipole.' I'm at a loss to understand why a receiver's inability to receive signals in one frequency range with an antenna designed for another can be considered the fault of the receiver.

"3.) After much globe hopping, antenna experimentation and side-by-side comparison, John finally concludes that the IC-PCR1000 works better with an external antenna designed for the frequencies one wishes to monitor than with the supplied 'whip' antenna. —The same

can be said of every receiver I've ever owned or used. Like the performance of an HF antenna at VHF/UHF frequencies, the underlying cause can be traced to the laws of physics as they apply to electromagnetic radiation."

"Dr. John's" response:

"1.) First Dave, let me say that I had lots of mail about the IC-PCR1000 before I wrote the article. The major questions asked were: How does it compare to other wide spectrum radios (i.e., WiNRADiO 1000i)? How does it compare to standard communications radios like the R-71? How easy is it to use? Can I throw it in my suitcase and use it with my laptop on business trips? [In retrospect] it might have been helpful to have mentioned the fourth item in the article. The travel aspect did seem to dominate.

"2.) On your question concerning the 'tuned antenna' and physics, I'm sure you'll remember that inducing a dipole moment into a conductor does not require tuning. Of course the transfer of energy is greatest when the conductor is resonant to the radiation. But this is not a necessity.

"Also, remembering those tried and true engineering formulas, you will find that there is no such thing as a single frequency tuned element. Every tuned conductor can resonate at multiples of the wavelength. The wave number X of the antenna (i.e., wavelength times X) has a great effect on the bandwidth of the resulting conductor at a given frequency. But as long as it is an integral number of wavelengths the dipole moment will be transferred with minimum loss.

"I don't use a discone because of its 'unity gain' characteristic, but it strikes me that its element lengths are more conducive to fairly broad VHF/UHF coverage than is the HF dipole. Seems like using the HF tuned dipole over a wide range of HF frequencies would be a fairer (and more realistic) test of the receiver. Stated another way, using the HF dipole on VHF/UHF would probably yield about the same results as would the discone on HF.

"The point is, the operation I reported was a result of the wide range, untuned input stages. By necessity, the front end gain has to be designed low if expensive banks of tuned stages are not used. High, untuned gain stages, in a wide spectrum radio, results in high sensitivity. But it is unusable due to mixing products with cause QRM everywhere.

"3.) The bottom line performance obviously had to do with design tradeoffs rather than testing methodology — that point came through 'loud and clear'!"

Bob Grove adds:

"Good dialogue. But there are two more issues in defense of Dave's postulates:

"(1) High SWR from using the HF dipole at VHF and UHF will result in significant line losses, especially at the higher frequencies and with long coax leads.

"(2) Directivity at VHF/UHF with an HF dipole favors the ends of the wire, and radiates up and down as well, plus it is horizontally polarized in a vertically-polarized VHF/UHF environment. All of these will produce consequential reductions in reception."

Indiana Public Law 35-44-3-12

From Lawrence Estep of New Albany, Indiana, we print excerpts from his excellent letter to new Indiana State Senator, Connie Sipes. Lawrence told Bob Grove, "I am continuing my efforts to see our unfair Indiana statute overturned. I am sure you remember my case in 1991, as I was the subject of your September editorial that year. I am still gainfully employed in the local media, full-time now, but continue to see harassment of myself and others based on the misunderstanding of this travesty of a law."

Mrs. Sipes,

I am writing you today regarding Indiana Public Law 35-44-3-12, which concerns use of radios capable of receiving police frequencies ... I had the pleasure of being a student at New Albany High School, and was actively involved in the Radio and TV program there.

I continued to pursue this field after high school, and presently work for WDRB/WFTE in Louisville. I was a freelance videographer for our local Louisville area media outlets starting in 1990, and I became very familiar with local fire department officials, and even assisted with filming several events for them for use in training courses. I have also been an active weather spotter with the National Weather Service for nearly a decade, and my observations have assisted in issuing severe weather warnings for several Indiana counties during that time.

On July 25th, 1991, while pursuing freelance media activities, I was arrested, handcuffed, and taken to the Floyd County jail for violation of Indiana law 35-44-3-12, Unlawful Use Of A Police Radio. I had a police scanner in my vehicle, programmed with local fire, police, media, and weather service/storm spotter frequencies. This radio was not used for any

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criminal purposes, but was used to assist me in my freelance videography and storm spotting....

Needless to say, I was subjected to severe humiliation, and treated like a criminal by local authorities, including being interrogated regarding my personal activities, ...and forfeiting my scanner... After explaining my situation to the local prosecutor, all charges were dropped. I was also thanked for my public service that I had performed before my arrest with the help of my scanner, including the severe weather spotting, and reporting several drunk drivers to police via CB radio as a member of REACT, a local volunteer CB group...

My concerns with the law, in its present unclear form, is that other law-abiding citizens may be harassed, arrested, and humiliated for providing a public service to their community, all because they simply possess a police scanner... If the law is loosely interpreted, even a citizen working with a neighborhood watch patrol walking or driving down their own street could be breaking the law. Severe weather spotters in mobile vehicles, monitoring local law enforcement, ham radio, and weather service reports, are definitely breaking the law.

[Lawrence wisely outlines what he considers reasonable restrictions on scanners, omitted for space constraints.]

I believe that the incidents of police scanners being used for criminal activities is far less than the incidents of such radios being used for the good of the community by law-abiding citizens such as myself. Bob Grove, author of *Monitoring Times* magazine, summarized this point best by saying, "Neighborhood patrols, crime watch teams, REACT chapters, and other scanner listeners—often in their cars—commonly provide critical information to public safety agencies of road hazards, accidents, locations of crime scenes and suspects, fires, and severe storms about which they hear over police broadcasts."

I believe that these issues were not considered by the authors of this statute, and that they only considered the criminal element in their decision-making. I hope you will continue the pledge of Senator Kathy Smith to look into this issue, and try and change this outdated and needlessly prohibitive law.

Strike three, I'm outta here

Bob Homuth, KB7AQD, responded to recent comments in *MT* about promoting radio hobbies in the newspapers and TV/radio news. Bob says, when he tried, these were the responses he got:

"The first reporter, recently retired from a

large newspaper and teaching my college newswriting class assured me that individuals should never have scanners or shortwave radios. It takes special skills to decipher the coded broadcasts — skills that only those on a major newsgathering staff can decode.

"I'm not with the police. I'm not a firefighter or rescue worker. I'm not even with the newspaper. To him — I do NOT need a scanner. Besides, I might spread panic if I tell anyone what really happens behind the scenes. (I bought two more scanners and a shortwave radio soon after!)"

"The second reporter, a TV/Radio columnist, laughed out loud when I told him that the local ham club relays the Space Shuttle STS mission audio on 440 MHz repeaters. He wrote a column saying that 'Bob hears 'little green men' on his scanner....'"

"Strike two...."

"Once more ... A local TV news station advertised their number for hot news tips. Norb answered my call, and wondered what the local mall security channels were? I sent him a 200-frequency list of local UHF activity. He never called me back.

"Some months later, he did call back. A local self-styled militia got arrested for allegedly planning to destroy government buildings in Phoenix. Norb called me with the accusation, '...since you ham radio types work within these terrorist organizations all the time, tell me about your 'inside knowledge'?"

"I refused to even answer that insult. He then asked if any special stuff was going on at our local zoo.

"I replied, 'Gee, Norb. They have lots of animals....' End of conversation.

"How are hams expected to promote the hobby under such confrontational and stereotyped opposition? You can't get anthrax from a scanner, and a 70cm beam won't blow up buildings!"

"I have not received a single complaint from Phoenix police, sheriff's officers, mall security, park rangers, or anyone else with authority and half a brain. What makes these reporters ... get apoplectic over Bob listening to weather reports, the Space Shuttle, and local businesses?"

Dear Monitoring Times,

Just want to thank you for the fun I have every month reading your magazine. Over the years I have enjoyed my Ham ticket more by reading *MT*, and have become active in other aspects of the radio hobby. I really have learned a great deal by reading *MT*, thank you so much for such an entertaining, educational publication.

—Jim Mooney KB5QAC, Albuquerque, NM

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By Bob Grove,
Publisher

Taking Credit Where Credit isn't Due...Again

I don't ordinarily indulge in "League bashing"—there are plenty of others out there already doing that. But a recent membership solicitation from David Sumner, K1ZZ, Executive Vice President of the American Radio Relay League (ARRL), was just too much to ignore.

Sumner lists several ostensible examples of how the League helps hams. One imaginative example describes their initial response to last year's initially-proposed anti-scanner legislation: "The ARRL spotted this legislative Trojan horse immediately and intervened successfully to alter the bill in our favor."

Fact: When *MT*'s assistant editor, Larry Van Horn, contacted the League's own legislative representative, Steve Mansfield, to alert him to the impending disaster, Mansfield shrugged the matter off, reflecting the League's traditional response: It's the scanner folk's problem.

It wasn't until *MT* had allied with more perceptive members of the communications profession, and had already mustered active opposition to the impending Bill, that the League realized that the hams would also be affected. Along with other representatives of the radio industry, they met with the Congressional staff and did help influence the outcome.

But their too-little, too-late, response has been costly to the hams. The FCC is preparing to decertify amateur radio equipment that can be altered for extended frequency coverage. Understandably, the League hasn't taken credit for that.

Such inertia and historical revisionism is reminiscent of earlier ARRL press releases, such as the one patting themselves on the back for supporting no-code licensing. In fact, the League vigorously opposed the no-code movement, but decided to take credit for that, too, after it became clear that the FCC was about to authorize it.

If you don't remember this, ask one of the League's old timers (and there are plenty of those) if he still has one of the offensive buttons worn by ARRL representatives at hamfests which said, "Stop Bitching; Learn the Code!" I'm sure this confrontational attitude toward newcomers really helped build League membership.

■ Listeners' Advocacy

MT is often asked to start a listeners' advocacy movement to protect the rights of radio enthusiasts who are at the mercy of ill-advised, repressive legislation, such as that which we nearly

experienced and successfully opposed last year. Had it not been for the concerted effort of thousands of irate radio hobbyists, hams, engineers, and manufacturers, Markey's original HR1984 and Tauzin's HR2369 bills, as choreographed with the cellular lobby, would have effectively shut down the scanner industry and deprived scanner listeners their legitimate access to the airwaves.

But would listening hobbyists rally to support such an umbrella organization the way a sizable number of hams support the ARRL? The Association of North American Radio Clubs (ANARC) attempted to mediate the needs of shortwave and scanner clubs for many years, even sponsoring annual conventions around the U.S. and in Canada, but never grew to an impressive membership. ANARC still exists, has their weekly ham radio net, and helps correlate member-club activities, but meets quietly at the SWL Winterfest in Kulpville, Pennsylvania.

Probably the main difference between radio amateurs and SWL/scannists is that the hams have more of a fraternity, a history. They go back to the earliest days of radio, have invented countless electronic technologies and products, have a common licensing requirement, are tested to prove their skill levels, and provide emergency communications during disasters. And perhaps most important, they use their common interest to communicate with one another over the airwaves, breaking down cultural and social barriers, exchanging information.

Hobby listeners have no such common ground; they buy their radios from Wal-Mart, Radio Shack, or some catalog discounter (and, hopefully, *MT* advertisers!), and sit back, passively listening without intercommunicating. They don't have to show their mettle to anyone. Thus, they are largely uninspired to become involved in movements since they don't feel they are part of a group and, therefore, have no larger loyalties.

There are approximately 600,000 hams, and some 171,000 of them belong to the ARRL and receive *QST* magazine. There are more than ten million scanner listeners, but the combined subscriptions to *MT* and *PopCom* are only in the tens of thousands. Who could do the work, and how would they be paid?

Our listening hobby, as enjoyable as it is, will remain secondary to other, more pressing activities. Future conflicts will arise, and motivated members will take action. But a concerted lobby is unlikely. Fortunately, the immediate alert capabilities of the Internet are on our side. For the first time, this exquisite tool of technology saved us from being swept under the rug by powerful special interests. It will do it again.

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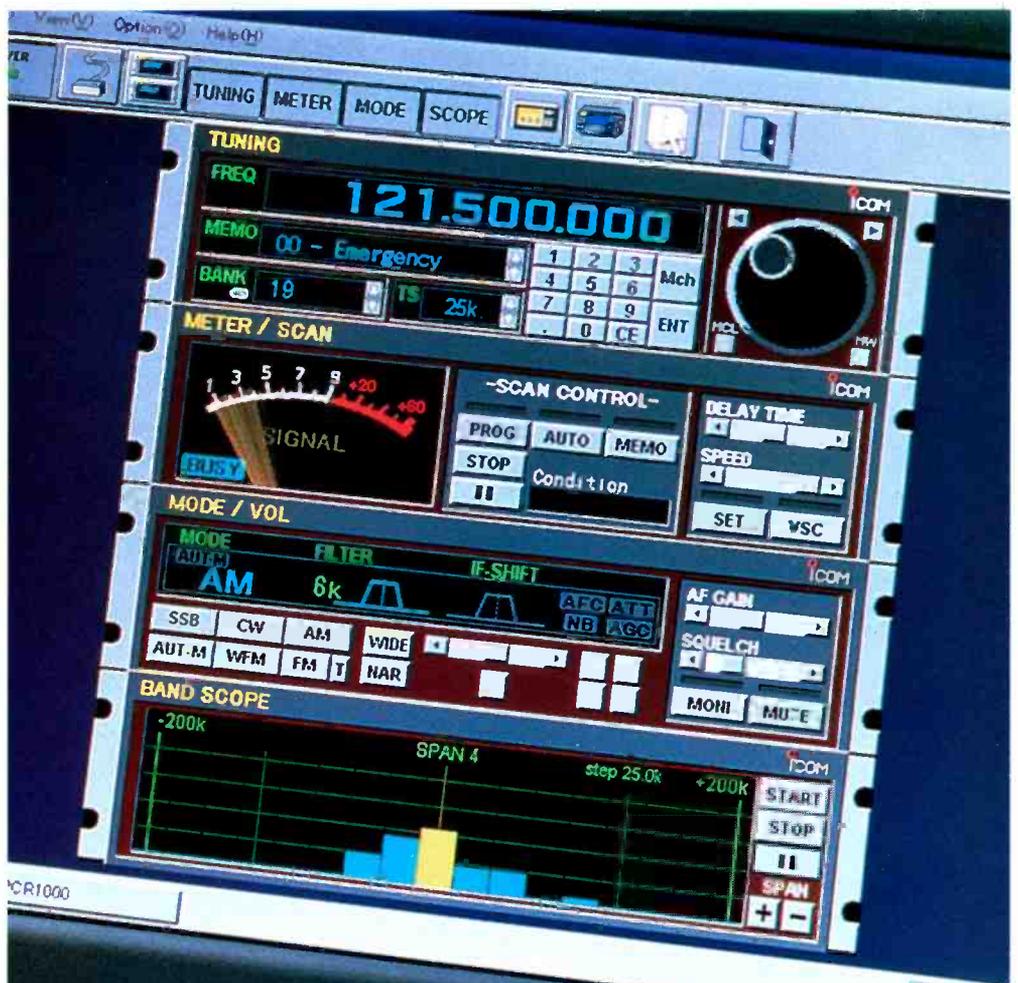
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