Radio–Homeland Security–Computers & Radio–Family & Hobby Comms

45635

POPULAR COMMUNICATIONS

FEBRUARY 2006

America's FM Radio Revolution

- Time Is On Your Side—Every Minute, Every Day pg. 8
- Tech Showcase: Uniden's BCD396T Scanner pg. 20
- New Aurora Evidence! pg. 71

PLUS: All About Fleet Maps • Got Juice? • XEYU Is Back • Programming Software Overview

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etón E1 XM

The etón **E1 XM** (originally announced as the Grundig Satellit 900) is the world's first radio that combines AM, FM, shortwave and XM Satellite radio into one ultra high-performance unit. In development for nearly ten years, in collaboration with RL Drake Company and XM Satellite Radio, the E1 is simply the finest full-sized portable in the world. The E1 is an elegant confluence of performance, features and capabilities. The look, feel and finish of this radio is superb. The solid, quality feel is second to none. The digitally synthesized, dual conversion shortwave tuner covers all shortwave frequency. Adjacent frequency interference can be minimized or eliminated with a choice of three bandwidths [7.0, 4.0, 2.5 kHz]. The sideband selectable Synchronous AM Detector further minimizes adjacent frequency interference and reduces fading distortion of AM signals. IF Passband Tuning is yet another advanced feature that functions in AM and SSB modes to reject interference. AGC is selectable at fast or slow. High dynamic range permits the detection of weak signals in the presence of strong signals. All this coupled with great sensitivity will bring in stations from every end of the globe. Organizing your stations is facilitated by 500 user programmable with alpha labeling, plus 1200 user definable country memories, for a total of 1700 presets. You can tune this radio many ways such as: direct shortwave band entry, direct frequency entry, up-down tuning and scanning. Plus you can tune the bands with the good *old fashion* tuning knob (that has *new fashion* variable-rate tuning). There is also a the dual-event programmable timer. Whether you are listening to AM, shortwave, FM or XM, you will experience superior audio quality via a bridged type audio amplifier large built in speaker and continuous bass and treble tone controls. Stereo line-level output is provided for recording or routing the audio in to another device such as a home stereo. The absolutely stunning LCD has four levels of backlighting and instantly shows you the complete status of your radio. Many receiver parameters such as AM step, FM coverage, beep, kHz/MHz entry etc., can be set to your personal taste via the preference menu. The E1 has a built in telescopic antenna for AM, shortwave and FM reception. Additionally there is a switchable antenna jack [KOK] for an external antenna. Universal also offers a PL259 to KOK antenna adapter (*#1052* $10.95).

The etón E1 comes with an AC adapter or may be operated from four D cells (not included). 13.1"L x 7.1"H x 2.3"W Weight: 4 lbs. 3oz.

E1 XM *Order #0101* **$499.95**

Note: The XM antenna (shown above) and XM subscription are sold separately. Activation and monthly subscription fee required for XM. Please visit the Universal Radio website for additional important details.

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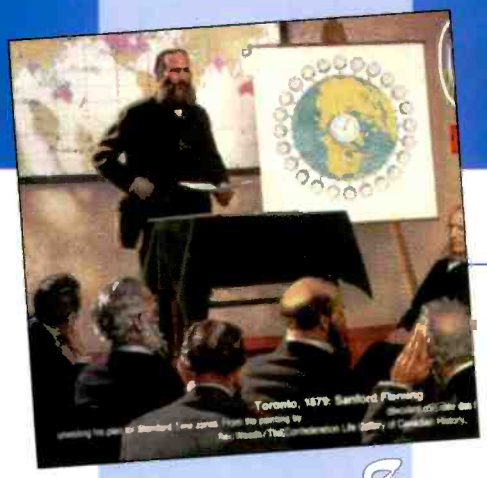

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On The Cover

Community broadcasters like Kristen (Billi) Hall and Patti Brainard, at the controls of WSLR 96.5 in Sarasota, Florida, are part of a "local" radio revolution sweeping across America. In this month's Broadcast Technology column by Bruce Conti, beginning on page 28, you'll get the latest LPFM (Low-Power FM) news as well as the complete station list! (Photo by Larry Mulvehill)

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Copies most standard shifts and speeds. Has MFJ *AutoTrak*™ Morse code speed tracking.

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MFJ-1022 **$49.95**

Eliminate power line noise!

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Completely eliminate power line noise, lightning crashes and interference *before they get into your receiver!* Works on all modes -- SSB, AM, CW, FM, data -- and on all shortwave bands. Plugs between main external antenna and receiver. Built-in active antenna picks up power line noise and cancels undesirable noise from main antenna. Also makes excellent active antenna.

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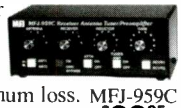

Matches your antenna to your receiver so you get maximum signal and minimum loss. **Preamp** with gain control boosts weak stations 10 times. 20 dB attenuator prevents overload. Select 2 antennas and 2 receivers. 1.6-30 MHz. 9x2x6 in. Use 9-18 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ-959C **$99.95**

High-Gain Preselector

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MFJ-1045C **$99.95**

Dual Tunable Audio Filter

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MFJ-752C **$99.95**

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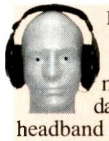

MFJ-392B **$19.95** New!

Perfect for shortwave radio listening for all modes -- SSB, FM, AM, data and CW. Superb padded headband and *ear cushioned* design makes listening extremely comfortable as you listen to stations all over the world! High-performance driver unit reproduces enhanced communication sound. Weighs 8 ounces, 9 ft. cord. Handles 450 mW. Frequency response is 100-24,000 Hz.

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New!

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New!

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Place this pocket-sized MFJ Morse Code Reader near your receiver's speaker. Then watch CW turn into solid text messages on LCD. Eavesdrop on Morse Code QSOs from hams all over the world!

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by Harold Ort, N2RLL

Readiness Roulette—The Game Where No One Wins

One of the strange things about our great country is how easy it is for some folks to never have to worry about getting a new job if they get canned. It seems the higher up the corporate ladder—in either the public or private sector – the easier life becomes. It's an unwritten rule that a canned Corporate or Washington Big's salary or job stature will never be less than the previous job.

Today's classic example is former FEMA director Michael D. Brown on whose shoulders the initial FEMA response to Hurricane Katrina lies. I'm sure by the time I'm finished writing this at least one or two more "big's" will get fired or resign because of either ineffectiveness or impropriety, and end up in a cushy leather chair in a room with a view, probably making more money than in their previous position! Strange, isn't it?

When I first heard the news about Brown starting his own *disaster preparedness consulting firm,* I know I must have looked like a deer in headlights. Did I hear it correctly? Indeed, it's true, but like they say, life is sometimes stranger than fiction – or something like that. Brown having anything remotely to do with emergency preparedness would be a lot like, for example, the FCC's former commissioner Kathleen "Broadband Nirvana" Abernathy doing PR for the ARRL. Not in my lifetime – I hope.

Brown told the *Rocky Mountain News* (he plans on moving back to the Boulder, Colorado area), "If I can help people focus on preparedness, how to be better prepared in their homes and better prepared in their businesses – because that goes straight to the bottom line – then I hope I can help the country in some way."

Too bad he didn't think that way in the months preceding Katrina.

Think for a moment how rewarding poor performance works. Suppose you're one of the folks digging up the road and you goof and accidentally jackhammer right through a huge cable, knocking out phone service for hundreds of thousands of people. Maybe you're the dispatcher at the local PD and you haven't the foggiest idea where you just dispatched Car 3; this has happened twice in the past four days because you, like most everyone else, has more going on than the daily work grind. Chances are the fellow that hacked through that cable won't be promoted or find himself giving a pep talk at the local phone company gala. The dispatcher certainly won't get nominated to be police chief; he'd be lucky to dispatch little Tonka trucks at his kids' birthday party!

That's because we're just not high enough on the Corporate Ladder. But Brownie was, you see. And apparently he already has "some great clients." I'm sure in time we'll see who was brilliant enough to sign on his dotted line.

But if he really wants to cause a stir, here's an idea for Brownie. In this time of Lucrative Government Contracts, he should consider getting FEMA as a client. Wouldn't that be a hoot? Now, if you're laughing, or think that's a rather dumb idea, it's really no stranger than we've come to expect; after all, if Brown, with no formal emergency management experience could head FEMA and was, for the most part, oblivious to what a major hurricane could do, he could conceivably talk his way into anything. Given what must have been an astonishing job interview at FEMA, it just proves to me that anyone could do the job.

"OK, maybe the personalized letterhead isn't such a great idea."

It's important for our country that we're prepared; I think most citizens are as prepared as they ever will be – either they're going to have extra batteries, flashlights, a few weeks of their meds, bottled water, extra shorts and perhaps a small radio or two to stay in touch during an emergency, or they're not. All the encouragement from Uncle Sam likely won't motivate Aunt Maude and Uncle Marvin in Arkansas to run out and buy a "go bag" until Marvin gets blown to Montana in a tornado. Maybe, though, if we had real leaders in these Big Positions, not just talking bobble heads, things might be different.

The county has lots of good, grassroots level, boots-on-the-ground leaders. You just have to look hard to find them. Frankly, I don't think having Michael Chertoff, a former judge and prosecutor as Department of Homeland Security director—overseeing FEMA—is one. Admittedly, I can only base my opinion on what I've heard come out of his mouth at press conferences (no, it's not a case of the nasty media reporting on what he says, but rather listening to his own words). I still hear from agencies that can't communicate effectively and read reports about the lack of interoperability more than four years after 9/11.

So let's get down to business. For the next go-round in D.C., I'd like to personally nominate our regular "Homeland Security" columnist, Rich Arland, to head the Department of Homeland Security when Mr. Chertoff steps down to pursue life's other pleasures. Rich is very much on top of the emergency preparedness situation and always closes his fine column with the statement, "Remember, preparedness is not optional." You see, by that statement *alone* he demonstrates he understands how the department should operate.

Change is inevitable, and it seems with how things work today, one day a bureau chief, the next day a high-paid consultant. Anyway, Rich has a solid grip on communications, is a trained volunteer communicator, works well under pressure, is able to put words on paper in a coherent fashion, gets his column in on time, and is always ready and able to answer my questions without any horse hockey. As the next director he could even have his own personalized letterhead, "Ar-Land Is Helping Our Land."

OK, maybe the personalized letterhead isn't such a great idea.

Maybe you're thinking Rich is too good - we shouldn't waste all that talent and experience as a government department head – so perhaps he's much better putting plans to work and communicating. Besides, he writes a great column, so keeping him as "Homeland Security" columnist for now might make more sense.

But certainly, of all our writers and staff we should be able

(Continued on page 82)

by Harold Ort, N2RLL, Editor, and D. Prabakaran

News, Trends, And Short Takes

Australian Government To Adopt European DAB Standard

Australia's Minister for Communications, Information Technology and the Arts, Senator Helen Coonan recently announced a framework to guide the introduction of digital radio in Australia. There will be a staged rollout of digital radio in Australia commencing in metropolitan areas as soon as practicable. The government will urge broadcasters to commence trials of digital radio in regional areas, so technical and other issues can be resolved. The government will then consider what financial support is necessary to expand digital radio services to rural and regional Australians.

Under the framework, Australia will implement terrestrial digital radio based upon European Digital Audio Broadcasting (DAB) Standards, also known as Eureka 147. The commercial, national and wide-coverage community broadcasters currently operating in the broadcasting services bands (BSB) in those areas will have the opportunity to participate and will share the available digital spectrum.

Other elements of the framework include dedicated spectrum for the two national broadcasters, a guaranteed minimum level of broadcast capacity to incumbent commercial broadcasters (more spectrum will be available if new services are offered), guaranteed access to the digital platform for wide-area community broadcasters, no simulcast requirement and a first right of refusal to broadcasters to control the multiplex and hold relevant spectrum for a nominal administration cost.

UK *Short Wave Magazine* To Merge With *Radio Active*

This month, the long-running UK publication for radio hobbyists, *Short Wave Magazine*, ceases publication as a separate title and merges with another magazine from the same publisher, *Radio Active*. The publishers are picking the best bits out of both magazines to create a new title, *RadioUser*. There isn't much else known about this at the moment as the publishers are still finalizing all their plans. However, this will not affect the company's flagship publication, *Practical Wireless*.

Christian Vision's CVC Increases DRM Broadcasts

Christian Vision's media arm, CVC, is increasing the number of broadcast hours on VT Communication's digital AM transmission platform, which utilizes Digital Radio Mondiale technology. Until recently, CVC was broadcasting one hour a week as part of VT Communications' AM broadcast pilot service from the UK to Western Europe, which has now been running for over two years. CVC's new development sees transmissions from mainland Europe into the UK, resulting in an increase to seven hours per week. The new schedule is 1000–1100 UTC daily on 11815 kHz.

Worldspace Goes Terrestrial In UAE And Bahrain

WorldSpace has announced that it has received licenses from the Telecommunications Regulatory Authorities of Bahrain and the United Arab Emirates (UAE) for terrestrial repeater networks. The licenses will enable World Space to deploy mobile satellite radio services in those countries. World Space plans to rollout the mobile services in the first half of this year.

The mobile rollout in these areas is part of WorldSpace's overall strategy to target additional markets within coverage areas at a minimal incremental cost.

The UAE and Bahrain are attractive markets for World Space services. The UAE has a population of over four million people with a GDP per capita of approximately $17,000 and one million vehicles in service. In particular, Dubai (part of the UAE) is a major international trade and tourist center, drawing over 16 million visitors annually. Bahrain has a population of approximately 700,000 with a GDP per capita of approximately $20,000 and 630,000 vehicles in service.

Mediumwave DRM Tests From Milano Siziano To Begin

According to the Italian press service ASCA, Rai Way (the company which owns the transmitters used by Italian public broadcaster RAI) will soon begin experimenting with DRM via Milano Siziano. Tests will be conducted at nighttime, presumably on the former Radio 2 frequency of 693 kHz. Exact power levels are not mentioned in the report, which says they will be "at low power" adding, however, that will ensure "high quality" and Europe-wide coverage.

DRM conversion of the ex-Radio 2 transmitter has been planned for a long time, according to RAI "insider" Andrea Borgnino. According to the same source, Rai Way began installing DRM equipment in Milan at end of 2004 for tests at the beginning of 2005. Apparently these were postponed to end of 2005/beginning of 2006.

BBC Supporters In Thailand Launch Campaign To Save Thai Service

The Nation newspaper reports that a campaign was launched in Thailand to save the BBC's Thai service after news broke of a plan to terminate the 65-year-old service. *The Nation* reports that the BBC World Service will terminate its Thai-language service at the end of the year. The paper, quoting a source in London, reported that the service would be shelved due to cost-cutting measures. *The Nation* said none of the Thai service staff was aware of the termination.

The BBC is focusing more attention on the World Service in Arabic and had asked the Foreign Office for funding to establish an Arabic language television channel for the Middle East and North Africa. The Foreign Office has approved the plan, but insists that the funding come from existing resources. Besides

(Continued on page 61)

Each month, we select representative reader letters for "Our Readers Speak Out" column. We reserve the right to condense lengthy letters for space reasons and to edit to conform to style. All letters submitted must be signed and show a return mailing address or valid e-mail address. Upon request, we will withhold a sender's name if the letter is used in "Our Readers Speak Out." Address letters to: Harold Ort, N2RLL, Editor, Popular Communications, *25 Newbridge Road, Hicksville, NY 11801-2909, or send e-mail via the Internet to popularcom@aol.com.*

Say It Ain't So

Dear Editor:

I enjoyed the editorial rant on the problems with FEMA and others regarding Katrina. We saw some of that mess up here in Maine when LIFEFLIGHT of Maine tried to send a chopper down to New Orleans to help out and were refused, yet FEMA had no problem with sending many truckloads of ice to a warehouse in Portland, Maine as they had too much ice in the hurricane area. As far as I know, some of that ice is still sitting in a warehouse in Portland. It cost the city of Portland a lot of Greenstamps for traffic control to keep these trucks coming in and out of the warehouse to avoid major traffic problems.

In the end the Maine Maritime Training Ship, *State of Maine* went down and acted as a floating hotel and restaurant for people in that area. She's back home now in Castine and some firefighters from Maine just returned home after being down there in the hurricane area helping people and their fellow firefighters who lost it all.

Don Hallenbeck KME1CW
(Registered Monitor)
Pittsfield, ME (via e-mail)

Burned 'Em Again

Dear Editor:

I just read your rant in the December 2005 Pop'comm. Ouch! Don't hold back, Harold, tell us how you really feel! I agree with you, and to prove it I am attaching my own, more technically oriented rant, on the same subject. I responded to an item I read on "Stupid Scanner Tricks" Yahoo group of which I am a member, and I have included that item as well. Publish as much or as little of it as you feel prudent. I am glad to see you show no mercy to people who don't deserve any.

Craig, N3TPM

Editor's Note: Here's Craig's well written, common sense approach to solving some of our problems.

From: stupidscannertricks@yahoogroups.com on behalf of Craig Leventhal [cleven@ptd.net]
Sent: Monday, September 19, 2005 6:09 PM
To: stupidscannertricks@yahoogroups.com
Cc: MYSELF
Subject: RE: [SST] U.S. Lacks Unified Emergency Radio System

I am surprised that the engineering team at M/A-Com Tyco, didn't take into account New Orleans vulnerability to floods, when they designed the system. Certainly the local service shops, the "people on the ground," could have provided some helpful input to engineering on this matter. Also the critical infrastructure components could have been placed outside of the zone protected by the levees and still provided the required coverage. As for interoperability, the city only needed to assign a few extra talkgroups to outside agencies for emergency use, and then hand out additional portable radios as needed. What really surprised me was the comment made by one of the Coast Guard personnel, in which he said that the helicopters could not communicate with the ground (airboat) units because they lacked a common band to operate on. The Coast Guard does have marine VHF channels (156-162 MHz) in all their vehicles, so how hard would it be to issue portables to the ground units? Or better yet, if any of the agencies on the ground are using VHF, why not just add some common channels to their radios for communications with the helos? Folks, this is not rocket science and it need not cost lots of money. OK so you are saying that the 800 MHz trunked system is off the air and the New Orleans PD's radios are just a $1500 brick. Well, boys and girls, when the cellular guys need extra capacity they bring in a C.O.W. (Cellsite On Wheels). These are completely self contained, need no outside power, and some have solar panels to keep the batteries charged and they can be deployed in short order. M/A-Com Tyco, Motorola, EF Johnson, are you guys listening to this?

Alright so here we are, now what do we do? We turn to ham radio, not for them to relay messages, which we all know they do with great efficiency, but for something else pioneered by hams; cross-linking. Connect two or more mobile radios together to form a repeater that, for example, receives on 146 MHz (VHF) and retransmits that signal on 446 MHz (UHF). And it works in both directions! Now substitute 154 MHz (VHF) and 453 MHz (UHF) and you have a cheap solution to an emergency interoperability problem. Now take it one step further; many radio manufacturers make ham radios that are dual-band or even more that can crosslink with the touch of a few buttons. No special modifications needed. Now if only the commercially type accepted version for public safety use could do the same thing, interoperability problems would go away. For those agencies using a tower-based system, whether it is a simple repeater or a full blown trunked system, this tragedy should highlight the need for tower sites to be hardened against a worst case scenario like Katrina. These hardening measures could be done over time as system components are replaced or upgraded, so that the cost would not be so overwhelming. In flood-prone areas, equipment could be mounted on platforms above the worst known high water levels, and backup power sources could also. Taking advantage of natural "high ground" should be maximized. Placing equipment on rooftops of apartment or office buildings should always be considered for critical public safety infrastructure and both battery and generator backup should be used. Lastly, there are several manufacturers that have products in the market that allow radios to be cross linked by simple plug-and-play setup. Any public safety official involved in emergency management, should consider acquiring appropriate radio gear for the purpose of cross linking and have it available for any emergency where outside agencies might be involved, and as a backup to their own existing system, just in case. If cost is a factor, most municipal radio shops have the talent on hand to setup a basic, rapidly deployable, crosslink system, utilizing previous radios that have been pulled from service or used as pares. There is no excuse for the apparent lack of communications after an emergency, as we have seen here with New Orleans. I know of small portable repeaters that can be connected to a mobile radio to provide intra as well as inter agency communications, they run on 12 volt dc power and are the size of a briefcase and can be brought on line in less than five minutes! Enough said.

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

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Does Anybody Really Know What Time It Is?

24/7/365, Here's How Time Got On Your Best Side

By Michael A. Lombardi

Occasionally I'll talk to people who can't believe that some radio stations exist solely to transmit accurate time. While they wouldn't poke fun at the Weather Channel or even a radio station that plays nothing but Garth Brooks records (imagine that), people often make jokes about time signal stations. They'll ask "Doesn't the programming get a little boring?" or "How does the announcer stay awake?" There have even been parodies of time signal stations. A recent Internet spoof of WWV contained zingers like "we'll be back with the time on WWV in just a minute, but first, here's another minute."

An episode of the animated PowerPuff *Girls* joined in the fun with a skit featuring a TV announcer named Sonny Dial who does promos for upcoming time announcements—"Welcome to the Time Channel where we give you up-to-the-minute time, twenty-four hours a day. Up next, the current time!"

Of course, after the laughter dies down, we all realize the importance of keeping accurate time. We live in the era of Internet FAQs, but the most frequently asked question in the real world is still "What time is it?" You might be surprised to learn that time signal stations have been answering this question for more than 100 years, making the transmission of time one of radio's first applications, and still one of the most important. Today, you can buy inexpensive radio-controlled clocks that never need to be set; some of us even wear them on our wrists.

Let's "go back in time" and look at the history of time signal stations, beginning with the first radio experiments and continuing to the present day.

The Early Days Of Time Signal Stations

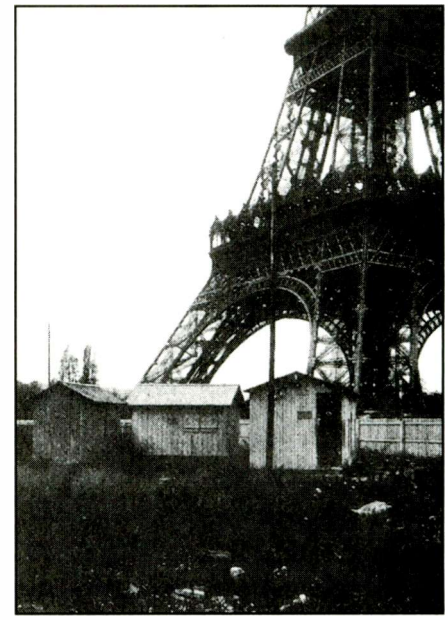
Guglielmo Marconi is usually acknowledged as the inventor of radio, with an impressive list of achievements known to most radio buffs. He used a spark-gap transmitter to successfully send radio signals over a distance of more than one mile in 1895. By 1899 he had transmitted signals across the English Channel, and sent signals across the Atlantic Ocean in 1901.

Surprisingly, in the midst of Marconi's early work, before any radio stations existed, or before the public even completely believed his results, a proposal was made to use the new wireless medium to broadcast time. In November 1898, an optical instrument maker and inventor named Sir Howard Grubb addressed the Royal Dublin Society and proposed the concept of a radio controlled clock. After many years of working with astronomical observatories, Grubb had developed a strong interest in timekeeping. After his talk, he published the following comments:

> There is something very beautiful in this action of the "Marconi" wave. In a city supplied with this apparatus we should be conscious as we hear each hour strike that above us and around us, swiftly and silently, this electrical wave is passing, conscientiously doing its work, and setting each clock in each establishment absolutely right, without any physical connection whatsoever between the central distributing clock, and those which it keeps correct by means of this mysterious electrical wave.
>
> We might go even still further, and although I do not put it forward as a proposition likely to be carried out in any way, except as an experiment, yet it undoubtedly would be perfectly possible to carry an apparatus in one's pocket, and have our watches automatically set by this electrical wave as we walk about the streets.

A true visionary, Grubb predicted the radio-controlled watch nearly 100 years before it finally appeared! Sharp-eyed readers might quibble that he described a pocket watch rather than a wristwatch, but keep in mind that men's wristwatches didn't appear until a few years later.

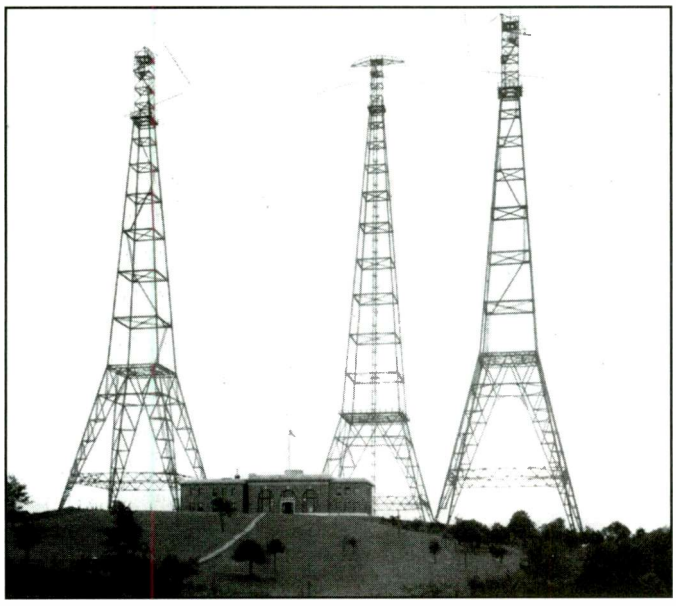
The "central distributing clock" that Grubb mentioned wasn't a new idea. Time signals had been distributed by telegraph for decades prior to the invention of radio, since the telegraph had been invented around 1840. When the first time signal stations were built, the telegraph was used to send time from the reference clock to the broadcasting station.



A photograph of the Eiffel Tower, published in 1909 prior to the start of the time broadcasts, which began in May 1910. It shows the small buildings at the base of the tower that housed the radio station equipment.

The first radio time signal, sent by telegraphic code, was broadcast in September 1903 by the United States Navy. Most sources list Navesink, New Jersey, as the site of this broadcast, but the reference clock was located at the United States Naval Observatory (USNO) in Washington, D.C.

The first regularly scheduled time broadcasts began on August 9, 1904, from the Navy Yard in Boston. By the end of 1905, the Navy had transmitted time signals from stations in several other cities, including Norfolk, Newport, Cape Cod, Key West, Portsmouth, and Mare Island in California.



The three towers of the Arlington Virginia radio station where the NAA time signal originated. The tallest tower reached a height of about 183 meters, or about 14 meters taller than the nearby Washington Monument.

Sending time by radio was a hot technology in the early part of the 20th century, allowing time signals to be distributed everywhere, not just to places with access to the cumbersome landlines used by telegraphs. There were countless benefits to having accurate time available, and railroad planners, ship navigators, military generals, business people, and others quickly became interested in the new technology.

Experimental time signal broadcasts were being tested in Switzerland and France as early as 1904, and patents for wireless time signal systems began arriving in the Swiss Patent Office by 1906, some passing across the desk of a young man named Albert Einstein. By 1907, Canada had begun to broadcast time from station VCS in Halifax, with signals referenced to the clock at St. John's Observatory.

High Atop The Eiffel Tower

The best known of the early time signal stations was FL in Paris, operated by the French Bureau of Longitude, which launched its signals from high atop the Eiffel Tower. Now one of the world's most famous monuments, the Eiffel Tower would have probably been demolished had it not proved to be useful as a radio tower. Then the world's tallest structure, the 312-meter tall tower was built in 1889 to help commemorate the centenary of the French Revolution. However, many Parisians had opposed its construction, and considered it unsightly. As a result, it was scheduled for demolition in 1909, when its 20-year lease finally expired. By 1904, however, the tower had become a station of the new French radio service, considered essential to the country's defense, and the now famous monument was spared.

The Eiffel Tower time signal broadcasts began on May 23, 1910. The frequency of the original broadcast was near 150 kHz and the radiated power was about 40 kW. Time signals referenced to the clocks at the nearby Paris Observatory were sent twice daily. The signals spanned the Atlantic Ocean, reaching the United States and Canada and serving their intended purpose: to allow ships at sea to correct their marine chronometers.

WWV staff members assembled at the station's entrance in Beltsville, Maryland, in April 1943. This building was constructed after a November 1940 fire destroyed an earlier transmitter building located about three miles away.

Soon, many others began decoding the signals to obtain the correct time, including railroad companies, clock makers, jewelers, and others.

By June 1913, a regularly scheduled time service had begun. The frequency, format, and schedule for the time service was repeatedly changed, but the French somehow managed to keep the time service going through World War I and into the 1920s.

A WWV QSL card picturing the transmitter building in Beltsville, Maryland, and advertising frequency and time intervals to better than 1 part in 10 million. The exact date of this card is unknown, but 1945 is a good guess. That was the year that E.U. Condon became the NBS director, and also the year the telegraphic time code service began (note that the time code is not mentioned on the card).

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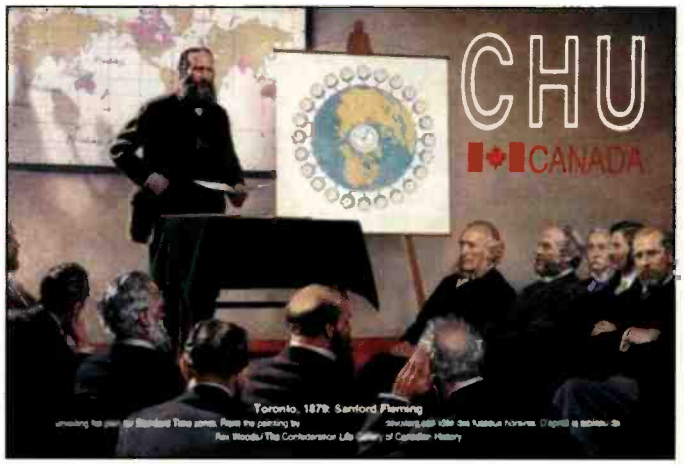
The QSL card sent today to listeners of NIST radio station WWVH which broadcasts from the island of Kauai in Hawaii. Reception has been confirmed in about 60 countries since 1990.

Today, the Eiffel Tower continues to be used as a mast for radio and television antennas.

Virginia's NAA

The American time signal station NAA began broadcasting time in 1913 from Fort Meyers in Arlington, Virginia. NAA used a rotary spark-gap transmitter at a frequency of 125 kHz and an output power of about 54 kW, making it the world's most powerful station.

The time came by wire from a USNO (US Naval Observatory) clock across the Potomac River, and was said to be accurate to "1/20 of a second" when it reached San Francisco. NAA was built as part of the U. S. Navy's effort to establish a worldwide communication network. The Arlington Radio Station included three towers, with the tallest tower reaching a height of about 183 meters.



The QSL card sent today to listeners of the Canadian time signal station CHU which broadcasts on three frequqncies from a site near Ottawa. It features a painting of Sanford Fleming, whose contribution to the adoption of the present system of time zones earned him the title of "The Father of Standard Time."

In 1915, engineers from American Telephone & Telegraph (AT&T) used the Arlington towers to send the first successful transoceanic voice communication, sending a message to a fellow American engineer who was listening in the Eiffel tower in Paris. It was only possible to send from west to east, so confirmation that the engineer's voice was heard was cabled back across the Atlantic.

By 1915, NAA was one of eight stations that made up the USNO's radio time service. Three stations (Arlington, Key West, and New Orleans) broadcast time controlled by the USNO clock in Washington, D.C.

How A Radio-Controlled Clock Works

Radio-controlled clocks contain both a miniature radio receiver and a traditional quartz clock. As a result, a typical WWVB clock contains two tiny quartz oscillators. One is a 32.768 kHz crystal that is used to control the timekeeping, the same type of oscillator you would find in any quartz watch or clock. The other is a 60 kHz crystal used to permanently tune the receiver to one frequency.

The receiver outputs a string of binary ones and zeros to a processing unit that decodes the signal and synchronizes the clock circuitry to the correct time. Because WWVB transmits UTC, the processing unit also applies a time zone correction to convert UTC to local time. This time zone setting is selected by the user, and must be changed if the clock is moved to a different time zone.

Building miniature antennas that work with longwave signals can be a challenge for receiver designers. Many radio-controlled clocks use ferrite loop antennas, consisting of a ferrite bar wrapped with a coil of fine wire, similar to what is found inside an AM radio.

In the case of wristwatches, the length of the ferrite bar is usually about 15 millimeters, and it must be hidden somewhere inside the watch. If the watch has a plastic or ceramic case this isn't a problem, but a metal case can block the signal. Some watches are partially metal, with the antenna hidden underneath a plastic panel near the connection to the watch band, or under the watch face.

Some radio-controlled clocks now work with more than one station. This usually means that they have more than one oscillator (a 60 KHz oscillator for WWVB and a 40 kHz oscillator for JJY, for example) but typically just one antenna. When a different station is selected, some designs match the antenna circuit to the antenna by varying the capacitance values. The size constraints make it difficult to build an antenna optimized for LF signals, so the goal is simply to get as much of the signal as possible, and to use the local oscillator and signal processing software to pull the time code out of the noise.

Most radio-controlled clocks only try to synchronize at night, because the signal is stronger and easier to receive after the sun goes down. Between synchs, the clock keeps time using its 32.768 kHz oscillator. Typically, the oscillator frequency is within a fraction of a hertz of its assigned value, which means it can keep time to within 1 second for a few days or more. Therefore, one synch per day is enough to make the clock appear to be on the right second, even though it has likely gained or lost a fraction of a second since the last synch. If the signal is not received the clock won't fail, but simply functions as an "uncontrolled" quartz clock.

Table 1. HF Time Signal Stations

Call Letters	Location	Frequency (MHz)	Language	Continuous Broadcast?
WWV	Fort Collins, Colorado	2.5, 5, 10, 15, 20	English	Yes
WWVH	Kauai, Hawaii	2.5, 5, 10, 15	English	Yes
CHU	Ottawa, Canada	3.33, 7.335, 14.67	French, English	Yes
BPM	Lintong, China	2.5, 5, 10, 15	Chinese	The 5 and 10 MHz signals are continuous, but 2.5 and 15 MHz only operate at scheduled times
HLA	Taejon, Korea	5	Korean	Yes
LOL	Buenos Aires, Argentina	5, 10	Spanish	No, currently only on from 1100 to 1200 Argentina Standard Time
YVTO	Caracas, Venezuela	5	Spanish	Yes

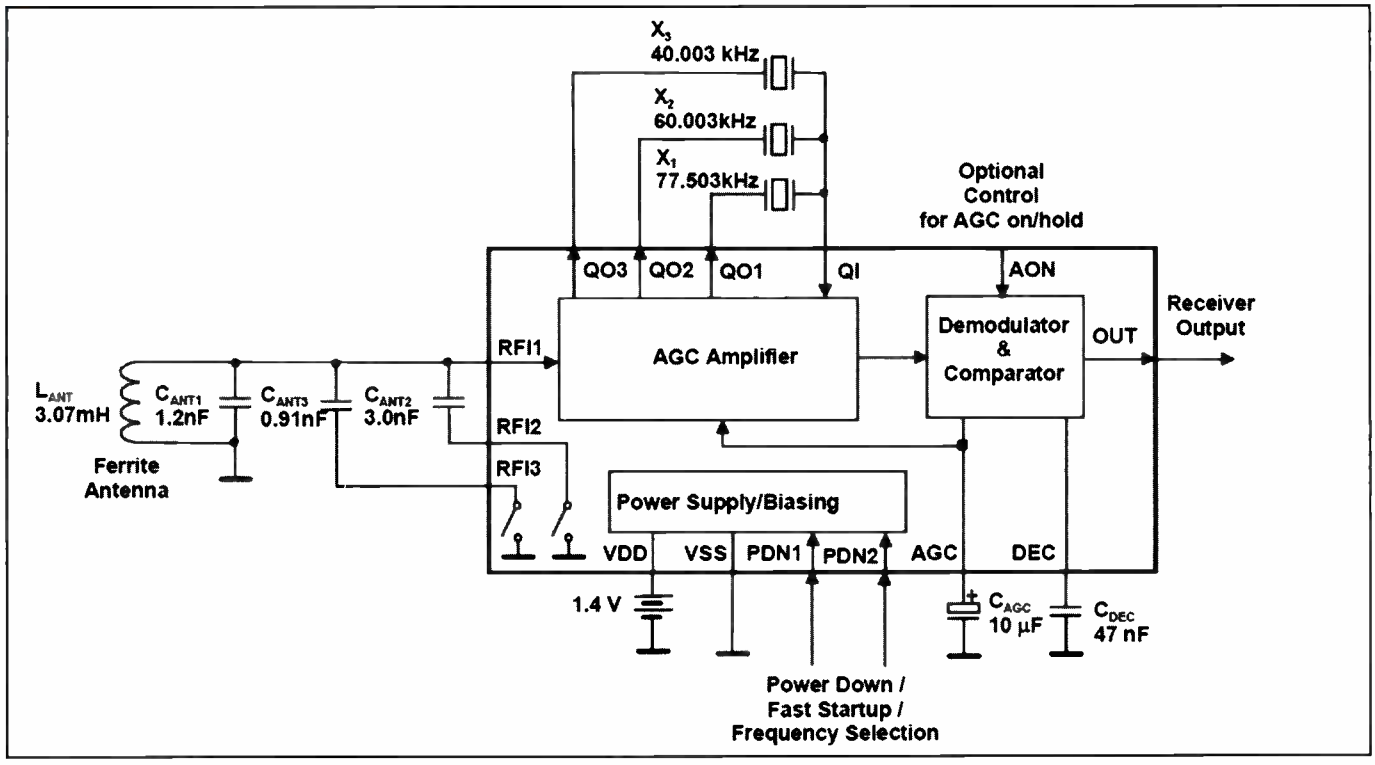
Five stations near the Pacific Ocean were used to broadcast the time maintained by a Navy clock at Mare Island. The signals were designed to be easy to decode. All eight stations would begin sending dots at 11:55 a.m., five minutes before noon. The dots were sent one second apart, with no signal sent on the 29th second of each minute, or during the last five seconds of each of the first four minutes. During the last minute before noon, the dots would stop 10 seconds before the end of the minute. A long dash was sent exactly at noon, serving as the on-time marker.

By 1924, NAA had switched to audio transmissions, and moved its operations to 690 kHz on the then new AM broadcast band. The historic Arlington towers were dismantled in 1941 because they were considered a hazard to aircraft approaching the new Washington National Airport.

The USNO's radio time service was overtaken during World War II by the time broadcasts of the National Bureau of Standards (discussed in the next section), but the NAA callsign lives on. Since 1961 it has been assigned to a megawatt VLF station in Cutler, Maine, that the U.S. Navy uses to communicate with submarines.

WWV Solves The Frequency Problem

The National Institute of Standards and Technology (NIST), formerly called the National Bureau of Standards (NBS), orig-



Sample circuit diagram for a radio-controlled watch chip that works with four different time signal stations. The circuit includes three crystal oscillators and a single antenna with a capacitance matching array. The 40 kHz crystal is for JJY, the 60 kHz crystal is for JJY, MSF, and WWVB, and the 77.5 kHz crystal is for DCF77. The chip can demodulate all four time codes. Note that the crystal filter circuit does not include a loading capacitor, so the nominal frequency of each crystal should be a few hertz high in order for the circuit to resonate at the time signal carrier frequency (circuit courtesy of Micro Analog Systems).

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- Built-in 2 white LED light source and one flashing red LED
- Dimensions: 6-1/2"W x 6"H x 2-1/2"D
- Weight: 1 lb. 3 oz.
- Power Source: Built-In Rechargeable Ni-MH Battery Pack; 3 AA Batteries (not included); Crank power alone; AC Adapter (not included); AC Adapter recharges built-in Ni-MH battery pack

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- Weight: 1 lb. 2 oz.
- Power Source: Built-In Rechargeable Ni-MH Battery Pack; 3 AA Batteries (not included); Crank power alone; AC Adapter (not included); AC Adapter recharges built-in Ni-MH battery pack
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  3. The AC adapter alone (AC adapter not included)
  4. The dynamo crank alone, even with no battery pack installed
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- Power Source: 3 AA Batteries (included) or AC Adapter (not included)

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Table 2. LF Time Signal Stations

Call Letters	Location	Frequency (kHz)	Controlling Agency
WWVB	Fort Collins, Colorado, United States	60	National Institute of Standards and Technology (NIST)
BPC	Lintong,China	68.5	National Time Service Center (NTSC), Chinese Academy of Sciences
DCF77	Mainflingen,Germany	77.5	Physikalisch-Technische Bundesanstalt (PTB)
HBG	Prangins, Switzerland	75	Swiss Federal Office of Metrology and Accreditation (METAS)
JJY	Japan	40 and 60	National Institute of Information and Communications Technology (NICT)
MSF	Rugby, United Kingdom	60	National Physical Laboratory (NPL)
RBU	Moscow, Russia	66.67	Institute of Metrology for Time and Space (IMVP)

inated in 1901 and was involved in radio research by 1905. However, the agency did not get involved in the time keeping business immediately, but instead focused its early efforts on developing frequency standards, eventually broadcasting standard frequencies from radio station WWV.

WWV began broadcasting in May 1920 from Washington, D.C. at a frequency of 600 kHz. Ironically, the first broadcasts consisted of Friday evening music concerts that lasted from 8:30 to 11:00 p.m. The station's 50 watt signal could be heard about 40 kilometers away.

Other uses of the station followed, but by late 1922, it was decided that the station's purpose would be to transmit standard frequencies that provided a reference signal for other radio broadcasters. By March 1923, WWV was broadcasting frequencies from 125 to 2000 kHz on a monthly or weekly schedule. The accuracy of the transmitted frequency was said to be "better than three-tenths of one per cent."

During WWV's early days, the transmitter was adjusted to the correct frequency using a wavemeter, which was checked against the national standard immediately before being brought to the station. However, the recently invented quartz oscillator soon became the national standard of frequency.

By 1927, a 50 kHz temperature-controlled quartz oscillator was installed at the station site. During the transmission, the frequency of the transmitter was held manually so that no beat note was audible between the transmitter and the quartz oscillator.

New radio stations were being built across the United States throughout the 1920s, and the radio industry desperately needed a reliable reference standard for frequency. If the new stations couldn't stay near their assigned frequencies, the airwaves would be unusable. To meet the needs of the fast growing radio industry, WWV was continuously evolving, adding more frequencies, increasing its coverage area, and increasing the accuracy of its standard frequencies, which was reduced to less than 1 part per million by the early 1930s.

It wasn't until 1937, however, when WWV began to transmit time. Originally, all that was sent were seconds pulses that served as a time interval reference. The pulses were not held in phase with any time reference, because the United States Navy still served as the nation's official radio time broadcaster. This

An aerial photograph of the site shared by WWV and WWVB near Fort Collins, Colorado, taken during the 1990s. The relatively small WWV antennas aren't visible from this angle, but the eight large towers support the massive WWVB antenna array.

The interior of a low cost watch controlled by WWVB signals. Note the ferrite bar antenna and two crystal oscillators, one a 32.768 kHz crystal that drives the quartz clock, the other is a 60 kHz crystal that serves as a preselector for the time signal. The battery appears to take up more area than the crystals and antenna combined.

changed in June 1944, when the Superintendent of the USNO authorized the synchronization of the WWV time signals to those of the USNO, largely because the Navy had ordered the USNO to cut back time transmissions during World War II. As a result, WWV began sending time messages in telegraphic code every five minutes in October 1945.

The famous voice announcements of time, now known to nearly all who listen to shortwave radio, began on January 1, 1950. By the 1960s, WWV and other time signal stations were controlled by atomic oscillators, and today most stations are referenced to frequency standards accurate to better than 1 part per trillion, although their received accuracy can be much less due to radio propagation noise.

Today's Time Is . . .

WWV moved to its current site in Fort Collins, Colorado, in 1966 and continues to broadcast standard time and frequency information on 2.5, 5, 10, 15, and 20 MHz. A sister station, WWVH, began operation in Hawaii in 1948, adding voice announcements of time in 1964.

Today, WWVH shares all of the WWV frequencies with the exception of 20 MHz, and it is often possible to hear both stations. It's easy to tell the difference, because a man's voice announces the time on WWV, and a woman's voice is used on WWVH. The WWV announcement begins about seven seconds prior to the top of the minute, and the WWVH announcement begins about 15 seconds prior to the top of the minute (lasting for about seven seconds), so the two announcements never overlap.

HF Time Signal Stations: Talking Clocks

WWV and WWVH aren't the only "talking clocks" found on the shortwave bands. The Canadian station CHU is normally an easy catch for U.S. listeners on 3.33, 7.335, and 14.67 MHz, with voice announcements of time made in both French and English. An official source of time in Canada, it is believed that CHU began broadcasting time in 1929, and has done so since 1938 using the current call letters.

Table 1 lists other HF time stations, most sharing the WWV and WWVH frequencies, which are internationally allocated for standard time and frequency broadcasts. Note that the ranks of the HF time stations have thinned recently, with stations such as IAM in Italy, VNG in Australia, JJY in Japan (the call letters were transferred to the LF station), ATA in India, and BSF in Taiwan all going off the air since 1998.

The HF time stations produce the world's most accurate voice announcements of time. Although some HF time signal stations (including WWV and WWVH) broadcast a time code, nearly all inexpensive radio-controlled clocks receive signals from the LF time signal stations that we'll discuss next. The LF stations lack the bandwidth to send any voice announcements at all, but their time codes are easy to receive indoors and outdoors with small antennas, making them perfectly suited for synchronizing radio-controlled clocks.

LF Time Signal Stations And Those Popular "Atomic" Clocks

Low-cost radio-controlled clocks first appeared in the early 1990s. Today they

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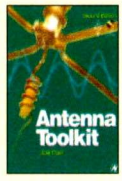

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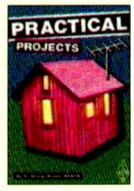

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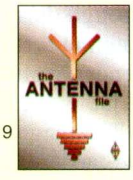

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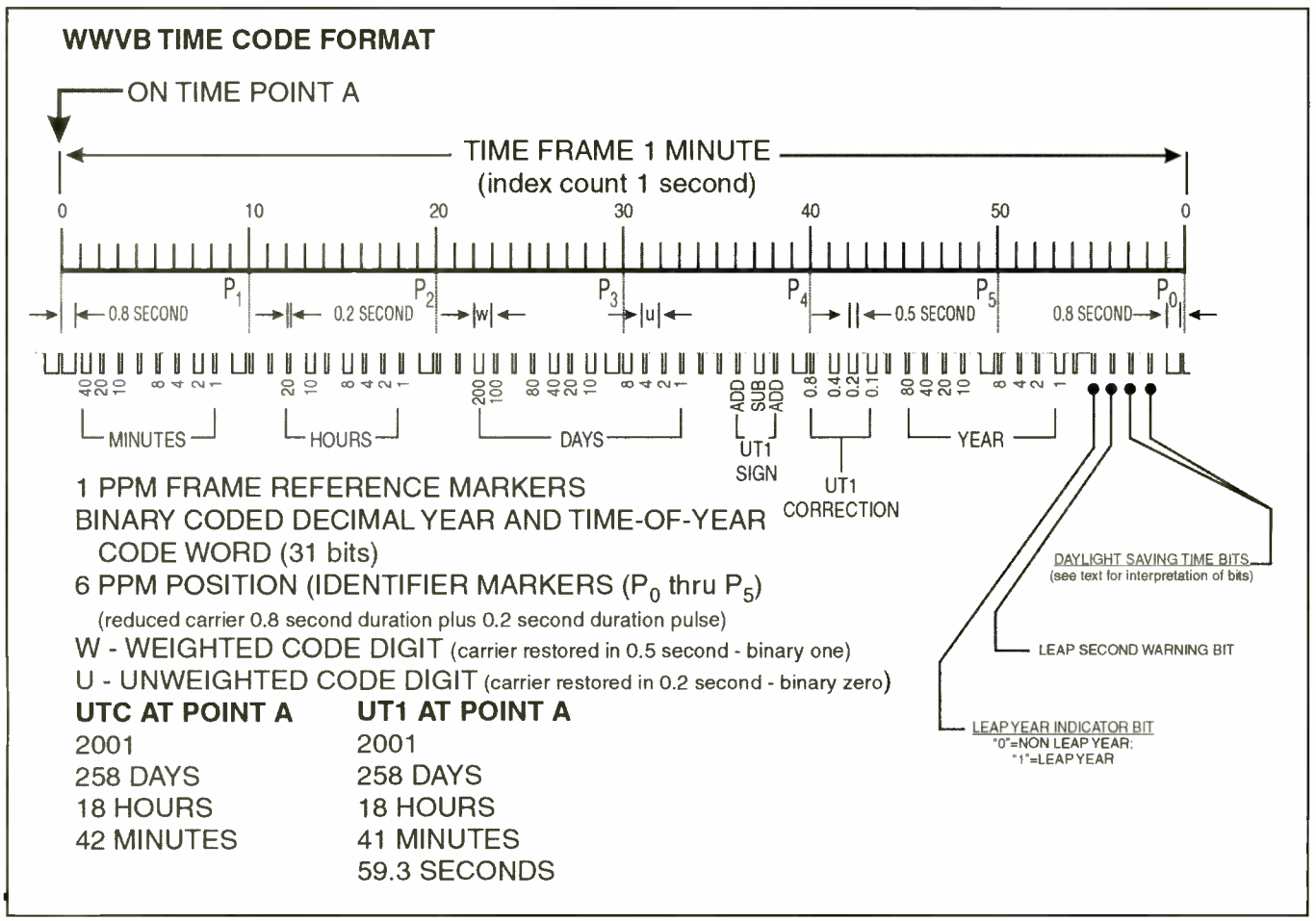

The time code format used by WWVB and now read by millions of radio-controlled clocks. The time code is sent continuously at a rate of 1 bit per second, with a complete time code sent every minute.

are found in retail stores throughout the United States, Asia, and Europe, and millions of units are sold annually. These clocks receive signals in the 40 to 80 kHz range, located in the LF part of the radio spectrum, the same band used by early stations like FL and NAA. Although LF communications is far from a new technology, it remains perfectly suited for time signals, where only a small amount of information is sent and little bandwidth is required.

Sometimes called longwave stations (the wavelength of 60 kHz is 5 kilometers, or more than three miles), LF stations (see **Table 2**) can cover a wide area with relatively low power. Even more importantly, their signals can be received indoors with simple antennas, because they easily pass through non-metallic buildings and walls. This gives them an edge over other time signals, such as those from the GPS satellites, which are hard to receive indoors.

All LF time signal stations are run by standards laboratories that keep the official time in their respective countries, so the time signal as broadcast is usually exceptionally accurate. The time code sent by the station normally contains the hour, minute, second, date, daylight saving time notification, and other information. All stations use a different time code format, but many radio-controlled clocks now work with more than one station, because the carrier frequencies and modulation schemes are similar. As a result, you can now buy a radio-controlled wristwatch that will synchronize in the United States, Asia, and Europe.

Future products should work in even more places, because in sharp contrast to the HF stations, the number of LF stations is expected to grow. To meet the anticipated demand for radio-controlled clocks, several countries are planning to build new LF time signal stations.

WWVB, Time Source For The United States

Most radio-controlled clocks in the United States are controlled by WWVB, which shares a sprawling 390 acre site with WWV near Fort Collins, Colorado. WWVB continuously broadcasts a 50 kW signal at 60 kHz that is strong enough during the nighttime hours to reach all 50 states. The antenna array is immense, covering about 30 acres and suspended from towers 122 meters tall, but the modulation technique is simple.

Time signals are sent by raising and lowering the power of the carrier frequency. The 60 kHz carrier frequency is locked to a cesium oscillator whose frequency is continuously steered to agree with the national frequency standard located in nearby Boulder, Colorado. A time code generator synchronized to Coordinated Universal Time (UTC) modulates the signal once per second by dropping the carrier power. If full power is restored 0.2 seconds later, it represents a 0 bit; if full power is restored 0.5 seconds later, it represents a 1 bit. A frame marker is sent by dropping the power for 0.8 seconds. The time code

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generator signal is sent to the transmitter, which amplifies the signal and sends it to the antenna array.

Although this form of modulation is sometimes called amplitude shift keying, it is more properly referred to as pulse width modulation by reduced carrier transmission. This is because the information contained in the signal is demodulated by looking at the pulse widths (duration) and not by looking at the amplitude. Most LF time signal stations use a similar method to modulate their time code (the one exception is RBU in Moscow which uses an AM subcarrier).

In today's world of high-speed communications, it's interesting to note that WWVB sends time at a glacial rate of 1 bit per second (imagine sending an e-mail or fax at that speed!). Even so, a full time code is sent each minute, and the signal requires very little bandwidth to transmit. Technically, the bandwidth requirement is just 5 Hz, but due to the nature of the transmission and antenna system, the station has a bandwidth allocation of 2 kHz, of which about 600 Hz is currently used. Another advantage is that very little processing power is required to keep up with the bits and read the time.

Suggested Reading

Steven J. Dick, *Sky and Ocean Joined, The U.S. Naval Observatory 1830–2000* (Cambridge University Press, 2003)

Tony Jones, *Splitting the Second: The Story of Atomic Time* (Institute of Physics Publishing, 2000)

Peter Gallison, *Einstein's Clocks, Poincare's Maps* (W. W. Norton & Company, 2003)

Gavin Weightman, *Signor Marconi's Magic Box* (Da Capo Press, 2003)

NIST Time and Frequency Services, NIST Special Publication 432, 2002 (available for download from http://tf.nist.gov/general/pdf/1383.pdf)

NIST Time and Frequency Radio Stations: WWV, WWVH, and WWVB, NIST Special Publication 250-67, 2005 (available for download from http://tf.nist.gov/general/pdf/1969.pdf)

WWVB Radio Controlled Clocks: Recommended Practices for Manufacturers and Consumers, NIST Special Publication 960-14, 2005 (available for download from http://tf.nist.gov/general/pdf/1976.pdf)

So the next time somebody makes a joke about time signal stations, go ahead and laugh politely. Then inform them that time signal stations have been around for more than 100 years, and that they control millions of clocks that never need to be set. Because after all, many of us now expect our clocks to be on time, all the time, and can envision a day when every clock is "absolutely right," making the more than century-old vision of Sir Howard Grubb a reality. ■

Michael Lombardi serves as the quality manager for the NIST Time and Frequency Division, the organization that operates radio stations WWV, WWVH, and WWVB. He can be reached at lombardi@hist.gov.

by Steve Douglass

Uniden's New BCD396T— A Scanner For MILCOM/MILAIR Monitoring?

I'm always on the lookout for a new VHF/UHF MILCOM/MILAIR receiver, even though I have several. In particular, I've been in the market for a portable scanner ever since I let my buddy talk me into selling him my venerable Realistic PRO-43. Why not? I thought. He really wants it and my ICOM R-3 works well, has features the PRO-43 doesn't have and it was time to let someone else enjoy that trusty scanner as much as I had.

Funny thing is, after a few months I really began to miss my old PRO-43. It was easy to program, had good audio and was a good all-around scanner. Plus, as much as I liked my ICOM R-3, its slow scan rate left something to be desired.

I was, therefore, very interested when a Uniden press release announced that the arrival on the market of a new scanner, the BCD396T, capable of storing up to 6,000 channels was imminent. I quickly scanned the specifications, which were very impressive, indeed.

But does it receive the all important military frequency bands both on VHF and UHF? Lately portable scanners capable of receiving my two favorite military bands had become rare. No military, no sale was my motto, but fortunately the Uniden BCD396T does!

Here are Uniden's published specs:

- TrunkTracker IV (Motorola APCO 25 Digital, Motorola, EDACS, LTR)
- 6000 Dynamically Allocated Channels
- Close Call RF Capture Technology—Instantly tunes to signals from nearby transmitters
- Fire Tone-Out
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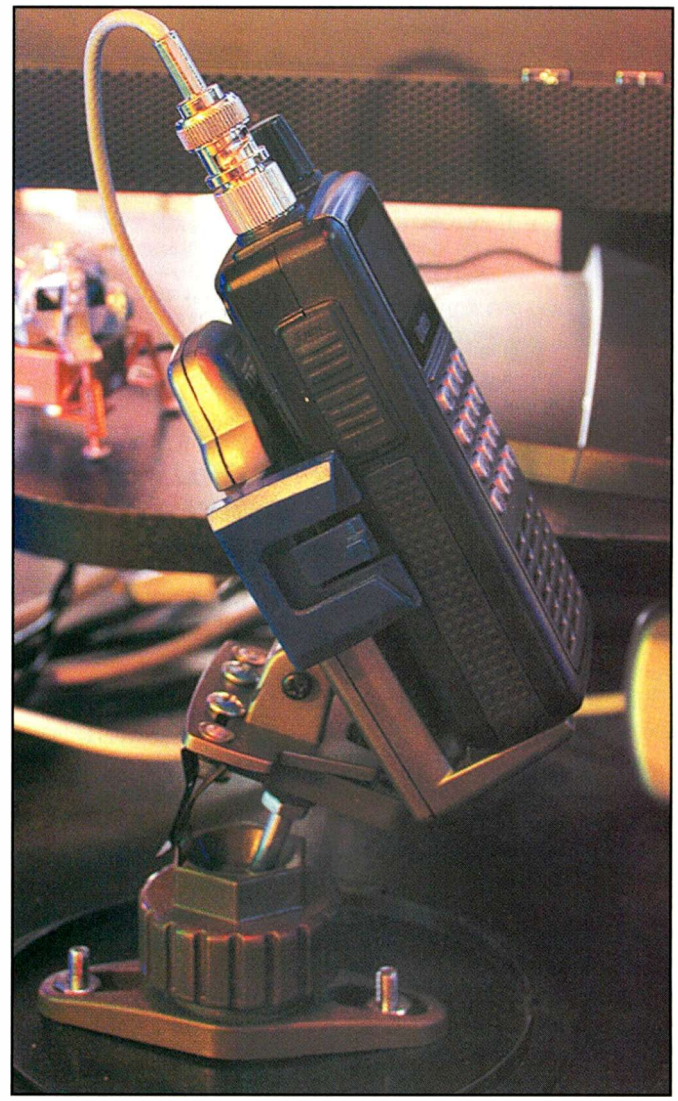
- DCS/CTCSS Rapid Decode—Instantly detects and displays the subaudible tone so you can quickly determine the system settings.
- S.A.M.E. (Specific Area Message Encoding) Weather Alert—During a NOAA weather or emergency alert, a code for your specific location will alert you to severe conditions in your immediate area.
- PC Control/Programming—Software included.

Although the bells and whistles were quite impressive, in my area (so far) there is no trunking, no APCO 25 digital, and no real need for a 6,000-channel scanner, but what really impressed me were the computer control, Close Call feature (if it worked on the civil and military aviation bands), and the alphanumeric readout. Now except for the Close Call, these are all features my BC-780 has, but it isn't portable so I decided to give the BCD396T a shot.



Author's improvised scanner holder for the Uniden BCD396T is cobbled together from a mobile cell phone holder, a leftover surround-sound speaker wall mount and the bottom plate from a "cake box" blank CD packaging. (Photos by Steve Douglass)

On opening the box I was surprised by how small the BCD396T is. In fact it was a tad smaller (thinner) then my old PRO-43. It's surprisingly more solid, though, and has the heft of a professional walkie-talkie.

The scanner is supplied with AC adaptor, screw-on SMA-type antenna (and BNC adaptor) rechargeable batteries and a

Author's BCD396T does double duty as a base scanner in his monitoring shack supplementing his other military scanners. With a capacity of 6,000 channels, computer control, and advanced features, this potent little scanner will give many larger base scanners a run for their money. (Photo by Steve Douglass)

professional-type rotating belt clip. Although the online specs say the software was included I could not find any. Instead it was a quick and easy download off Uniden's site at Uniden.com.

I was pleased to see that the Uniden BCD96T worked with regular rechargeable AA (metal hydride) batteries and that it didn't require purchasing an expensive proprietary battery pack like other Uniden scanners—a main complaint of many scanner owners.

I installed the supplied batteries, turned it on and was instantly rewarded by a cool-blue glowing keypad and easily readable display for my tired and aging eyes.

Preprogrammed, But You'll Need To Work With It!

The Uniden BCD396T comes pre-programmed with thousands of frequencies, including one group called "Nationwide" that it began scanning immediately. It was only seconds before it locked on a local police channel. The audio was a bit heavy on the treble side, but it was clear, not objectionable, and about what you'd expect for a speaker as small as this one is. I've read on some forums that the speaker sound was tinny, but I found this was not the case. I would say it was on par with, but considerably louder than, the sound from my PRO-43.

As I read the manual—an intimidating 148 pages—it dawned on me that this was not my father's scanning radio. Instead the Uniden BCD396T was a rather complicated, but rightly so, communications interception tool that happened to also be a potent scanning radio. In light of this, if you decide to purchase a Uniden BC396T, give yourself some quality alone time (several hours) to get used to the way this scanner works.

Although at first glance it does seem a bit complicated, after a few hours of reading and punching the buttons you'll find the programming quite intuitive and not as difficult as it first seems.

One of the harder concepts to grasp is Uniden's channel programming hierarchy of "systems" and "groups," which on the face seem complicated, but in actuality is straightforward and really quite smart.

Comparison Test

After getting the hang of programming (through the key pad not via PC, we'll save that for later), I was ready to give the BCD396T a comparison test and stacked it up against my BC-780 and ICOM R-3.

Using the same antenna on each scanner I found that the Uniden 396T was a tad more sensitive than either my BC780 or ICOM R-3, especially on VHF and UHF. I did notice that the BCD396T was a bit more sensitive to unwanted noise on the VHF police bands, but entering the proper DCS/PL tones for each channel easily cured this, and since my main interest is military monitoring, this was not a major concern. My guess, however, is that this could be a problem in RF-crowded urban area and on some fre-

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The BCD396T fits well in most cell phone and GMRS radio cases. This case, bought at a sporting goods store for $6, even has a side pocket capable of holding a UHF rubber duck antenna.

quencies where DP/PL tones are not used, as is the case on some of the low-power car-to-car police frequencies in my area.

As for military mobile (138 to 144 MHz), civil aviation (108 to 136 MHz), and UHF aero band frequencies (225 to 400 MHz), again it was on a par with, if not better than, either my BC-780 or ICOM R-3. This was surprising for a handheld scanner.

I programmed each scanner with the weak VHF/UHF ATIS broadcast from my local airport, located 12 miles away as the crow flies, which I could usually only barely pick up with the squelch totally turned off on the BC-780 and the ICOM R-3. To my surprise the weak ATIS was not only louder on the BCD396T, but also easily broke squelch on *both* VHF and UHF broadcasts.

Over the next few days I listened to each scanner and became convinced that the BCD396T was slightly better in picking up military communications. Sometimes when I was listening to a UHF aero-comm and it would drop out on one scanner, it would continue for a little while longer on the BCD396T. Although there are some features, like expanded band coverage and television video reception, on my ICOM R-3 that the BCD396T doesn't have, in my opinion it's a darned good scanner, and is now doing double duty as a portable and base scanner.

Close Call!

I must admit I was a tad skeptical when I read about the "Close Call" features in the BCD396T manual. I have used several RF close-capture products, such as Optoelectronic's Scout and Interceptor as well as many frequency counters (marketed as signal sniffers), and have had varying degrees of success. Sometimes they worked flawlessly revealing frequencies I never knew were in use, and sometimes they became so overloaded by FM and TV broadcast emitters that they became deaf as a post and basically useless.

However, as I read on, it became clear that Uniden has put quite a bit of thought and signal intercepting experience into the design of the Close Call technology. For example, to keep from getting overloaded by broadcast emitters, you can customize the Close Call function to skip those frequencies. You can have it only scan a certain band of frequencies, say aircraft, and even permanently lockout offending strong transmitters. You also have the option of automatically storing any Close Call frequency captures into a scanable group (bank) using Close Call while scanning other frequencies or using it on its own. Nice options.

Hooking the scanner up to my mobile antenna, I took the BCD396T (Close Call option selected) for a spin around my local airport to see what it could capture. I'm happy to say Close Call worked as advertised. It easily picked up and displayed both FM and AM signals. I captured two VHF security frequencies that I didn't know existed, as well as several AM (both civil and military) aircraft frequencies up to a quarter-mile from the transmitting source. My guess is the capture range is dependent on the proximity and the strength of the transmitter in question, but on the whole I was very impressed with Close Call.

Alert!

Another cool feature is that you can set special audible tones to alert you when Close Call finds an active frequency or when a programmed frequency becomes active. Let's say there's a frequency in your area that doesn't have much traffic on it but you still need to be alerted when there's any radio traffic there. You can set the scanner to alert you with one of several audible tones (from a standard beep to a warble) that will get your attention. Since you can use different tones on different channels, it's easy to know just by the tone which channel is active.

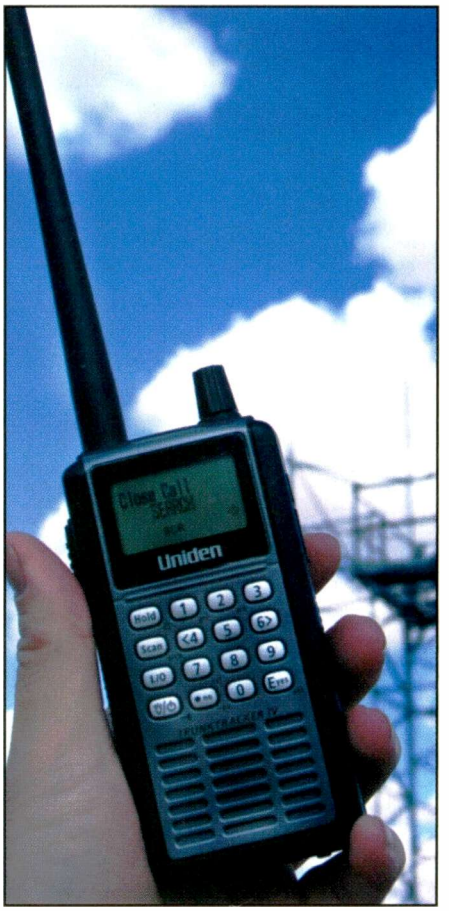


Photo of Uniden BCD396T in Close Call mode displaying a captured VHF AM aircraft signal. Close Call works like a near-field receiver and can capture signals you didn't even know existed.

Well Worth It

In the final analysis, I think the BCD396T is one heck of a great scanner radio for MILCOM and MILAIR reception. Some think it's a bit pricey at above $500, but I think this feature-packed scanner is well worth the price. A great portable, you'll find it also could become your main base-scanner.

For more information, contact Uniden at www.uniden.com. Be sure to tell them you read about the new BCD396T in *Popular Communications*! ■

by R.B. Sturtevant, KD7KTS

Radio Fun And Going Back In Time

Q. You've said before that the first Police radios were one-way on the AM band. When did the cops get their own frequencies and two-way communications?

A. Shortly after World War II the FCC decreed that all police radio would shift to the VHF frequencies and operate between 150 and 160 MHz. During the War years we'd learned a lot about radio. The new systems, often using ex-military gear were two-way. Lake County, Illinois, claims to be the first to accomplish this. February 1, 1949, they went into service with a 250-foot tower and service building in Libertyville, Illinois. The Radio Department operated 200 radios for all the police and fire agencies in the county at a cost of $10 per agency per month. Anyone know of an earlier system?

Q. Is the Navy able to keep track of foreign military vessels at sea?

A. They sure are. The project is called "White Cloud" and is based on small satellites called Subsatellite Units or SSUs. Working in groups of three or four SSUs from 30 to 240 kilometers apart, they sweep the seas below and each takes a fix on the various vessels. They take their fixes from the communications, air and surface search and weapons control systems on the ships. When each has its fix they compare notes and transmit the information to the Navy's ground stations. Passing over any one point at sea about 30 times a day they can work out course and direction of about any ship out there. They are thought to be transmitting their signals in the .5 to 10 GHz range but details are understandably hard to find. They have been up there since the early '70s and were still being deployed through the end of the '90s. Question is, are "they still up there?" Want to bet they're not?

Q. Most hams are aware of station K2BSA, the official Boy Scout Ham station. Have they ever done anything with AM or FM broadcasting?

A. Yes they have. Every four years there is a National Jamboree. Naturally K2BSA is there and on the air. In 1989 the National Jamboree was held at Camp A.P. Hill near Bowling Green, Virginia. It attracted Scouts from all over the USA and more than 30 countries. Daily attendance was over 100,000. To help with the crowds a 530 kHz AM station played parking and general information on a continuous loop. At 5 watts the 530 station reached between two to five miles depending on weather.

A 1610 kHz AM and 91.7 MHz FM station simulcasted live music, news, interviews, DJs and special programs. Two-way radios were used to conduct remotes. The 1610 AM sent out 5 watts and had a reach of around three miles with enough power to be heard with a small portable receiver. The FM station put out 10 watts and reached out to five or six miles. All this was covered by a special Experimental License granted by the FCC.

All three stations were built by the Scouts who did the antennas on site and the "in front of the mic" work. This was the first time Scouts broadcast, as opposed to transmitted, during a Jamboree.

Q. How important is communications procedure for the military in a combat situation? Is it really as important as everyone says it is?

A. Well, the enemy really is always listening. The North Vietnamese Peoples Liberation Army had an intercept program going from 1924 until 1975 and probably after that. But it really paid off for one soldier who kept his cool.

Armored Cavalry units often left soldiers on lookout posts at night around their area of encampment, particularly in the field. Because of radio security there would not be any "Outpost 1 reporting. No traffic foolishness. The radioman at the main camp would call the outpost number and the lookout would reply with one click on his mic key if he was OK, twice if he wasn't. One night a lookout answered with two clicks. When asked if it was safe to transmit by voice he again answered with two clicks. Through a process of clicks on the mic he let Command know that he was in the same place he had been left, was not wounded or injured, could not see the enemy, was in grave danger and needed immediate relief. Fearing an ambush, several tanks, armored vehicles and heavily armed troops were sent out to rescue their endangered comrade. Upon arrival the rescue column found a very frightened lookout still up in a tree with a large tiger licking his boots.

Looking Back...

Five Years Ago In *Pop'Comm*

Despite the fact that CW is slowly fading into history as a testing requirement for US hams, it's still an excellent mode of communication. If you want to learn CW, writer and ham Arthur Lee's excellent article in our February 2001 *Pop'Comm*, "The Three-Minute Tip" will get you started. And for something a little more "high tech," you can still work those satellites with a handheld transceiver; Gordon West's' Radio Resources showed us how.

Ten Years Ago In *Pop'Comm*

Cell phones were certainly nothing "new" but there was – and in some circles still is—an ongoing discussion of amateur radio vs. cellular. Joe Lynch, N6CL's article in February 1996 now provides an excellent historical perspective of the issue. New were several Trident handheld scanners and Opto-electronic's Scout.

Twenty Years Ago In *Pop'Comm*

Equipment we were drooling over back in 1986 and advertised in *Pop'Comm:* Sony's IC-2002, and IC-2010; the JRC NRD-515 and Yaesu FRG-8800. The Voice of the Islamic Republic of Iran is still doing its thing—as it was 20 years ago as reported by writer Gerry Dexter in an article, "Iranian Close-Up." Those were the days of the Iran-Iraq War. And the drama in the Middle East continues two decades later!

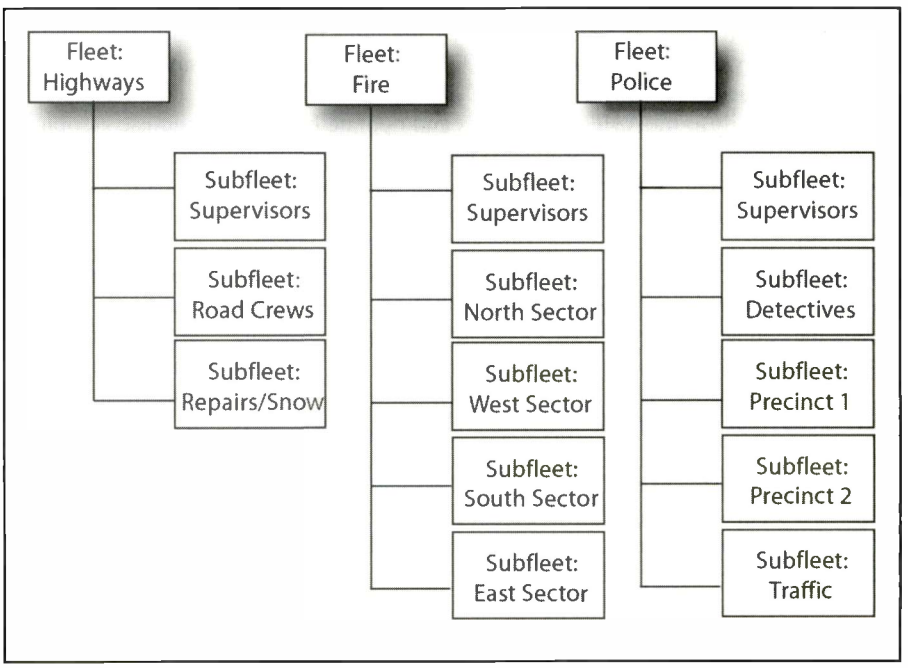
by Ken Reiss, radioken@earthlink.net

All About Fleet Maps

Uniden recently introduced the TrunkTracker III series. While that's probably not news to anyone anymore, a lot of scanner enthusiasts are still confused about some of the new techniques and setups for this new series of scanners.

If you're new to scanning, this whole concept of trunking itself can be a bit elusive. This can be complicated by the fact that not all systems are created equal, and different manufacturers have different ways of dealing with the differences between them. To explain a bit about the concept we'll be focusing on the TrunkTracker III, but the basic concepts apply to other radios as well. Just how you apply the concepts may be completely different, depending on which radio you have.

The first thing you need to do is figure out the type of trunking system you have. Many excellent references, including *Police Call* available at most RadioShack stores, may be of some help there. Once that's determined, you'll need to do some calculating, or guessing, about how to enter the system into your scanner. Have your owner's manual handy.



Under a type 1 system, each area had its own fleet, and users who needed to talk to each other were on a subfleet. This is what you're telling the radio how to deal with when you program a custom fleet map.

Trunking Systems

There are several types of systems out there. LTR systems are used primarily for *businesses*. Programming an LTR system into your scanner requires that you know all the channels in use, but after that it's pretty automatic. You then only have to worry about finding the talkgroups that are of interest.

EDACS systems require the frequencies to be entered in order. The system may be in frequency order, but it may not be. If it's not, good luck, as any random ordering of frequencies will work with a system as long as the system knows what they are. The advantage is that the system and its users all know what the order is, but they may be just as happy if you don't. Some trial and error may be required before you can start following conversations correctly.

Motorola systems, by far the most common, are usually a bit easier to get into your scanner. The good news here is that most of them are what's called "type II," and your scanner can follow a type II system without much fuss. All you need on the TrunkTracker III radios is the control channel and it can find the rest. Pretty slick!

Of course, if there's a type II, that implies there must have been a type I before. There was, and that's where things get a bit sticky. Type I systems are a bit older and a bit less sophisticated. The type I system needs something called a fleet map, which is a list of groups that are on the system and shows how the channels are divided between groups. It's a bit like a code to allow the channels in use to be selected correctly for the right group of listeners at the right time.

Type II systems have a fleet map, too, but it's really to make them compatible with the older systems. As the type II systems came out, most new radios purchased were type II, but the users of these systems didn't want to give up their old radios. So Motorola wisely came up with a hybrid system that allowed type I and II systems to coexist within the same system until all the radios could be upgraded. Most systems are type II and any new radios purchased are type II, so this issue will probably go away completely in another few years. But for now there are still some type I systems and some hybrids in use.

The First Step

The first thing to do in fleet map programming is to get the radio programmed into the trunked mode. You should have all the frequencies entered, and be able to search the trunked bank, looking for ID numbers. One method to help you determine if you need a custom fleet map is to look at the ID numbers themselves as you listen to the conversations. If you see lots of numbers, particularly odd ones (those ending in an odd number), it may indicate that you

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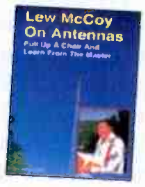

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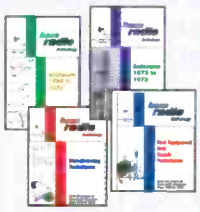

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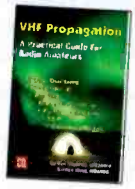

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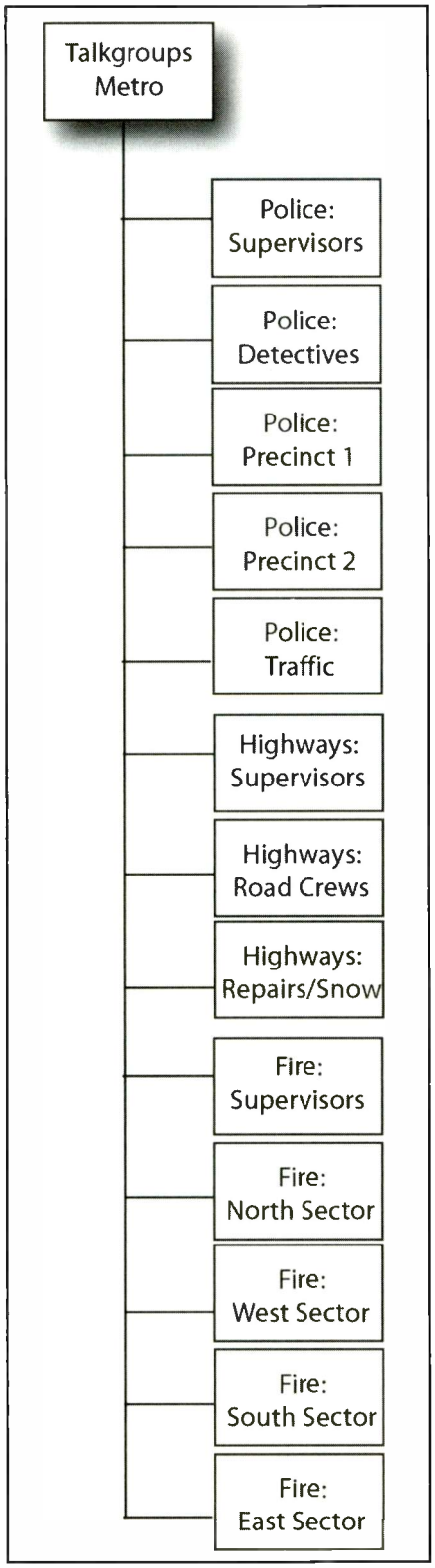


Under the newer type II systems, talkgroups are the way to get things done. Talkgroups can be created for any group of users, and on some systems they can even be created on the fly as a situation develops. It's a much more flexible system and your radio is already programmed to deal with it. You'll only need a custom fleet map if this doesn't work to follow conversations.

Frequency Of The Month

Each month we ask our readers to let us know what they're hearing on our "Frequency Of The Month." Give it a listen and report your findings to me here at "ScanTech." We'll pick a name at random from the entries we receive and give the lucky winner a free one-year gift subscription, or extension, to *Pop'Comm.*

Let's go back to UHF for this month and have a listen to **450.580**. Let me know what you hear. You can send your entry to radioken@earthlink.net, or to Ken Reiss, 9051 Watson Rd. #309, St. Louis, MO 63126. Please include the frequency in the subject line or on the front of the envelope so it can be processed correctly.

need to adjust the fleet map. However, there are times in a type II system when odd numbers will be legitimate, so don't conclude that you have the wrong fleet map just because of an odd ID or two.

As you watch the ID numbers, listen to the voices. You'll quickly begin to recognize some of the dispatchers, as well as background sounds or other telltale signs that one particular user is transmitting. Pick one of these that you think is incorrect, and wait for that ID to pop up. If the delay mode is on, or you press hold, you should hear a response. Sometimes, you won't hear the response, but you'll hear the first person answer back. This is definitely a sign of an incorrect fleet map.

Another way to look for problems is to start searching again, this time with the delay *off*, waiting for a transmission that you think is in the "troubled" group. As soon as the transmission ends, hit search again to look for the reply. Here, you may actually have to use your lockouts to block the busier channels or the users that you think are working okay. If the fleet map is correct, you'll get the same ID number for the reply as for the original transmission. If you don't, another fleet map setting will probably work better for you.

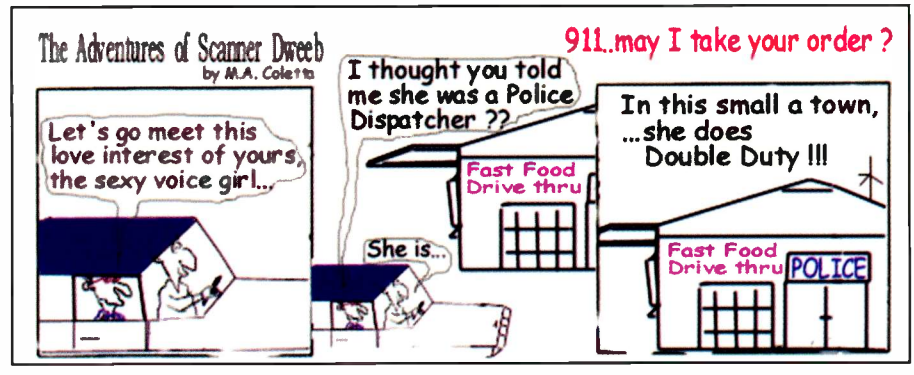
A Little Math—Very Little!

It's helpful to note the ID numbers you're getting, even though they are wrong. If you're up to a bit of math, you can divide the ID number by 8192 (don't worry about any decimal fraction) and the number will tell you what "block" the user is in.

Now, we're ready to experiment. It's useful to do the early work on this at night when many users of the system are off the air, but eventually you'll have to check during the day, too, to make sure that you've got the whole system under control. If you notice that all the transmissions you're hearing are coming up with different numbers, even when they appear to be talking to each other, it may be that you have a type I system. If some of them seem to work okay (that is they keep the same ID number for the reply), then you probably have a hybrid system. Either one will require some experimenting at this point. If you can identify transmissions that are correct, it's worthwhile to do the math (divide the ID by 8192 and drop the decimal part) to determine which blocks you can leave alone. A type II ID is size code 0, and those blocks can be left alone, which will shorten the list of combinations you have to try.

Programming A Fleet Map

Uniden has included several preprogrammed fleet maps. The default map used is for a pure type II system, which is the most common. There are also some "standard" type I and type Iii maps pre-



programmed into the radio, and these are worth checking before you set out to reinvent the wheel. These preprogrammed maps are listed in the back of the manual along with the size codes that are represented by each one.

To set any of the fleet maps, press MENU and then rotate the dial to PROGRAM SYSTEM. Select the system you want to work on and then enter that system. Then select EDIT SYS OPTIONS followed by EDIT FLEET MAP.

You can then choose to select a preprogrammed fleet map (and you should give those a try) or to enter a custom fleet map. If you enter custom, you'll get to select block sizes and codes for each of the eight blocks that make up a system numbered 0–7. At this point, you begin programming the size codes you want for the map. If you've been through the exercise of trying all the built-in maps, you may already have some idea of what does and doesn't work. Select size codes for all the blocks at once, or just set one for the block you're interested in and ignore the rest. You're likely to have to repeat this procedure often before you come up with an accurate map.

Any block using a type 1 size code will identify on the scanner with a number beginning with that block number. It will make it much easier to tell if a particular block's ID is working or not in this mode. Simply watch for the ID in the block you're testing, and hit hold to see if you can hear the return conversation. It is a much better test if the repeater actually drops before the reply is heard as then the controller has to assign a new frequency to the subfleet, and your TrunkTracker will have the opportunity to follow that new assignment. Sometimes it only takes a few seconds of listening to determine that a particular size code is wrong, but it *can* take quite a while, so be patient.

Once you have a working fleet map, the effort will pay off and you'll be able to enjoy listening to the trunked system and control which groups you listen to.

Drop Me A Line

I'd like to know what you're hearing and what luck—or otherwise—you're having with trunked systems in your area. As usual, you can write to me at Ken Reiss, 9051 Watson Rd. #309, St. Louis, MO 63126 or e-mail me at radioken@earthlink.net. ■

V.I.P. SPOTLIGHT

Our February Winner: Walter Schivo, KB6BKN, of Novato, California!

Walter Schivo, KB6BKN, of Novato, California in his natural habitat—with lots of classic radios! Walter has appeared in 33 movies, six TV series and national commercials. He has also filmed 26 two-hour underground music performances.

Pop'Comm reader Walter Schivo of California tells us,

It warms my heart to see some QSLs in *Pop'Comm* that I've sent in from the past. One was from Radio Denmark; a QSL card I had received from a report I sent on August 17, 1957—yes, long ago, but I remember I was little and had a Hallicrafters S38B. I have just received a Hallicrafters SX43 at Christmas. We were living at my parent's summer house in Forest Knolls, California. I was able to put up a multi-wire antenna with spacers I made with wooden dowels covered in candle wax. The wire was from a 300-foot roll costing a dollar, and fed with 300-ohm twin lead.

About that time I would listen to a ham operator, W6ZUB, who was the fire lookout warden on Mount Barnabe, the second highest peak in Marin County. It was on 1995 AM in the 160 meter band. One day I walked up and met him and this sparked my interest in amateur radio. This was put on hold through college and the military. Later, still having receivers, I was interested in shortwave and amateur radio and obtained my license which I have had for many years.

I enjoy the AM mode of operation and have many classic radios I have restored. I also enjoy 160 and 10-meter AM. My son is also a ham and we have a QTH up on the mountains at 4000 feet and have worked many stations around the world from this prime location. If you visit qrz.com and my callsign you will see one section of the AM station here in my studio. If you check my son's call, KD6GCG, you will see the station up at the mountain location. ■

Popular Communications invites you to submit, in about 300 words, how you got started in the communications hobby. Entries should be typewritten, or otherwise easily readable. If possible, your photo should be included.

Each month, we'll select one entry and publish it here. All submissions become the property of *Popular Communications*, and none will be acknowledged or returned. Entries will be selected taking into consideration the story they relate, and if it is especially interesting, unusual or even humorous. We reserve the right to edit all submitted material for length, grammar, and style.

The person whose entry is selected will receive a one-year gift subscription (or one-year subscription extension) to *Popular Communications*. Address all entries to: "V.I.P. Spotlight," *Popular Communications*, 25 Newbridge Road, Hicksville, NY 11801 or e-mail your entry to popularcom@aol.com

by Bruce A. Conti, BAConti@aol.com

Low-Power FM And Microbroadcasting: The Latest News Will Surprise You!

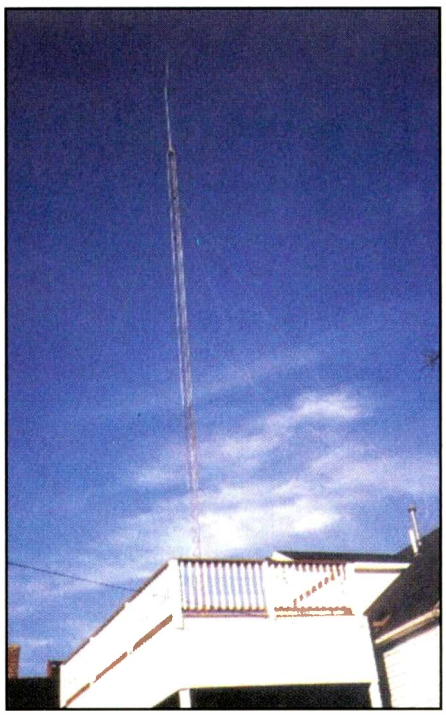
Have you heard the news? Community service is alive and well on the radio. There's a revolution in public broadcasting going on right now across the dial. Small low-power radio stations are carrying the news of your community and serving the public with programming not found among the big guns, thanks to a relatively new low-power FM service created by the FCC. Meanwhile, alternative broadcasters in big cities are bypassing the FCC in order to serve their local communities. Welcome to the exciting world of low-power radio.

Low-Power FM

A low-power FM (LPFM) broadcast service in the United States was created partially in response to criticism of FCC deregulation that relaxed radio station ownership rules that, by most accounts, diluted local community service across the dial. The service also eliminates many of the construction and operating expenses of a standard broadcast station, which, at greater than 100 watts, are considered prohibitive for a small non-commercial operation, although start-up costs are still in the $10,000 range.

Initially it was proposed that LPFM broadcast stations be allowed on second adjacent frequencies or "channels" of existing broadcast stations. However the proposal was short-circuited by existing "full service" broadcasters concerned about increased interference. The final FCC ruling limited LPFM to within the *third* adjacent channel, significantly watering down the effectiveness of the service in urban areas where the FM broadcast band is too crowded to accept any new radio stations.

There have been petitions for restoring the original parameters for the service, but for now LPFM broadcasting remains limited to third adjacent channel protection standards, although expansion or strengthening of the service is under consideration by the FCC, at least in terms of protecting LPFM stations already on the air, while also extending



The 1570 WKNM Lowell antenna. (File photo by Ron Gitschier)

the length of construction permits for those in the process of getting there.

Under the current proposal being considered, low-power operation would be allowed to continue in cases where interference is predicted to occur within the 70-dBu contour of a subsequently authorized second or third adjacent full-service FM station. Otherwise, LPFM stations must protect broadcast stations on the same channel, as well as the first, second, and third adjacent. Yet *LPFM stations* are not protected from interference by other classes of FM stations. Despite the limitations, LPFM has flourished in some areas, with over 600 stations on the air across the United States, perhaps a clear indication of the need for community radio services.

LPFM stations are authorized for non-commercial educational broadcast purposes only, including non-profit community groups, public schools and private universities, government public safety, and transportation organizations. Operation is with an effective radiated

Sign outside the 1570 WKNM studio. (File photo by Ron Gitschier)

power (ERP) of 100 watts or as little as 10 watts, essentially dividing the service into two classes, LP10 and LP100.

The maximum output is defined as 100 watts ERP at 100 feet antenna height above average terrain, providing a service range of approximately 3.5 miles radius. The FCC strongly advises that a construction permit or license be obtained before an LPFM station is constructed or operated, and warns of scams involving the purchase of equipment prior to being issued a license.

An LPFM license is issued free of charge. However the FCC is not accepting new applications at this time, while "mutually exclusive" disputes from earlier application windows are still being resolved. Where one application does not meet the spacing requirements to another application, such applications are mutually exclusive in that both applications cannot be granted if interference is to be avoided, and therefore are being evaluated on a case by case basis. In some cases a license might be shared between conflicting applicants. To keep up with the latest regulatory news visit www.fcc.gov/mb/audio/lpfm/index.html, the FCC webpage dedicated to the LPFM service.

Unlike Anything On Commercial Radio

Expect the unexpected when you tune in to an LPFM radio station. While some might broadcast a community calendar of

events, town meetings, and various public affairs programs similar to what might be found on a cable television community access channel, others are providing diverse cultural and ethnic entertainment unlike anything on commercial radio. *Popular Communications* reader Eldon Luoma suggests some favorites:

"94.7 KPIE-LP Dallas, Oregon, is a good example of a community hobby LPFM station started by a retired broadcast engineer. The KPIE-LP website at www.kpie.org is worth a visit to learn more about low power FM from the experiences of Oregon's first low-power FM station. You might also check out 106.7 WEAK-LP Athens, Ohio, owned by Hobby Radio Inc., and 95.5 WOOO-LP Defiance, Ohio, operated by Fort Defiance Youth Radio, Inc. Another unique LPFM station is 97.1 WSAP-LP Dane, Wisconsin, near Madison, owned by the Polka Appreciation Society and featuring polka music programs."

Another station worth a listen is 93.3 WFBO-LP Flagler Beach, Florida, where "Broadcast Technology" contributor Ron Gitschier has been on the air playing the oldies. "The webstream is available via www.theblizzard.us," says Ron. "We play about 3800-plus selections in our daily rotation." For a list of stations to try listening in on, check out "Licensed LPFM Radio Stations."

Unlicensed Radio Stations

Despite an explosion of LPFM radio stations on the air and under construction, as mentioned earlier, the largest urban areas across the United States are not included by default. Because

1620 Radio Energy, Boston.

the FM broadcast band is already too congested in many cities, there's simply no room for LPFM under the present third adjacent channel protection standards. As a result, some communities have turned to unlicensed "microbroadcast" operations, as allowed according to Part 15 of the FCC rules.

The service range of AM and FM Part 15 transmitters should be no more than 200 feet, typically with a maximum power of 100 milliwatts or 1/10 of a watt. Violation of the rules may result in a maximum $75,000 fine and confiscation of equipment. While some might be illegally operating beyond Part 15 limits, unlike "pirate" broadcasters on shortwave, many of these unlicensed broadcasters justify the risk in believing that they fulfill a need for information, cultural, and ethnic programming in local communities that are otherwise underserved and largely ignored by licensed full-service radio stations. Perhaps nowhere is this more evident than in the Boston, Massachusetts metro area, where a high level of unlicensed broadcast activity exists.

Following are the results of monitoring and a follow-up Internet search for low-power and unlicensed AM/FM broadcasts on the air in the greater Boston area. Note the dominance of radio stations serving the Haitian community. Many of these

Licensed LPFM Radio Stations

WESZ-LP	Abbeville AL	98.7	KRMN-LP	Mena AR	101.1	KCIG-LP	Craig CO	99.7
WGHE-LP	Athens AL	97.9	KQIX-LP	Perryville AR	96.5	KDEA-LP	Delta CO	99.1
WACM-LP	Auburn AL	94.3	KTPV-LP	Prairie Grove AR	96.9	KMZG-LP	Durango CO	96.1
WAUF-LP	Auburn AL	94.3	KDUA-LP	Rogers AR	96.5	KEAE-LP	Eagle CO	107.9
WWFC-LP	Bryant AL	99.9	KHEL-LP	Rogers AR	97.3	KREV-LP	Estes Park CO	104.7
WJWC-LP	Gallion AL	101.9	KSSQ-LP	Siloam Springs AR	102.3	KGJN-LP	Grand Junction CO	106.7
WFBH-LP	Hamilton AL	103.5	KIHW-LP	West Helena AR	97.7	KELS-LP	Greeley CO	104.7
WJSD-LP	Henagar AL	94.5	KMAI-LP	Alturas CA	97.9	KGUS-LP	Gunnison CO	99.1
WKOC-LP	Ider AL	103.1	KCHP-LP	Arcata CA	97.1	KYGT-LP	Idaho Springs CO	102.7
WQJJ-LP	Jasper AL	97.7	KWBB-LP	Big Bear Lake CA	105.5	KRLG-LP	Kremmling CO	107.9
WRNK-LP	Lanett AL	96.3	KMOB-LP	Clearlake CA	100.3	KLEV-LP	Leadville CO	107.9
WVMB-LP	Madison AL	107.9	KGIC-LP	Corona CA	105.5	KMTE-LP	Montrose CO	99.1
WALW-LP	Moulton AL	98.3	KDRT-LP	Davis CA	101.5	KURA-LP	Ouray CO	98.9
WPMR-LP	Russellville AL	95.7	KDPT-LP	Dos Palos CA	102.9	KSBP-LP	Parachute CO	101.1
KDHS-LP	Delta Junction AK	95.5	KFCA-LP	Fresno CA	104.5	KPCT-LP	Parachute CO	106.7
KEAA-LP	Eagle AK	97.9	KFOK-LP	Georgetown CA	95.1	KTPJ-LP	Pueblo CO	103.5
KXES-LP	Galena AK	92.9	KFXM-LP	Lancaster CA	96.7	KHEN-LP	Salida CO	106.9
KBJZ-LP	Juneau AK	94.1	KGAR-LP	Lemoore CA	93.3	KSJC-LP	Silverton CO	92.5
KAMP-LP	St. Michael AK	92.9	KSTG-LP	Lodi CA	101.5	KWMV-LP	Westcliffe CO	95.9
KAQU-LP	Sitka AK	88.1	KPFZ-LP	Lucerne CA	104.5	WWBW-LP	Higganum CT	96.9
KULA-LP	Ili'Ili AS	95.1	KWVS-LP	Malibu CA	101.5	WCSE-LP	Ledyard CT	100.1
KBWV-LP	Bacavi AZ	101.5	KGDM-LP	Merced CA	105.5	WRBG-LP	Millsboro DE	107.9
KBRP-LP	Bisbee AZ	96.1	KMSJ-LP	Mt. Shasta CA	94.1	WAPQ-LP	Avon Park FL	95.9
KCWG-LP	Crown King AZ	100.3	KRBS-LP	Oroville CA	107.1	WWMA-LP	Avon Park FL	107.9
KWPS-LP	Ehrenberg AZ	95.7	KRBH-LP	Red Bluff CA	107.7	WGGP-LP	Big Pine Key FL	106.7
KJBE-LP	Lakeside AZ	100.5	KDEE-LP	Sacramento CA	97.7	WKJO-LP	Brooksville FL	102.7
KPUP-LP	Patagonia AZ	100.5	KSHC-LP	St. Helena CA	106.5	WSVB-LP	Chiefland FL	95.1
KRIM-LP	Payson AZ	96.3	KQRP-LP	Salida CA	106.1	WFJV-LP	Citronelle FL	103.3
KCMA-LP	Payson AZ	98.5	KRDW-LP	Smith River CA	107.3	WFLP-LP	Collier County FL	98.7
KPYT-LP	Tucson AZ	100.3	KEFC-LP	Turlock CA	100.5	WXEI-LP	Crestview FL	95.3
KSWH-LP	Arkadelphia AR	99.9	KWLK-LP	Valley Springs CA	103.7	WCKO-LP	Cross City FL	96.7
KCCJ-LP	Batesville AR	102.3	KCVE-LP	Ventura CA	92.3	WZPH-LP	Dade City FL	96.7
KUOZ-LP	Clarksville AR	100.5	KWMI-LP	Weimar CA	104.1	WIKD-LP	Daytona Beach FL	99.1
KHBR-LP	Decatur AR	96.7	KYLO-LP	Woodland CA	93.3	WWEO-LP	De Funiak Springs FL	103.9
KOZR-LP	Gentry AR	102.9	KASP-LP	Aspen CO	107.9	WRLE-LP	Dunnellon FL	94.9
KPJN-LP	Marshall AR	101.1	KBDL-LP	Carbondale CO	107.9	WLGM-LP	Edgewater FL	95.3

Licensed LPFM Radio Stations

WFBO-LP	Flagler Beach FL	93.3	WTND-LP	Macomb IL	106.3	WCCR-LP	Williamsburg KY	94.5
WPZM-LP	Gainesville FL	107.7	WPDQ-LP	Mt. Carmel IL	93.9	WNLW-LP	Williamsburg KY	95.1
WFBB-LP	Glen St. Mary FL	100.3	WWKJ-LP	Peoria IL	102.9	WYAH-LP	Winchester KY	93.7
WFBU-LP	Graceville FL	94.7	WQIN-LP	Quincy IL	102.9	KCJM-LP	Alexandria LA	107.9
WJIX-LP	Homosassa FL	103.1	WQJC-LP	Quincy IL	107.9	KURC-LP	Bastrop LA	95.7
WCIW-LP	Immokalee FL	107.9	WHJG-LP	Rockford IL	93.3	WTQT-LP	Baton Rouge LA	94.9
WJIK-LP	Inverness FL	100.1	WTPB-LP	Rockford IL	99.3	KVTZ-LP	Breaux Bridge LA	92.9
WJTW-LP	Jupiter FL	100.3	WGVV-LP	Rock Island IL	92.5	WZEN-LP	Hammond LA	107.9
WORZ-LP	Key Largo FL	104.3	WPKC-LP	West Frankfort IL	95.5	KQWJ-LP	Jonesboro LA	95.5
WUCR-LP	Lake Butler FL	107.9	WYIR-LP	Baugh City IN	96.9	KZJM-LP	Lafayette LA	92.7
WMJB-LP	Lake City FL	107.7	WHUM-LP	Columbus IN	98.5	KELB-LP	Lake Charles LA	100.5
WMLO-LP	Live Oak FL	97.1	WVRG-LP	Crawfordsville IN	93.9	KEPT-LP	Mansfield LA	106.1
WIMR-LP	McIntosh FL	96.5	WLFQ-LP	Elkhart IN	98.7	KCRJ-LP	Monroe LA	94.9
WGRZ-LP	Melbourne FL	93.1	WCFY-LP	Evansville IN	102.7	KOUS-LP	Monroe LA	96.3
WFHA-LP	Melbourne FL	94.1	WLDC-LP	Goshen IN	105.9	KOCZ-LP	Opelousas LA	103.7
WCPL-LP	Merritt Island FL	95.5	WQHU-LP	Huntington IN	105.5	KZLC-LP	Pineville LA	95.5
WBFT-LP	Micco FL	105.5	WJJD-LP	Kokomo IN	101.3	KQAR-LP	Shreveport LA	107.1
WFLU-LP	Miles City FL	107.9	WTGO-LP	Lafayette IN	97.7	WGON-LP	Slidell LA	103.7
WPCU-LP	Panama City FL	106.9	WNRL-LP	Ligonier IN	105.9	WJZP-LP	Portland ME	105.1
WGBW-LP	Port Saint Joe FL	88.5	WCWC-LP	Marion IN	94.3	WRFR-LP	Rockland ME	93.3
WSLR-LP	Sarasota FL	96.5	WJPB-LP	Muncie IN	99.1	WJZF-LP	Standish ME	97.1
WTHA-LP	Seaside FL	107.1	WHHC-LP	New Castle IN	107.5	WEES-LP	Ocean City MD	107.9
WCTA-LP	Southport FL	107.1	WOCU-LP	Oakland City IN	94.1	WMVK-LP	Perryville MD	107.3
WJRN-LP	Summerfield FL	95.9	WJUK-LP	Plymouth IN	105.7	WMJS-LP	Prince Frederick MD	102.1
WZRO-LP	Suwannee FL	93.1	WSBL-LP	South Bend IN	98.1	WXSU-LP	Salisbury MD	96.3
WHTR-LP	Wakulla County FL	96.9	WITW-LP	Valparaiso IN	93.5	WRYR-LP	Sherwood MD	97.5
WASU-LP	Albany GA	92.7	WVLP-LP	Valparaiso IN	98.3	WNRC-LP	Dudley MA	97.5
WSRD-LP	Albany GA	93.1	WIOE-LP	Warsaw IN	98.3	WXLJ-LP	East Harwich MA	97.7
WJTR-LP	Ashburn GA	102.7	WWCC-LP	West Lafayette IN	97.3	WBCR-LP	Great Barrington MA	97.7
WPPP-LP	Athens GA	100.7	KDDI-LP	Adair IA	102.9	WKGT-LP	North Adams MA	98.9
WDRW-LP	Athens GA	107.9	KCDM-LP	Burlington IA	98.3	WXOJ-LP	Northampton MA	103.3
WHLE-LP	Atlanta GA	106.3	KYMJ-LP	Carroll IA	103.1	WRRS-LP	Pittsfield MA	104.3
WRMK-LP	Augusta GA	100.3	KULT-LP	Cedar Falls IA	94.5	WFPM-LP	Battle Creek MI	99.5
WAAK-LP	Boynton GA	94.7	KQOP-LP	Charles City IA	94.7	WVBH-LP	Benton Harbor MI	105.3
WBFC-LP	Boynton GA	103.7	KXJX-LP	Clinton IA	92.5	WSFT-LP	Berrien Springs MI	96.3
WBHS-LP	Brunswick GA	106.7	KOUR-LP	Coralville IA	92.7	WLWZ-LP	Cassopolis MI	97.1
WLOJ-LP	Calhoun GA	102.9	KTJT-LP	Davenport IA	102.7	WGLN-LP	Cedar Lake MI	93.5
WPCG-LP	Canton GA	107.9	KRQC-LP	Davenport IA	107.9	WDLP-LP	Fenwick MI	92.9
WGGR-LP	Carrollton GA	95.3	KSDE-LP	De Soto IA	104.9	WKUF-LP	Flint MI	94.3
WHLB-LP	Cartersville GA	104.9	KGYS-LP	Dewitt IA	92.5	WEEH-LP	Hart MI	100.5
WBUE-LP	Columbus GA	96.1	KEMB-LP	Emmetsburg IA	94.1	WMLY-LP	Marshall MI	93.1
WZHB-LP	Douglasville GA	106.3	KDME-LP	Fort Madison IA	99.9	WQOS-LP	Mount Pleasant MI	98.9
WLVN-LP	Fort Valley GA	97.1	KCRM-LP	Marshalltown IA	96.7	WUVS-LP	Muskegon MI	103.7
WFVS-LP	Fort Valley GA	104.3	KTDC-LP	Muscatine IA	105.3	WMMT-LP	Muskegon MI	106.1
WFNG-LP	Frogtown GA	100.5	KPBC-LP	Pleasantville IA	94.1	WMBC-LP	Norton Shores MI	100.9
WRMH-LP	LaGrange GA	98.9	KWFF-LP	Pocahontas IA	95.3	WRDS-LP	Roscommon MI	104.3
WAQA-LP	Morganton GA	94.5	KSOA-LP	Sloan IA	94.5	WBSQ-LP	St. Louis MI	105.9
WWEZ-LP	St. Simons Island GA	94.7	KUBH-LP	Urbana Garage IA	99.9	WMLZ-LP	Temperance MI	107.9
WBLY-LP	Sycamore GA	101.5	KBOL-LP	Waterloo IA	100.1	WAWB-LP	West Branch MI	107.3
WCRU-LP	Thomaston GA	97.1	KCCA-LP	Anthony KS	92.1	WUSG-LP	Cambridge MN	88.7
WJGG-LP	Thomasville GA	98.1	KFEX-LP	Chanute KS	97.7	WYSG-LP	Hinckley MN	96.3
WSDA-LP	Trenton GA	98.7	KVPC-LP	Dodge City KS	100.5	KKRM-LP	Montevideo MN	96.7
KJHI-LP	Honokaa HI	107.3	KODC-LP	Dodge City KS	102.1	KXBQ-LP	Moorhead MN	95.9
KIOM-LP	Kaunakakai HI	98.9	KCCC-LP	Hays KS	98.5	WMLA-LP	Moose Lake MN	99.7
KLUI-LP	Kula HI	97.3	KCIU-LP	Lawrence KS	103.7	KGLH-LP	Spicer MN	96.9
KEAO-LP	Wailuku HI	91.5	KRMI-LP	Manhattan KS	105.5	WQRZ-LP	Bay St. Louis MS	103.5
KMEI-LP	Kamiah ID	97.3	KSMK-LP	St. Marys KS	98.3	WWCV-LP	Canton MS	100.5
KPLL-LP	Lewiston ID	94.9	KTHA-LP	Thayer KS	100.5	WQTP-LP	Columbus MS	106.9
KRFP-LP	Moscow ID	92.5	WITB-LP	Benton KY	107.1	WTRR-LP	Glen MS	97.1
KUMC-LP	Rupert ID	93.3	WBLG-LP	Bowling Green KY	107.9	WIXP-LP	Greenville MS	106.7
KAGF-LP	Twin Falls ID	105.5	WRHR-LP	Corbin KY	95.3	WQID-LP	Hattiesburg MS	105.3
WFEL-LP	Antioch IL	99.9	WJJA-LP	East Berstadt KY	98.5	WGWT-LP	Houston MS	103.7
WEWT-LP	Bloomington IL	103.3	WRVG-LP	Georgetown KY	93.7	WLEZ-LP	Jackson MS	103.7
WJHP-LP	Carmi IL	103.3	WYZQ-LP	Hazard KY	106.1	WNNN-LP	Noxapater MS	96.7
WJAF-LP	Centralia IL	103.7	WSPP-LP	Hopkinsville KY	93.5	WPWS-LP	Piney Woods MS	104.3
WLMM-LP	Channahon IL	103.9	WPJI-LP	Hopkinsville KY	94.5	WKIU-LP	Tupelo MS	94.9
WLBM-LP	Danville IL	105.7	WKYD-LP	Jamestown KY	95.5	KCSW-LP	Canton MS	97.1
WCFS-LP	Du Quoin IL	105.9	WXYR-LP	Monticello KY	104.5	KDMC-LP	Cape Girardeau MO	103.7
WJHV-LP	Fairbury IL	95.1	WFBR-LP	Mt. Washington KY	93.9	KSDC-LP	Centralia MO	94.9
WVCL-LP	Galesburg IL	95.7	WIMM-LP	Owensboro KY	107.7	KWWU-LP	Fulton MO	94.9
WGRG-LP	Geneseo IL	100.5	WRHX-LP	Richwood KY	107.9	KRFL-LP	Fulton MO	97.5
WLGS-LP	Lake Villa IL	101.5	WZFR-LP	Walton KY	97.7	KHBL-LP	Hannibal MO	96.9

Licensed LPFM Radio Stations

KZLX-LP	Maryville MO	106.7	WAPP-LP	Westhampton NY	100.3	KWPB-LP	Newport OR	98.7
KYHO-LP	Poplar Bluff MO	106.9	WRES-LP	Asheville NC	100.7	KPAI-LP	Paisley OR	103.1
KJTR-LP	Rolla MO	101.7	WPVM-LP	Asheville NC	103.5	KCUW-LP	Pendleton OR	101.1
KLHM-LP	St. Joseph MO	100.7	WBYJ-LP	Burlington NC	97.9	KLLF-LP	Roseburg OR	106.7
KQPW-LP	West Quincy MO	102.5	WCOM-LP	Chapel Hill NC	103.5	KPIK-LP	Stayton OR	102.9
KBAS-LP	Basin MT	98.3	WDJD-LP	Elizabethtown NC	93.7	WMES-LP	Altoona PA	107.7
KEME-LP	Boulder MT	106.3	WFWC-LP	Fremont NC	99.3	WFBM-LP	Beaver Springs PA	100.1
KOFK-LP	Bozeman MT	98.3	WLRZ-LP	Hickory NC	99.3	WBBY-LP	Berwick PA	100.3
KMEA-LP	Bozeman MT	107.7	WHCR-LP	Hobgood NC	105.3	WWJL-LP	Brookville PA	95.9
KBWG-LP	Browning MT	107.5	WSEQ-LP	Hudson NC	92.9	WXCS-LP	Cambridge Springs PA	92.9
KQOV-LP	Butte MT	98.5	WSER-LP	Lenoir NC	100.1	WRZO-LP	Chambersburg PA	102.9
KEAC-LP	Cardwell MT	106.1	WJOF-LP	Liberty NC	97.9	WLRI-LP	Gap PA	92.9
KEAJ-LP	Cell Site MT	100.3	WWGT-LP	Lincolnton NC	100.9	WFSJ-LP	Indiana PA	103.7
KCTQ-LP	Charlo MT	103.3	WPTP-LP	Marble NC	95.1	WMUG-LP	Indiana PA	105.1
KCTD-LP	Dixon MT	104.7	WHGW-LP	Morganton NC	100.3	WKCV-LP	La Plume PA	103.5
KWEP-LP	Elk Park MT	103.7	WFOG-LP	Mt. Airy NC	101.3	WOMA-LP	Lebanon PA	93.1
KCTM-LP	Elmo MT	93.7	WZNC-LP	Roanoke Rapids NC	95.9	WCSD-LP	Shawnee-on-Delaware PA	104.9
KEUR-LP	Eureka MT	107.7	WDSG-LP	Sanford NC	107.9			
KCTJ-LP	Finely Point MT	107.1	WVEM-LP	Stanley NC	100.5	WCTD-LP	Ashaway RI	96.9
KRWS-LP	Harden MT	100.7	WEOM-LP	Thomasville NC	103.1	WXHQ-LP	Newport RI	105.9
KNEH-LP	Helena MT	97.3	WEHB-LP	Wadesboro NC	98.3	WASD-LP	Aiken SC	101.9
KHFG-LP	Helena MT	101.9	WBPL-LP	Wilmington NC	92.7	WPCX-LP	Clinton SC	97.1
KXZI-LP	Kalispell MT	101.9	WFEC-LP	Winston Salem NC	103.1	WXRY-LP	Columbia SC	99.3
KANB-LP	Kalispell MT	102.3	KLBE-LP	Bismarck ND	100.7	WLRE-LP	Elloree SC	105.5
KJRZ-LP	Libby MT	105.3	KOWW-LP	Burlington ND	98.1	WGEO-LP	Georgetown SC	105.7
KCTB-LP	Lonepine MT	94.1	KPAR-LP	Dickinson ND	103.3	WWOK-LP	Greenville SC	95.3
KWLG-LP	Montana City MT	106.3	KNDS-LP	Fargo ND	105.9	WPLS-LP	Greenville SC	95.9
KCTP-LP	Pablo MT	106.7	WEAK-LP	Athens OH	106.7	WHZK-LP	Greenwood SC	97.7
KWHP-LP	Plains MT	104.5	WVVW-LP	Belpre OH	98.1	WHEZ-LP	Hartsville SC	95.3
KMDM-LP	Polson MT	107.9	WBWH-LP	Bluffton OH	99.3	WIAR-LP	Hilton Head Island SC	100.5
KTGC-LP	St. Regis MT	101.3	WKJH-LP	Bryan OH	103.5	WZKQ-LP	Hodges SC	105.3
KDGZ-LP	Townsend MT	98.3	WOOO-LP	Defiance OH	95.5	WVOY-LP	Jefferson SC	98.9
KCTG-LP	Turtle Lake MT	98.1	WYCF-LP	Defiance OH	104.1	WYLI-LP	Lake Wylie SC	93.7
KESW-LP	Whitehall MT	106.5	WINF-LP	Delaware OH	101.9	WGNH-LP	Lexington SC	107.7
KIVE-LP	Aurora NE	92.5	WPCO-LP	Fremont OH	105.7	WSCM-LP	Moncks Corner SC	100.1
KAWA-LP	Callaway NE	102.7	WJHE-LP	Heath OH	98.7	WWPZ-LP	Newberry SC	95.9
KAVS-LP	Fallon NV	93.9	WCBV-LP	Lima OH	105.9	WNMI-LP	N. Myrtle Beach SC	98.7
KPOT-LP	Jackpot NV	93.9	WWTL-LP	Logan OH	106.7	WRHJ-LP	Rock Hill SC	93.1
KKTT-LP	Winnemucca NV	97.9	WCYC-LP	London OH	105.1	WSHG-LP	St. George SC	105.9
WJSK-LP	Bartlett NH	101.1	WZLP-LP	Loudonville OH	95.7	WYCJ-LP	Simpsonville SC	104.5
WCNH-LP	Concord NH	94.7	WNCG-LP	Mansfield OH	95.7	WHRZ-LP	Spartanburg SC	104.1
WXGR-LP	Dover NH	101.5	WVVP-LP	Marietta OH	96.1	WNGR-LP	Tigerville SC	95.5
WFCB-LP	Dublin NH	100.3	WWOH-LP	Marietta OH	104.5	KPGN-LP	Pierre SD	104.7
WXND-LP	Etna NH	107.3	WTPS-LP	Napoleon OH	94.1	WKPJ-LP	Athens TN	104.5
WKHP-LP	Keene NH	94.9	WLCI-LP	Nelsonville OH	97.5	WYMA-LP	Calhoun TN	97.9
WLLO-LP	Londonderry NH	102.9	WJFY-LP	Newark OH	104.3	WOOP-LP	Cleveland TN	99.9
WSCA-LP	Portsmouth NH	106.1	WNHS-LP	Newcomerstown OH	105.7	WVOO-LP	Columbia TN	107.1
WFPC-LP	Rindge NH	105.3	WHRR-LP	Portsmouth OH	96.1	WJNU-LP	Cookeville TN	96.9
WUPC-LP	Arrowhead Village NJ	102.3	WRPO-LP	Russells Point OH	93.5	WLTD-LP	Dickson TN	100.7
WZFI-LP	Bridgeton NJ	98.5	WAJB-LP	Wellston OH	92.5	WUCP-LP	Farragut TN	106.1
WMDI-LP	Lakewood NJ	107.9	WUHS-LP	West Union OH	96.9	WENV-LP	Gainesboro TN	97.3
WLOM-LP	Ocean City NJ	92.7	WJFZ-LP	Zanesville OH	104.1	WSAB-LP	Jamestown TN	92.5
KLDK-LP	Dixon NM	96.5	KADB-LP	Ada OK	96.7	WJCR-LP	Jasper TN	94.9
KROZ-LP	Hobbs NM	105.9	KXBI-LP	Bartlesville OK	101.9	WLNT-LP	Loudon TN	96.1
KCMG-LP	Lovington NM	100.1	KLGB-LP	Enid OK	94.3	WLHR-LP	Maryville TN	105.9
KEDU-LP	Ruidoso NM	102.3	KEIF-LP	Enid OK	104.7	WSOJ-LP	McMinnville TN	102.5
WNAR-LP	Arcade NY	100.3	KJRM-LP	McAlester OK	93.3	WTAZ-LP	New Tazewell TN	98.3
WSVV-LP	Center Moriches NY	100.9	KSEP-LP	Brookings OR	99.9	WYTY-LP	Ooltewah TN	99.7
WDRX-LP	Cortland NY	100.7	KBWR-LP	Burns OR	98.1	WMTN-LP	Sewanee TN	94.1
WELV-LP	Ellenville NY	107.9	KPOL-LP	Canyonville OR	106.9	WSPE-LP	Spencer TN	93.1
WSAC-LP	Geneva NY	105.7	KBCC-LP	Cave Junction OR	107.9	WTRL-LP	Vonore TN	106.9
WBLN-LP	Glens Falls NY	104.9	KLYF-LP	Coquille OR	100.7	KVVO-LP	Abilene TX	94.1
WOGM-LP	Jamestown NY	105.9	KPIE-LP	Dallas OR	94.7	KDLP-LP	Ace TX	104.7
WRFA-LP	Jamestown NY	107.9	KUMP-LP	Days Creek OR	107.9	KDSH-LP	Borger TX	105.1
WKHV-LP	Kingston NY	103.9	KFSL-LP	Fossil OR	99.5	KYRE-LP	Breckenridge TX	92.7
WNYL-LP	Lima NY	104.9	KITC-LP	Gilchrist OR	106.5	KQLC-LP	Brookshire TX	107.9
WKEG-LP	Limestone NY	104.7	KLBG-LP	Glide OR	92.3	KHIA-LP	Brundage TX	97.7
WMUD-LP	Moriah NY	89.3	KHRB-LP	Harrisburg OR	92.3	KJEM-LP	Centerville TX	98.1
WKUY-LP	Newport NY	105.9	KZAS-LP	Hood River OR	95.1	KZQX-LP	Chalk Hill TX	104.7
WJIH-LP	Oneonta NY	95.9	KHJA-LP	Madras OR	102.1	KCER-LP	Cisco TX	105.9
WUOW-LP	Oneonta NY	104.7	KKJC-LP	McMinnville OR	96.3	KORG-LP	Cleveland TX	105.3
WLIX-LP	Ridge NY	94.7	KRAD-LP	Millersburg OR	94.9	KWSK-LP	Daingerfield TX	92.7
WNYP-LP	Ripley NY	98.7	KSHY-LP	Newport OR	94.3	KXPW-LP	Georgetown TX	106.7

Licensed LPFM Radio Stations

KYLP-LP	Greenville TX	101.5	WJPL-LP	Barre VT	92.1	WDTF-LP	Berkeley Springs WV	107.9
KQAT-LP	Hallsville TX	104.9	WOOL-LP	Bellows Falls VT	100.1	WYAP-LP	Clay WV	101.7
KPIA-LP	Huntsville TX	102.5	WDER-LP	Derby VT	98.3	WQAZ-LP	Edmond WV	98.5
KXZX-LP	Juilliard TX	106.5	WEVT-LP	Enosburg Falls VT	98.1	WBWG-LP	Fairmont WV	99.1
KERC-LP	Kermit TX	93.7	WYTC-LP	Hyde Park VT	89.1	WGAG-LP	Princeton WV	93.1
KCYR-LP	Kerrville TX	101.5	WJSY-LP	Newport VT	96.1	WHMG-LP	Purgitsville WV	98.7
KWSP-LP	Kerrville TX	104.9	WRAN-LP	Randolph VT	100.1	WVBL-LP	Salem WV	99.9
KJHV-LP	Killeen TX	96.3	WMRW-LP	Warren VT	95.1	WYRC-LP	Spencer WV	92.3
KHSP-LP	Killeen TX	104.5	WTJC-LP	Charlotte Amalie VI	96.9	WMCC-LP	Spencer WV	105.7
KDOL-LP	Livingston TX	96.1	WKJV-LP	Bristol VA	100.5	WJLM-LP	Altoona WI	96.9
KLFK-LP	Lufkin TX	104.1	WXRE-LP	Danville VA	97.9	WPCA-LP	Amery WI	95.7
KFGG-LP	Marble Falls TX	101.9	WLMP-LP	Fredericksburg VA	99.9	WDTS-LP	Appleton WI	101.9
KACD-LP	Midland TX	94.1	WWZE-LP	Hillsville VA	101.1	WRNC-LP	Ashland WI	97.7
KNOB-LP	Mineral Wells TX	99.9	WHCK-LP	Hopewell VA	107.7	WPGR-LP	Clear Lake WI	105.7
KJUK-LP	Mount Pleasant TX	92.3	WRMV-LP	Madison Heights VA	94.5	WCWL-LP	Clearwater Lake WI	103.5
KXDX-LP	Mount Pleasant TX	95.7	WRIR-LP	Richmond VA	97.3	WSAP-LP	Dane, WI	97.1
KLNA-LP	Pittsburg TX	100.5	WRKE-LP	Salem VA	100.3	WHYS-LP	Eau Claire WI	96.3
KOLF-LP	Plainview TX	100.7	WCCA-LP	Scottsville VA	93.5	WRFP-LP	Eau Claire WI	101.9
KSAP-LP	Port Arthur TX	107.1	WSUV-LP	Susan VA	102.3	WLCJ-LP	Marinette WI	92.5
KCSA-LP	San Angelo TX	95.7	WJRX-LP	Williamsburg VA	102.5	WLWR-LP	Marinette WI	107.7
KCCP-LP	S. Padre Island TX	102.3	KAHS-LP	Aberdeen WA	106.5	WRJF-LP	Menomonie WI	101.7
KTRL-LP	Stephenville TX	100.7	KCHW-LP	Chewelah WA	97.3	WDYD-LP	Merrill WI	100.9
KVVT-LP	Sulphur Springs TX	94.9	KEIT-LP	Colville WA	100.7	KFGR-LP	Powell WY	105.3
KXVX-LP	Sulphur Springs TX	99.1	KWPA-LP	Coupeville WA	103.1	WRZC-LP	Red Cliff WI	92.3
KRYH-LP	Temple TX	104.7	KGRU-LP	Ellensburg WA	96.1	WWJP-LP	Rice Lake WI	101.7
KGOD-LP	Tenaha TX	94.1	KITR-LP	Kettle Falls WA	101.5	WGHF-LP	Superior WI	93.7
KWRA-LP	Waco TX	96.7	KOSW-LP	Ocean Shores WA	91.3	WLBI-LP	Tomahawk WI	107.1
KXZY-LP	Waco TX	100.7	KAYO-LP	Ocean Shores WA	100.1	KSLW-LP	Buffalo WY	99.5
KXVI-LP	Winfield TX	94.3	KOWA-LP	Olympia WA	106.5	KFCB-LP	Douglas WY	105.1
KLGU-LP	Logan UT	106.1	KXPB-LP	Pacific Beach WA	89.1	KCOV-LP	Gillette WY	99.1
KAAJ-LP	Monticello UT	103.5	KYRS-LP	Spokane WA	95.3	KJHB-LP	Jackson WY	97.7
KOEZ-LP	St. George UT	105.1	WVPP-LP	Beckley WV	97.9	KOCA-LP	Laramie WY	93.5
KWBR-LP	St. George UT	105.7	WVJW-LP	Benwood WV	94.1	KJHR-LP	Teton Village WY	100.1

Pop'Comm February 2006 Survey Questions

I typically do the following with my copy of Pop'Comm:

Read through it and keep it as a reference for a few days....1
Read through it and keep it only until I get the next issue....2
Keep it a month or so....3
Keep it less than a year....4
Keep it more than a year, but less than three years....5
Keep it indefinitely in a binder or box....6
Give it to a friend....7
Tear out an article or two and keep it for reference....8

Pop'Comm cover photos that attract my attention the most are (mark no more than three):

Military....9
Public safety; police and EMS....10
Firefighter or firefighting photos....11
Commercial aircraft in flight or runway....12
Military aircraft, including cockpit photos....13
Commercial station antennas....14
Commercial broadcast studios....15
Disaster photos....16
Space-related photos (Shuttle, etc.)....17
Those featuring a person in his or her monitoring shack....18

Pop'Comm's covers are:

Interesting and well done....19
Compare favorably with other radio publications including amateur publications....20
Not as eye-catching as other radio publications....21
Much better than other radio publications....22

I'd like to see more of this coverage in Pop'Comm: (mark all that are appropriate)

Military monitoring, VHF/UHF....23
Satellites....24
Cell phone and other portable electronics....25
CB....26
FRS....27
Antenna construction projects....28
Shortwave broadcasting....29
GMRS....30

My favorite THREE columns/writers are (please write titles/names on card)

Scan Our Web Site

FCC Callsign Changes

Pending

New Call	Location	Freq.	Old Call
KLHC	Bakersfield CA	1350	KBID
KDTD	Kansas City KS	1340	KCKN
WDYT	Kings Mountain NC	1220	WKMT
KTKX	Sand Springs OK	1340	KTFX
KYZZ	Salinas CA	97.9	KEXA
WYFZ	Belleview FL	91.3	WWKO
KPBT-TV	Odessa TX	36	KOCV-TV

Changes

New Call	Location	Freq.	Old Call
KQPN	West Memphis AR	730	KSUD
KKKK	Colorado Springs CO	1580	KWYD
KCEG	Pueblo CO	780	New
WRJE	Dover DE	1600	WKEN
WAYI	Bunnell FL	1550	New
WHBO	Dunedin FL	1470	WLVU
WPBI	North Palm Beach FL	960	WGGT
KVOG	Agana GU	1530	New
KBET	Pocatello ID	1440	KPTO
WTHQ	Brookport IL	750	WNTX
WSKT	Martinsville IN	1540	WMCB
WPPI	Sauk Rapids MN	1010	New
KZYM	Joplin MO	1230	KWAS
KJUL	Winchester NV	790	KBET
WJGK	Highland NY	1200	New
WGIV	Gastonia NC	1370	WLTC
WYJK	Connellsville PA	1340	WPNT
WBYN	Lehighton PA	1160	WYNS

New Call	Location	Freq.	Old Call
WEAF	Camden SC	1130	WQIS
WOLI	Spartanburg SC	910	WSPA
WQZQ	Clarksville TN	1550	WCTZ
WNSG	Nashville TN	880	WNVL
WNVL	Nashville TN	1240	WNSG
KHFX	Burleson TX	1460	KTFW
KJDL	Lubbock TX	1420	KLFB
KXTA	Centerville UT	1600	KRRD
WAVA	Arlington VA	780	WABS
WVAX	Charlottesville VA	1450	New
KTRW	Opportunity WA	630	KXLI
KTTO	Spokane WA	970	KTRW
KBBO-FM	Houston AK	92.1	KQEZ
KZNZ	Kasilof AK	106.9	New
KWPS-LP	Ehrenberg AZ	95.7	New
KQMR	Globe AZ	100.3	KMRR
KFPW-FM	Barling AR	94.5	KOLX
KQBK	Booneville AR	104.7	KRBK
KLSZ-FM	Fort Smith AR	100.7	KBBQ-FM
KJAT-LP	Sulphur Springs AR	97.3	New
KBBQ-FM	Van Buren AR	102.7	KLSZ-FM
KTKZ-FM	Dunnigan CA	105.5	KVMG
KFJK	Fresno CA	105.9	KKDG
KWDS	Kettleman City CA	89.9	New
KXTT	Maricopa CA	94.9	New
KPCA-LP	Petaluma CA	105.7	New
KQJK	Roseville CA	93.7	KHWD
KEAR-FM	Sacramento CA	88.1	KEDR
KSCF	San Diego CA	103.7	KPLN
KCNL	Sunnyvale CA	104.9	KMJO
KEAL	Taft CA	106.5	New

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530 Radio Planet Compas, Randolph—French Caribbean (www.planetcompas.com).
540 Radio Log, Dorchester—R&B/urban contemporary.
870 unidentified—Classical music days, French Caribbean zouk nights.
1570 WKNM Radio Commercial, Lowell—Off the air? Noted open carrier, driving by studio/xmtr site at 599 Central St.
1580 WRCB Radio Concorde, Mattapan—French Caribbean (www.radioconcorde.com).

FCC Callsign Changes

New Call	Location	Freq.	Old Call	New Call	Location	Freq.	Old Call
KUVC-LP	Ukiah CA	104.3	New	KTBT	Broken Arrow OK	92.1	KIZS
WMYZ	Clermont FL	88.7	WWKG	KIZS	Collinsville OK	101.5	KTBT
WGTT	Emeralda FL	91.5	New	KXOW	Eldorado OK	96.9	New
WQRD-LP	Gibsonton FL	96.5	New	KPPK	Rainier OR	98.3	KJNI
WFSD-LP	Tallahasse FL	107.9	New	KVRA	Sisters OR	89.3	New
WDRR	Martinez GA	93.9	WKDG	KCPB-FM	Warrenton OR	90.9	New
KHAI	Wahiawa HI	103.5	KKHI	WBYN-FM	Boyertown PA	107.5	WBYN
WSHY	Columbia City IN	106.3	WDDB	WLRI-LP	Gap PA	92.9	WOBS-LP
WIAU	Franklin IN	95.9	WIJY	WPSX	Kane PA	90.1	WPSB
WNTR	Indianapolis IN	107.9	WTPI	WWRR	Scranton PA	104.9	WWDL-FM
WWLO	Lowell IN	89.1	New	WDAH	Shenandoah PA	91.5	New
WTMW	North Judson IN	91.3	New	WPSU	State College PA	91.5	WPSU-FM
WCLS	Spencer IN	92.7	WSKT	WOLI-FM	Easley SC	103.9	WOLI
WEFI	Effingham IL	89.5	New	WIHB	Moncks Corner SC	92.5	WCSQ
KMCN	Clinton IA	94.7	KZEG	WFIV-FM	Loudon TN	105.3	WKVL-FM
KMCS	Muscatine IA	93.1	KWCC	WQJK	Maryville TN	95.7	WTXM-FM
KKLG	Newton IA	88.3	KNNU	WRJK	Norris TN	106.7	WRMX-FM
KTDV	State Center IA	91.9	New	WVNS-FM	Pegram TN	102.5	WQZQ-FM
KJKC	Hutchinson KS	95.9	New	KNOS	Albany TX	98.9	New
WHFG	Broussard LA	91.3	New	KKWV	Aransas Pass TX	88.1	New
WTKL	Kenner LA	105.3	WKBU	KATG	Athens TX	88.1	New
WKBU	New Orleans LA	95.7	WTKL	KEDR	Bay City TX	88.1	KFRT
WILD-FM	Brockton MA	97.7	WBOT	KBEX	Brenham TX	89.7	New
WLPV-LP	Greenfield MA	107.9	New	KHLE	Burnet TX	106.9	KHLB
WTBT	Carrollton MI	100.5	WXQL	KTXO	Goldsmith TX	94.7	New
WJZL	Charlotte MI	92.7	WQTX	KKUL-FM	Groveton TX	98.1	New
WSRT	Gaylord MI	106.7	WKPK	KTSX	Knox City TX	107.3	New
WSRJ	Honor MI	100.7	WKVK	KAJZ	Llano TX	96.3	KQBT
KJRZ-LP	Libby MT	105.3	New	KHLB	Mason TX	102.5	KHLE
WKPK	Michigamme MI	88.1	New	KWGW	Mexia TX	104.9	KYCX-FM
WMKD	Pickford MI	105.5	WADW	KZBT	Midland TX	93.3	KBAT
WTNP	Richland MI	91.9	New	KAHA	Olney TX	104.3	New
WQTX	St. Johns MI	92.1	WTXQ	KGEE	Pecos TX	97.3	KKLY
WAKK-FM	Centreville MS	104.9	WZFL-FM	KZNO	Seymour TX	92.3	New
KWJK	Boonville MO	93.1	KWRT-FM	KXME	Wellington TX	98.5	New
KCXM	Lee's Summit MO	97.3	KZPL	KZKL	Wichita Falls TX	90.5	KTEO
KKQX	Manhattan MT	105.7	New	KQMB	Levan UT	96.7	KCFM
KHYY	Minatare NE	106.9	New	KENZ	Ogden UT	101.9	KPQP
KETT	Mitchell NE	99.3	New	KKAT-FM	Orem UT	107.5	KENZ
KQBW	Omaha NE	96.1	KEFM	KRPX	Wellington UT	95.3	New
KCYE	North Las Vegas NV	104.3	KJUL	WJPK	Barton VT	100.3	New
WPLY-FM	Walpole NH	96.3	WCFR-FM	WAVA-FM	Arlington VA	105.1	WAVA
WPOV-LP	Vineland NJ	99.9	New	WCMC-FM	Chase City VA	99.9	WFXQ
KKTC	Angel Fire NM	99.1	KKIT	WWLB	Midlothian VA	98.9	WCUL
KBNM-LP	Belen NM	98.7	New	KZAL	Manson WA	94.7	New
KIDS	Grants NM	88.1	New	KANY	Ocean Shores WA	93.5	New
KANM	Magdalena NM	95.9	New	KPLI	Olympia WA	90.1	KWGV
KQBT	Rio Rancho NM	101.7	KAJZ	KABW	Westport WA	101.3	New
KKIT	Taos NM	95.9	KKTC	WOVM	Appleton WI	91.1	WLFM
WFVL	Southern Pines NC	106.9	WKQB	WWMD-LP	Ashland WI	95.5	New
KJIT-LP	Bismarck ND	106.7	New	WYZM	Mount Horeb WI	106.7	New
KXGT	Carrington ND	98.3	KYNU	WDDW	Sturtevant WI	104.7	WEXT
KKLQ	Harwood ND	100.7	KDJZ	KKHI	Rock River WY	95.9	KVAN
KYNU	Jamestown ND	95.5	KXGT	KLWB	New Iberia LA	50	KACB-TV
WYJK-FM	Bellaire OH	100.5	WOMP-FM	WPSU-TV	Clearfield PA	3	WPSX-TV
WBWR	Hilliard OH	105.7	WFJX				

1620 Radio Energy, Boston—French Caribbean (www.radioenergyboston.com).
1620 Radio Soleil International, Brockton—French Caribbean.
1620 WPRI268 Leominster—Relays 162.525 MHz WNG575 Pack Monadnock, NOAA Weather.
1630 Zumix Radio, East Boston—202 Maverick St., free-format music; blues, jazz, rock, soul, urban contemporary, anything goes.
1640 WRNM Radio Nouveaute, Boston—Off the air? Moved to 1710 kHz? Reported shutdown by FCC (www.radionouveaute.com).
1650 WQBE789/WQBQ732 East Boston—Logan Airport airline terminal assignments and parking info.
1670 WRDI Radio Diffusion International, Boston—French news/talk.
1670 Radio Communautaire de Brockton, Brockton—French Caribbean.
1680 WRUI Radio Union International, Boston—Continuous French Caribbean zouk (www.radiounioninter.com).
1690 WRCI Radio Creole International, Lynn—French news/talk, AM Stereo (www.radiocreoleinter.com).
1700 Radio Bel Ayiti, Boston—French Caribbean (www.belayiti.com).
1700 Radio Luz/Radio Palabra de Vida, Lawrence—Spanish contemporary Christian music and preaching.
1710 unidentified, Dorchester—French Caribbean, possibly the relocated Radio Nouveaute.
88.5 Radio Free Cambridge/Radio Pandemonium, Cambridge.
89.3 Radio Planet Compas, Boston—French news/talk, IDs as "Compas FM" (www.planetcompas.com).
91.3 Radio Superstars, Everett—French news/talk, IDs as "W Radio" and "La radio d'information."
102.9 Choice FM, Dorchester-Boston—Caribbean/African American, "Number one in Boston for Caribbean music."

A list of Haitian radio stations in the Boston area can be found online at www.hauinc.org/html/community/Media/Radio/ RadioStations.asp, the Haitian Americans United website. A more comprehensive site with links to Haitian radio in Boston is at www.anselme.homestead.com/radioboston.html.

A special thanks to Boston Area DXers Mark Connelly, Chris Lobdell, and Paul McDonough, along with Rick Levy, Aaron Read, and Jeff Lehmann for their continued input monitoring of unlicensed activity in Boston.

What Are You Hearing?

Of course Boston is only one example of what might be termed "urban discontent" with the state of broadcasting. Other hotbeds of unlicensed activity include New York City, where the Chabad-Lubavitch radio station on 1710 kHz AM is widely heard, and Miami, Florida, where Cuban and Haitian broadcasts abound, especially on FM. If you hear an interesting LPFM or unlicensed radio broadcast, be sure to let us know about it. Then stay tuned right here for continuing coverage in future editions of "Broadcast Technology." 73 and Good DX! ■

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by Rich Arland, K7SZ, richard.arland@verizon.net

It's More Than Ham Radio Volunteers!

The face of emergency communications (EmComm) is rapidly changing. The time honored position of the ham radio operator as a traffic handler in times of disaster is rapidly coming to a close. How do I know this? The weekend of October 22-23, 2005, my wife, Tricia, KB3MCT, and I attended the 2nd Annual EmComm Conference at Shimokin Dam, PA, sponsored by the Snyder County RACES/ARES and the Northumberland County ARES groups.

Chris Snyder, NG3F, ARRL Eastern Pennsylvania Section Emergency Coordinator/Snyder County ARES Emergency Coordinator/RACES Officer, and his group put on a tremendous collection of informational forums that spanned the entire weekend. If you live and work in Eastern Pennsylvania and have an interest in emergency communications, this is the place you needed to be. At that conference we came face to face with the future of amateur radio involvement in EmComm, and it is a shocker!

For many years hams have been at the forefront of disaster relief communications furnishing on the spot, real-time tactical communications for disaster response personnel. In addition, during the aftermath, hams traditionally bore the brunt of health and welfare traffic alerting the families and friends of disaster victims as to their status. This picture is changing as we speak. Amateur Radio involvement in EmComm is about to take a dramatic turn and if we do not respond quickly and accept our new roles as system administrators as opposed to radio operators, we will be left in the dust as professional disaster mitigators find new ways to communicate without the ham radio community!

It's Not April 1, Folks!

No, I am not kidding. What I saw and experienced at the EmComm conference in October was sobering and has me wondering whether or not the Amateur Radio community can actually make the changes needed to keep up with the needs of our served agencies. It seems that in today's EmComm world, everyone on the disaster site has a walkie-talkie. What often happens, especially in the case of an act of terrorism, is that a federal agency—the FBI or ATF, for example—comes into an area with their own portable trunked radio system; they set it up, and proceed to communicate just fine without restoring to using the ham radio volunteers. These state-of-the-art radio systems are quite advanced, providing great local area coverage, and are secure, so agents on the ground can talk freely without the fear of being overheard by the local news media and scanner enthusiasts. Add to this the fact that most county and state Emergency Management Agency (EMA) groups, along with the state police also have their own portable radio systems, many times they are trunked with portable repeaters, and you get a rough idea of how we hams fit into the picture when it comes to tactical communications: we don't!

Hams are a stubborn lot and we are so married to our 2 Meter handie-talkies and the National Traffic System (NTS) that we very well may go the way of the dinosaur in the not too distant future. If and when this happens, Amateur Radio will be doomed. It has been our one saving grace that in the past we can respond to emergencies and provide communications under a variety of conditions, using various modes and our unlimited frequencies. Now, however, the new EmComm plan calls for hams to set up systems that will allow professional disaster mitigation personnel to communicate in a real-time manner with their higher headquarters and their field units without having to undergo a learning curve using proven methods like fax and e-mail.

While initially packet radio (remember the '80s?) was touted to be the "savior" of ham radio in disaster communications, it quickly became clear that packet had a rather steep learning curve and it took a ham radio operator manning a terminal to transmit and receive messages via packet. This was not a good situation, since it added one more layer of protocol to the task of managing communications. Granted, it did provide a modicum of "job security" for the hams, but in reality you could not take the average secretary in an EOC, set that person down at a packet terminal, and expect them to handle traffic without a lot of training. (Packet is a unique digital system offering 100 percent reliable error-free traffic. When you understand how packet works and the various commands necessary to transmit and receive messages, it is a passable EmComm system, even at 1200 baud). However, the average office worker has neither an idea of the packet commands, the unique language encountered when using packet radio nor protocols of traffic handling using NTS message format.

E-mail And The Internet—OK Up To A Point

The ONE thing that almost everyone in a management position CAN and DOES use is e-mail. E-mail has replaced the office memo, "snail mail" and, in many cases the fax machine. E-mail depends upon an Internet connection. Without access to the Internet, all generated e-mail stays within an extremely localized area, limited by the network that the computers are hooked to. If the network has Internet access, all is well, but what happens in the middle of a disaster when the local Dial Central Office (DCO) with its T-1 and T-3 high-speed pipes along with the cell sites all go down? No Internet, that's what.

We Can Do It!

It now becomes the task of the EmComm personnel to supply Internet connectivity where there is none. An insurmountable task, you say? Not hardly. Enter WinLink, the next generation in emergency communications support.

WinLink is the new standard that meets current Department of Homeland Security (DHS) and EMA standards. In other words, our served agencies have "raised the bar" when it comes to what they want and need for emergency communications.

WinLink can provide end-to-end, user-to-user e-mail with or without Internet connectivity (ISP) via V/UHF radio links.

If you have been involved with EmComm planning you have undoubtedly heard the term, "the last mile." This is the area that is actively affected by the disaster. Nobody knows exactly how big "the last mile" really is until the disaster actually occurs. However, it encompasses the area that has no "normal" communications channels and is essentially cut off from the rest of the world. "The last mile" is where we, the EmComm volunteers have our work cut out for us to furnish the type of communications that our served agencies need to implement the disaster plan and start the recovery process. Today's disaster professionals are requiring more than simple point-to-point tactical and long-haul radio communications.

In the last couple of years the Federal Communications Commission (FCC) has been pushing the American Radio Relay League (ARRL) to move forward and promote digital modes as opposed to the traditional ham radio menu of FM/CW/Packet/SSB HF communications. They have been coaching the ham radio community to adopt Software-Defined Radios (SDRs) that can be adapted, on the fly with updated software/firmware as needed, to meet specific user requirements. In short, everyone is waiting for the hams to make it into the 21st century. Unfortunately, most of us are still clinging to our time honored traditions of FM voice traffic nets using the antiquated NTS message format to provide our customers with communications during emergencies. The time is rapidly approaching when this will be a thing of the past and should the hams not rise to the occasion and get on board with newer digital technology, we will be relegated to the list of "also rans" in the disaster communications race.

About now you may be asking yourself, why the sudden shift in direction when it comes to the needs of the served agencies? First of all it has not been a sudden shift at all. The handwriting has been on the wall for several years. Secondly, the professional world revolves around the Internet and e-mail. That's how business is conducted in today's world. Everyone from the CEO to the janitor knows about and uses e-mail. Huge messages can be passed with ease using e-mail and attachments. Try passing a five page report using the ARRL NTS message format! I think you'll get the picture pretty quickly.

Our Thinking Needs To Be Retuned

We, the Amateur Radio community, need to be proactive and get on board with digital modes and digital radio systems in order to be players in today's EmComm world. It's just that simple. As emergency communicators we have to give our clients what they need to do their jobs. If we don't then they will find another way to do business and we won't be in the game any longer.

Let's talk more about WinLink. WinLink provides Internet access to affected disaster areas by routing e-mail traffic (using e-mail programs like Outlook Express) from the deployed disaster mitigation personnel to an ISP outside the area using V/UHF radio systems. The on-site interface consists of a V/UHF FM radio, some form of digital modem and a terminal or computer. As the e-mail is generated on this terminal it is fired off on a radio link to a participating station mode called a PMBO (participating mail-

When Disaster Strikes...

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REACT Teams work with local, state, and national disaster response agencies. Often ***REACT*** plays a unique role in disaster relief because ***REACT*** is the only volunteer communications organization whose members are trained to use **all types of two-way communications** from CB to packet radio, Amateur radio to GMRS.

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box office), that maintains a constant Internet connection. Should the PMBO that you are using suffer loss of the ISP connection, it can utilize another V/UHF radio link or an HF radio link to find another PMBO that has Internet connectivity. At the disaster site end of this system, the terminal can also be connected to a Wi-Fi LAN (802.11b or g) to provide a multitude of Internet capable terminals for various players in the affected area. In other words, the Radio Amateur furnishes the on-site equipment to connect to a PMBO and possibly a Wi-Fi router to interconnect local users at the disaster site, and he/she manages the system, but does not have an active message handling role in the disaster communications. In turn, the users of the WinLink system have a "business as usual" day sending and receiving e-mail just like they were connected to an on-site ISP. Life is good.

I can hear some of you now, groaning and moaning about handling traffic, "shadowing" key personnel, etc. The way things are going, those days are almost gone. As I stated before, many of the responding agencies have their own tactical comm systems that are not only deployable but they are secure. This is something we cannot provide by licensing requirements—no codes or ciphers.

I invite your comments and suggestions on this fast-changing scene. You can always write to me at *Popular Communications*, ATTN: "Homeland Security", 25 Newbridge Road, Hicksville, NY 11801 or my e-mail address, richard.arland@verizon.net.

Flight 93

One of the most fascinating forums that we attended during the recent conference was an overview of the United Airlines Flight 93 crash in Somerset County near Snecksville, PA in the western part of the state. Richard Lohr, N3VFG, the county EMA coordinator, was the presenter of this forum and it was a real eye-opener.

Flt 93 was a transcontinental flight, which meant that it was carrying a full fuel load (around 8000 pounds of jet fuel) and a full flight crew. The terrorists waited until after breakfast had been served and the serving carts were secured out of the way to make their move. This happened over the skies of western Pennsylvania. When the aircraft impacted the ground it was flying inverted and augured in at over 500 MPH! The impact crater was huge and contained no recognizable debris. Crash recovery crews had to dig down 50 feet to recover airframe wreckage and body parts. When an aircraft hits the ground that fast, carrying that much fuel, nothing survives the impact.

Rich Lohr did indicate that the only piece of personal property they found at the crash site immediately after the incident was the Holy Bible, allegedly opened to the 23rd Psalm!

In the four years since the terrorist act, the remains of all persons on board Flt 93 have been identified, including the terrorists. This alone says something about the professionalism and thoroughness of the forensic staff assigned to the task of finding the remains and identifying them.

Initial response by the local EMA group had the site contained and communications was being provided by EmComm volunteers. Within a couple of hours of the crash, the FBI came on scene and immediately quarantined the site, cordoned it off and placed their mobile trunked, secure radio system on the air. They dismissed the ham radio operators along with the majority of the EMA staff, sighting that this was a terrorist act and therefore a crime scene.

The FBI handled the investigation of the crash site and when they left, they indicated to the EMA folks that they (the FBI) had recovered 95 percent of the debris and left the other 5 percent for them. In reality these figures were reversed! The EMA recovery workers had weeks of digging and sifting wreckage ahead of them. During this time the Red Cross and the Salvation Army were on scene 24/7 to provide food, and a rest area for recovery workers. The gruesome work of recovering the body parts of the 44 passengers, crew, and hijackers onboard Flt 93 took three weeks.

Rich Lohr's crew set up their Command Post in an old mining building. A mobile CP came from Fayette County EMA along with the Pennsylvania State Police mobile CP arrived on scene. Motorola provided a self-contained comm van that used the Motorola Mascot-I 800 MHz secure trunked radio system. If you'll notice, there is a decided lack of Amateur Radio participation in this disaster. Daily briefings were held and, finally after two days, the FBI decided it would be in their best interests to start attending these daily briefings so they could keep on top of events.

Recovered body parts were transported to a makeshift morgue at a local National Guard Armory about four miles from the crash site. Here the difficult and time consuming task of obtaining positive identification of human remains took place. It took almost four years to accomplish, but all 44 people aboard the ill-fated flight were positively identified.

On the 1st anniversary of the crash, (I can't help remembering this rather pathetic situation), a 150-foot carpet was ordered and placed down so Attorney General John Ashcroft could walk from his limo to a nearby tent to address attendees at the event without getting his shoes dirty! Your tax dollars at work!

Richard Lohr's forum was well attended and he held everyone spellbound as he recounted the various stages of the recovery process undertaken at the UAL Flt 93 crash site in western Pennsylvania. He and his EMA personnel did a tremendous job in the face of an intimidating task and equally intimidating federal agencies that muscled in and took over.

That's it for this month, gang. Next month we'll take another look at the 2nd Annual EmComm Conference held at Shamokin Dam, PA at the end of October. A lot of valuable information was offered, and this stuff needs to be disseminated rapidly in order to be ready when the next terrorist attack happens. Until then, remember our motto: Preparedness is not optional. ■

by Richard Fisher, KI6SN

Capitol Hill And FCC Actions Affecting Communications

FCC Gets Approval For Revised Indecency Complaint Form

The Office of Management and Budget has issued a Notice of Action approving the revised Federal Communications Commission Form 475, General Consumer Complaint Form and new Federal Communications Commission Form 475B, Obscene, Profane, and/or Indecent Material Complaint Form.

"The new FCC Form 475B will enable the Commission to collect detailed data from consumers on the practices of those entities that may air obscene, profane, and/or indecent material by giving consumers an opportunity, for the first time, to use a specific form to file their complaints," the FCC announced November 1. "Form 475B will be used only for complaints associated with obscene, profane, and/or indecent material."

According to the Commission, both Form 475 and Form 475B "will significantly improve the informal complaint process for consumers, industry, and Commission staff by minimizing confusion on what information the Commission requires. Use of these forms also will improve the complaint process and the overall quality of the complaints received."

More information about filing a complaint with the FCC can be found at www.fcc.gov/cgb/complaints.html.

CNCS Extends Grant For Hurricane Communications Volunteers

The Corporation for National and Community Services (CNCS) has extended its grant program for Ham Aid, offering limited reimbursement for out-of-pocket expenses incurred by radio amateurs providing emergency communications in the wake of hurricanes Rita and Wilma. Hurricane Katrina volunteers were initially covered by the grant.

"To date there is adequate funding to support the hundreds of hams who traveled to the Southeast since late August," the American Radio Relay League's Mary Hobart, K1MMH, said in the *ARRL Letter*. The reimbursement procedures are similar to those in place for hurricane Katrina.

In an effort to disperse the funds broadly, Hobart said the reimbursements had been limited to $25 per day for a maximum of four days. The total per radio amateur was set at $100, with one expense reimbursement granted for each hurricane. As of November, the program covered per-diem payouts between September 1 and December 31, 2005. Hobart said there is a possibility the period could be extended.

According to the *ARRL Letter*, "Hobart says she wanted to allay fears of amateur radio volunteers who believe accepting the money is contrary to FCC Part 97 rules." While 97.113 prohibits "communications for hire or for material compensation, direct or indirect, paid or promised, except as otherwise provided in these rules," Hobart said that Ham Aid reimbursements "are not for providing 'communications' but to help with such costs as travel, meals, lodging and other necessities."

The CNCS grant is an extension of the League's Homeland Security training grant, which has provided certification in emergency communication protocols to nearly 5,500 amateur radio volunteers over the past three years. "These out-of-pocket expenses can be a hardship for some amateur radio volunteers," Hobart said, pointing out that some of the operators are unemployed or are seniors on fixed incomes. "If we can help one ham to serve where badly needed, that's what this grant is intended to do," she said.

For updates and information about the program, visit www.arrl.org/FandES/field/forms/cncs.

Parts Of ITU Communications *Handbook* Available On Line

Significant portions of the *2005 Handbook on Emergency Communications* by the International Telecommunication Union can be downloaded free from the Internet in English, Spanish, or French, the organization has announced. The handbook was written as a companion text for everyone who is called upon to provide and use telecommunications during disasters and relief efforts.

For more information, visit www.itu.int/ITU-D/emergency telecoms/publications.html.

FCC Asked To Consider More Privileges For Radio Newcomers

In response to an FCC Notice of Proposed Rule Making and Order in July 2005, the ARRL is urging the Commission "to provide meaningful operating privileges to entry-level amateur radio licensees, including access to HF (high frequencies) even if the commission doesn't want to create a new license class."

"Retaining Morse telegraphy as a requirement for only the Amateur Extra class license, in the ARRL's view, places Morse telegraphy in a proper, balanced perspective," the League told the commission on the deadline for comment in October.

"The FCC's NPRM&O proposed eliminating the 5-words-per-minute code requirement for all amateur radio license classes but denied requests to create a new entry-level class with limited HF privileges," according to the *ARRL Letter*.

The ARRL argued that "if the FCC will not create a new Novice class license as the League had suggested in its earlier Petition for Rule Making (RM-10867) in the proceeding, it should modify Technician operating privileges instead," the *ARRL Letter* reported. "The present licensing regime limits Technicians to VHF bands and above, 'leaving newcomers to the amateur service isolated from their peers holding higher class licenses. The Technician class is, for too many, a dead end to what might otherwise be an active, progressive interest in amateur radio, technical self-training and incentive-based educational progress in the many facets of the avocation.'"

Under the ARRL plan, Technicians would have telegraphy

(Continued on page 82)

World News, Commentary, Music, Sports, And Drama At Your Fingertips

This listing is designed to help you hear more shortwave broadcasting stations. The list includes a variety of stations, including international broadcasters beaming programs to North America, others to other parts of the world, as well as local and regional shortwave stations. Many of the transmissions listed here are not in English. Your ability to receive these stations will depend on time of day, time of year, your geographic location, highly variable propagation conditions, and the receiving equipment used.

AA, FF, SS, GG, etc. are abbreviations for languages (Arabic, French, Spanish, German). Times given are in UTC, which is five hours ahead of EST, i.e. 0000 UTC equals 7 p.m. EST, 6 p.m. CST, 4 p.m. PST.

UTC	Freq.	Station/Country	Notes
0000	7440	Radio Ukraine Int.	
0000	9435	Democratic Voice of Burma, via Germany	Burmese
0000	9830	Voice of Russia	SS
0000	11690	Radio Vilnius, Lithuania	
0000	17715	Radio Australia	
0030	5035	Radio Aparecida, Brazil	PP
0030	5910	Radio Ukraine Int.	
0030	6060	Radio Nacional, Argentina	SS
0030	9865	Radio Farda, USA	Farsi to Iran
0030	15120	China Radio Int, via Cuba	SS
0100	4052.5	Radio Verdad, Guatemala	SS
0100	5900	Radio Bulgaria	BB
0100	6190	Deutschelandrundfunk, Germany	GG
0100	7260	Radio Thailand	EE, others
0100	7355	Vatican Radio	Hindi, etc.
0100	11800	RAI Int., Italy	II
0100	11915	Radio Gaucha, Brazil	PP
0130	6115	Radio Tirana, Albania	
0130	3259	Radio Luz y Vida, Honduras	SS
0130	6065	Radio Sweden, via Canada	
0130	6140	Radio Lider, Colombia	SS
0130	9480	Radio Rossii, Russia	RR
0130	9505	Radio Rebelde, Cuba	SS
0130	9675	Radio Cancao Nova, Brazil	PP
0130	9737	Radio Nacional Paraguay	SS
0200	4780	Radio Cultural Coatan, Guatemala	SS
0200	4800	Radio Buenas Nuevas, Guatemala	SS
0200	4819	La Voz Evangelica, Honduras	SS
0200	4915	Radio Anhanguera, Brazil	PP
0200	5025	Radio Rebelde, Cuba	SS
0200	9410	BBC Relay, Cyprus	
0200	9780	Rep. of Yemen Radio	AA
0200	10330	All India Radio	HH
0230	3279	La Voz del Napo, Ecuador	SS
0230	4915	Radio Difusora Macapa, Brazil	PP
0230	6040	Radio Clube Paranaense, Brazil	PP
0300	3240	Radio Misiones Int., Honduras	SS
0300	4780	RTD Djibouti	FF
0300	6040	Radio Monte Carlo, via Canada	AA
0300	7110	Voice of Ethiopia	Amharic
0300	7200	Republic of Sudan Radio	AA
0300	9345	Kol Israel	HH
0300	9420	Voice of Greece	Greek
0300	9460	Voice of Turkey	TT
0300	9965	Voice of Armenia	Armenian
0330	3240	Trans World Radio, Swaziland	vern
0330	3345	Channel Africa, South Africa	
0330	6940	Radio Fana, Ethiopia	Amharic
0330	7215	Trans World Radio via South Africa	unid
0330	9885	Voice of America Relay, Botswana	
0330	11815	Radio Brazil Central	PP
0400	4885	Radio Clube do Para, Brazil	PP
0400	4930	Voice of America Relay, Botswana	
0400	4965	The Voice, Zambia	
0400	5500	Voice of Tigray Revolution (clandestine)	to Ethiopia
0400	5865	Voice of Greece	Greek
0400	5920	Radio Rossii, Russia	RR
0400	7275	RT Tunisienne, Tunisia	AA
0400	11690	Radio Okapi, Congo, via South Africa	
0400	12080	VOA Relay, Botswana	
0430	4775	Trans World Radio, Swaziland	
0430	4810	Radio Transcontinental, Mexico	SS
0430	5985	RTV Congolaise, Congo	FF
0430	7205	BBC via South Africa	PP
0500	4950	Radio Nacional Angola	PP
0500	11820	Radio New Zealand Int.	
0500	6185	Radio Educacion, Mexico	SS
0500	7255	Voice of Nigeria	
0500	9625	CBC Northern Quebec Service, Canada	
0530	9685	Channel Africa, South Africa	
0530	5005	Radio Nacional, Equatorial Guinea	SS
0530	7290	VOA Relay, Sao Tome	
0600	4760	ELWA, Liberia	
0600	4783	RT Malienne, Mali	FF
0600	5885	Vatican Radio	II
0700	6110	Voz Cristiana, Chile	SS
0700	6115	Radio Union, Peru	SS
0700	6140	Radio Lider, Colombia	SS
0700	6160	CKZN, Canada	
0700	9525	Star Radio, Liberia, via Ascension Is.	
0700	9885	Radio New Zealand Int.	
0730	9720	Radio Victoria, Peru	SS
0800	3290	Voice of Guyana	DD/EE
0800	5954	Faro del Caribe, Costa Rica	SS
0800	6010	Radio Mil, Mexico	SS
0800	7405	Radio Marti, USA	SS to Cuba

UTC	Freq.	Station/Country	Notes
0830	4990	Radio Apinte, Suriname	DD
0830	5940	Radio Melodia, Peru	SS
0900	3310	Radio Mosoj Chaski, Bolivia	SS
0900	5990	Radio Senado, Brazil	PP
0900	6035	La Voz del Guaviare, Colombia	SS
0900	6134	Radio Santa Cruz, Bolivia	SS
1000	3925	Radio Nikkei, Japan	JJ
1000	4747	Radio Huanta, Peru	SS
1000	7200	Radio Rossii, Russia	RR
1030	4775	Radio Tarma, Peru	SS
1030	5040	Voz del Upano, Ecuador	SS
1030	7260	Voice of Mongolia	vern
1032	9965	KHBN, Palau	
1100	3220	HCJB	SS
1100	4605	RRI-Serui, Indonesia	II
1100	4905	Xizang PBS, Tibet	CC
1100	5020	Solomon Islands Broadcasting Service	
1100	5446.5	AFN/AFRTS, Florida	USB
1100	6080	Radio Singapore Int.	
1100	9405	FEBC, Philippines	CC
1100	9440	China Radio Int.	CC
1100	9520	Radio New Zealand Int.	
1100	9750	Voice of Malaysia	MM
1100	11770	Adventist World Radio, Guam	CC
1100	11785	Voice of Indonesia	II
1130	4920	Xiang PBS, Tibet, China	TT
1130	3385	Radio East New Britain, Papua New Guinea	Pidgin
1200	7255	VOA Relay, Thailand	
1200	7260	Voice of America, Thailand Relay	Indo
1200	9345	Pyongyang Broadcasting Station, North Korea	KK
1200	9465	Trans World Radio, Guam	unid
1200	11905	Sri Lanka Broadcasting Co.	Tamil
1200	9525	Radio Polonia, Poland	
1230	6020	Radio Australia	
1230	7220	Voice of Vietnam	RR
1230	12030	Radio Free Asia, USA, via No. Marianas	VV
1230	11555	KWHR, Hawaii	
1230	12030	BBC via United Arab Emirates	unid
1230	13685	Voice International, Australia	
1230	15250	Radio Sweden	
1230	15405	HCJB, Australia	unid
1300	21505	BSKSA, Saudi Arabia	AA
1300	9525	Voice of Indonesia	
1300	13625	Radio Free Asia, USA, via Northern Marianas	unid
1300	15350	Voice of Turkey	TT
1300	15400	YLE/Radio Finland Int.	Finnish
1300	17870	Radio Japan/NHK via Ascension	JJ
1330	11875	Radio Veritas, Philippines	Hindi
1400	15430	Golos Rossi	RR
1400	15140	Radio Sultanate of Oman	
1400	17615	RDP Int., Portugal	PP
1430	11600	Radio Slovakia Int.	Slovak
1430	11665	Central Broadcasting System, Taiwan	CC
1430	11680	Radio Free Asia, USA via Sri Lanka	VV
1430	11805	VOA Relay, Northern Marianas	CC
1430	15100	Radio Pakistan	Urdu
1500	11690	Radio Jordan	
1500	12020	HCJB, Ecuador	
1500	12115	Radio Liberty, USA via Sri Lanka	unid
1500	13775	Radio Austria Int.	GG
1500	17570	RTBF, Belgium, via Germany	FF
1500	17770	Channel Africa, South Africa	
1530	11530	Voice of Mesopotamia via Moldova	Kurdish
1530	21600	BSKSA, Saudi Arabia	FF
1530	21700	Radio Exterior de Espana, Spain	SS
1534	15235	Vatican Radio	
1600	9795	KNLS, Alaska	RR
1600	11570	Radio Pakistan	
1600	11650	Voice of Islamic Rep. of Iran	
1600	15435	Emirates Radio, UAE	AA
1700	17485	Radio Prague, Czech Rep.	
1700	21655	RDP Int., Portugal	PP
1730	11590	Kol Israel	
1730	15560	Radio Jamahiriya, Libya, via France	AA
1830	15190	Radio Philipinas, Philippines	Tagalog
1830	15475	Africa No. One, Gabon	FF
1900	11820	BSKSA, Saudi Arabia	AA
1930	15345	RTV Marocaine, Morocco	RTV
		Marocaine, Morocco	AA
1930	11860	Voice of Islamic Rep. of Iran	Farsi
1930	12005	RT Tunisienne, Tunisia	AA
1930	15630	Voice of Greece	Greek
2000	9750	Radio Liberty, USA, via Morocco	Byelorussian
2000	13675	Vatican Radio	
2000	17810	Radio Nederland, via Bonaire	
2030	11720	VOA Relay, Morocco	
2030	9675	IBRA Radio, Sweden via Germany	FF
2030	11735	Radio Tanzania-Zanzibar	Swahili
2030	12085	Radio Damascus, Syria	
2100	17680	Voz Cristiana, Chile	SS
2100	17860	Deutsche Welle, Germany via Rwanda	PP
2130	9605	BBC Relay, Seychelles	
2130	11975	VOA Relay, Sao Tome	
2200	6005	Deutschland Radio, Germany	GG
2200	6180	Radio Nacional Amazonas, Brazil	PP
2200	7450	RS Makedonias, Greece	Greek
2200	7460	Radio Nacional de la RASD, Algeria	AA (cland.)
2200	9990	Radio Cairo	
2200	11715	All India Radio (Goa)	
2200	11895	Radio Japan/NHK via French Guiana	JJ
2215	9925	Croatian Radio, via Germany	
2230	5470	Radio Veritas, Liberia	
2230	7125	RTV Guineenne, Guinea	FF
2230	9990	Radio Cairo, Egypt	
2230	15345	Radio Nacional, Argentina	SS
2245	11755	Radio Canada Int. via Ascension Is.	FF
2300	4845	Radio Mauritanie, Mauritania	AA
2300	9425	All India Radio	Hindi
2330	9855	Radio Kuwait	AA
2330	5030	RTV Burkina, Burkina Faso	
2330	9575	Radio Medi-Un, Morocco	AA
2330	9700	Radio Bulgaria	
2330	9875	Radio Vilnius, Lithuania	

by Harold Ort, N2RLL

New, Interesting, And Useful Communications Products

New Ameritron Programmable 10-Memory Screwdriver Controller

Ameritron's SDC-102 lets you save 10 screwdriver antenna positions in memory, and then with a push of a button you can quickly return to any saved position. The up/down buttons let you manually move the antenna to any desired position. A four-digit turns counter with bright LEDs gives you precise antenna positioning.

Ameritron's SDC-102 lets you save 10 screwdriver antenna positions in memory, and then with a push of a button you can quickly return to any saved position.

Ameritron's AutoPark feature automatically bottoms your antenna for parking in your garage and resets and calibrates your counter each time to eliminate antenna slippage and turns count errors.

Additionally, the SDC-102, that sells for $119.95, allows you to monitor motor current for signs of trouble and to determine stall current. Motor direction can be reversed so the UP button is always up.

To order, get a free catalog, or for your nearest dealer, call Ameritron at 800-713-3550; or write to Ameritron, 116 Willow Road, Starkville, MS 39759; or go online to http://www.ameritron.com; or fax the company at 662-323-9810.

New *FM Atlas* Announced

The 20th edition of the *FM Atlas*, published by Bruce F. Elving, Ph.D., is 264 pages of FM station news, maps and directories arranged by geography and station frequency. It covers the United States, Canada and Mexico.

The book started as a project by Bruce and his wife, Carol in 1971. Through the years its size and coverage of the FM industry has increased. FM has become the most popular radio band, now accounting for over 80 percent of listening in the United States. Technically, the book shows FM (main) stations, translators and boosters, which relay the main stations. It gives power and coverage radii to help take the guesswork out of FM listening. Low-power stations are also shown as are program formats, and slogans used by various stations.

The *FM Atlas* is $19.95 plus $2.05 shipping from FM Atlas, P.O. Box 336, Esko, MN 55733-0336. American Express, Visa, MasterCard or PayPal orders may be e-mailed to FmAtlas@aol.com.

OtterBox 1910—Protection For The HP iPaq 6500

Otter Products, LLC., introduces the OtterBox 1910, an interactive, waterproof case designed for the HP iPaq 6500. With this case, users have an innovative convergent technology solution; a phone, PDA, keypad, GPS and a rugged device all in one.

The OtterBox 1910 provides access to all major functions on the 6500, including sync/charge, SD Slot, headset jack, and keypad. A clear window on the back allows use of the 6500's camera and flash through the case. The 6500's keypad also remains operable with direct push activation through the 1910 and an external stylus holder adds convenience. Retail for the 1910 is $129.95.

The OtterBox 1910 is made through an injection molding process and comprised of a glass-reinforced, polycarbonate shell with a thermoplastic rubber overmolding for added drop-protection. The case meets IP67 and MIL SPEC 810F for dust, water, and drop protection.

Otter Products, founded in 1996, offers technology protection lines for PDAs, iPods, Tablet PCs and other valuables with a 100 percent money back guarantee.

The OtterBox 1910 offers rugged, interactive protection for the HP iPaq 6500.

For more information or to purchase an OtterBox 1910 visit www.otterbox.com or call 888-695-8820.

ICP Solar's New Sunsei Solar Product Line

ICP Solar announces the launch of a new brand, the Sunsei line of solar products. The company says, "ICP's solar cells–the heart of all Sunsei products—deliver 50 percent more power per square—inch than competing solar technologies."

The new product line from ICP Solar works with a variety of power needs, from storage battery maintenance to providing a completely independent power source. Sunsei products are easy to install, operate in silence, require zero maintenance and deliver clean renewable energy, even under cloudy conditions.

ICP Solar chargers are complemented by tailor-made mounting kits and charge controllers that ensure easy installation and optimal product perfor-

ICP Solar's Sunsei Solar Charger SE-1200 protects against battery drain and replaces the daily power consumption of 12V lighting systems and appliances in boats, remote cabins and RVs. Cigarette lighter adaptor, battery clamps, terminal rings, connector wires and mounting hardware are all included.

mance. Sunsei products are also sold with "plug 'n play" connectors and are easily expandable without rewiring. These ICP Solar products are available worldwide at select retailers, including West Marine, PEP Boys, Sears, Amazon.com, and Boater's World.

Klingenfuss' *2006 Shortwave Frequency Guide*

It's out and hailed by professional radio enthusiasts as a must-have shack resource! The new *2006 Shortwave Frequency* Guide is 500 pages and uses the latest computer-to-plate technology; production time is only 10 days.

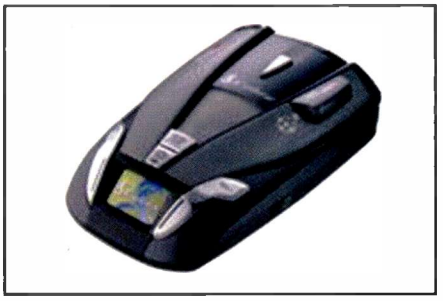
The new 10th Edition of the *Guide* includes worldwide broadcast and utility radio stations and has schedules of all clandestine, domestic, and international broadcast stations compiled by a new team of international top experts, assisted by more than 100 experienced collaborators and monitors worldwide.

The Klingenfuss *2006 Shortwave Frequency Guide* features a gigantic broadcast frequency list with 9,303 entries and an alphabetical list of stations as well.

For more information on the *2006 Shortwave Frequency Guide*, that is priced at 35 EUR, e-mail them at info@klingenfuss.org or visit them online at www.klingenfuss.org.

Cobra's New XRS9930 Radar Detector

We've just received word on Cobra's 2006 line of digital radar/laser detectors that feature a full-color Extreme Bright DataGrafix™ display. New circuitry provides the 12 Band Ultra™ models with extended detection range and the most advanced alert times possible.



Cobra's new XRS9930 radar detector.

Key features of the new XRS9930 that has an MSRP of $229.95, include:

- Xtreme Range Superheterodyne® technology provides extra detection and advance warning.
- Full-color, customizable graphic display provides easy-to-read set-up menu, icons, eight-point digital compass and alert screens.
- 12 Band system detects and alerts drivers to two safety, six radar and four laser signals.
- Detects fastest laser and radar guns on the market today, including POP Mode and new Ku Band radar guns.
- IntelliMute™ technology monitors vehicle's relative speed and mutes system to prevent false alerts.
- IntelliShield® uses three settings to significantly reduce the number of false signals in crowded urban environments.
- SmartPower™ feature automatically shuts off unit when vehicle's ignition is turned off.
- Exclusive Strobe Alert® and Safety Alert® warn of oncoming emergency vehicles and select road hazards.
- Voice Alert™ provides user with clear voice annunciation of the specific band detected.
- Provides complete immunity to VG-2 and Spectre-I radar detector-detectors.

For more information on this new radar detector or other Cobra products, contact Cobra directly at http://cobraelectronics.com/ or call them at 773-889-8870. Please tell them you read about it in *Popular Communications*.

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by Gordon West, WB6NOA, WB6NOA@arrl.net

Got Juice?

When emergency communicators are called in to staff an evacuation shelter or maybe a field station totally independent of commercial power, we need more than just a handheld and a single 1-amp-hour NiCd internal battery pack. Okay, so your handheld runs on NIMH, then you maybe have 1.5 amp-hours of handheld battery capacity. If you have the new lithium ion battery pack for your handheld, you may have up to 1.8 amp-hours of battery capacity.

Field Experience

The radio operators who returned from hurricane duty all report that it took more than just a single handheld to keep them on the air from their shelter or field operating point. Most reported the need for an occasional 20 or 30 watts of output power, and the utility of a dual-band mobile with variable power output settings. There's just no way you're going to run a mobile off a handheld battery supply!

An excellent battery choice would be the well-constructed, automobile jump-start battery systems boasting up to 17 amp-hours of lead-acid, non-spillable battery capacity, and usually available for under $75. Even with the less expensive $39.95 specials with 12-amp-hour capacity, you are on the air with that mobile radio for at least 24 hours if you monitor with squelch on, talk mainly on the lowest power output, and keep your transmissions short to conserve your car jump-battery capacity.

How Much Juice Do They Have?

Determining just how much capacity these neat jump-start battery systems have is sometimes tough. They're often rated at

This small "minimum" battery is adequate for short periods of time.

This is the emergency communicator's power connection—the Anderson Powerpole.

Here's a major-size 17-amp-hour battery system with a mobile VHF/UHF radio attached.

peak amperage output, which is not helpful in determining *actual* amp-hour ratings. I usually go by how *heavy* the battery pack is; there is little question that more amp-hours from a lead-acid battery come from more weight, and an extremely light jump-start battery is probably not going to last very long.

Usually the major discount warehouse stores have a big pile of these vehicle jump-start batteries, all in bright colors, each with a carrying handle. If it's under $50 and it feels heavy, chances are this will be a great addition to your field radio pack. Look to see if it has an analog voltmeter—if so, all the better. And if you're in the automotive section of the store, pick up one of those cigarette lighter gooseneck lights, as this will give you illumination when you need to write down something in the log. But keep that light off at all other times, unless it is a new, sophisticated light-emitting-diode lamp. Popular catalog company Griot's Garage offers a jump-start battery pack which includes a flexible light-emitting-diode gooseneck light, perfect for illuminating your paperwork, yet frugal current-wise so as to consume only a few milliamps of power.

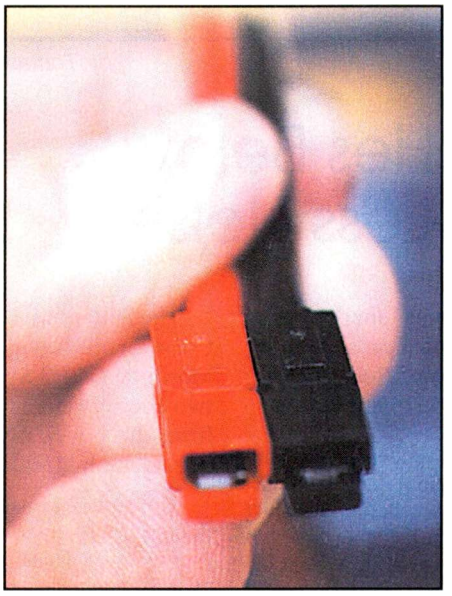
These jump-start batteries normally feature a cigarette-lighter receptacle outlet. These are sometimes fused, generally to no less than 10 amps. This means you can safely charge your battery from another vehicle, or run small equipment off your battery for short periods of time. I generally use my socket for charging.

For Higher Demands

To pull large and small amounts of current from the same jump-start battery, I usually connect to the big red and black leads that sometimes sport the big red and black battery terminal alligator clips. You generally won't need alligator clips in the field, so carefully cut the clips off and solder on the appropriate connectors that will run your mobile radio equipment.

Connectors?

Appropriate connectors? Yes, indeed. I refer to the Anderson Powerpole connectors, which will keep your setup common with other emergency communicators. If you don't think you can work with the little tiny connector contacts and the right tool to get them fastened onto the smaller wires, buy red and black wire kits with the connectors already on them, and carefully solder the smaller wires onto the larger jump-lead red and black wires. I always run an additional fuse in series with the positive, red lead, just in case.



Anderson Powerpoles: red is on the left, contacts down when viewed from the front.

And when you do your Anderson wire additions, be sure to wire in a few spares because someone may come along with charging capabilities and you might need all the incoming juice you can get in a hurry. It's also possible that someone might need to borrow a little bit of your battery power to run a piece of radio equipment; if they're equipped with a common Anderson Powerpole connector, they plug right into your battery pack.

My Favorites, And A Few Power Tips

I like the inexpensive automotive jump-start battery packs that have an analog needle movement voltmeter. A quick transmit on high power lets you quickly see how much juice you have left in your battery system. On high power, you might see the needle barely move, telling you that you still have plenty of amps in reserve. But, if on high power you watch the voltmeter dip from 12 volts down to 9 volts, you know you are just about off the air and it's time for a recharge.

A small solar panel recharges these jump-start batteries quickly. They can be rolled up into a small size if you get the flexible variety, available at most marine stores. Nothing beats charging from the sun!

Finally, resist the urge to constantly keep your jump-start battery on a constant charge. This begins to heat up the chemistry inside the battery pack, and ultimately decreases the life expectancy of your jump-start battery system. Rather, give it a good healthy charge once a month, then run your radio equipment to give it a good healthy discharge, then charge it up again for rapid radio deployment.

Incidentally, if your mobile radio turns on with a soft-touch key, DISCONNECT the mobile radio power plug from the battery because these "soft turn-on" circuits continuously draw a few milliamps, even though the radio is turned off. If your mobile radio turns on with a click switch, there is next to no current consumption, other than a couple of microamps to keep your memory battery circuit alive.

Stock Up

So the next time you're out at your favorite warehouse or "we-have-everything" store, look for a display of jump-start batteries and load up! Convert them over to a wonderful self-contained, safe DC power source for your emergency mobile and portable radio system. Have fun and be safe! ■

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by Tomas Hood, NW7US, pc-prop-man@hfradio.org

More On What Lies Below, And Look Ma—Less Noise!

Let's look into our "Propagation Corner" mailbag this month and answer one reader's comment on something we talked about in December's column. Bob Roehrig, K9EUI, of Aurora University's Telecom Department wrote:

Just received the magazine yesterday and was wondering how long ago you wrote the article [on longwave propagation] or if you bothered to do any recent research on what goes on below the broadcast band. On page 39 (middle column) you mention listening for both GWEN stations and OMEGA navigation signals. OMEGA went off the air Sept 30, 1997. GWEN has been deactivated, I believe deactivation started in 1993 (at least on paper), but has certainly not been operational since 2000. Some of the GWEN installations have been converted for DGPS transmissions.

Duly noted, Bob. This goes to show us that one must be careful when relying on information found on the Internet, as that information could well be out of date. I should have cross-referenced the information I was researching in order to uncover those facts.

The Differential GPS (DGPS) System is operated by the U.S. Coast Guard Navigation Center (NAVCEN). The Coast Guard Maritime DGPS System, at the time of this writing, consists of two control centers and over 60 remote broadcast sites. This is from the NAVCEN website at http://www.navcen.uscg.gov/dgps/default.htm:

The Service broadcasts correction signals on marine radio beacon frequencies to improve the accuracy of and integrity to GPS-derived positions. The Coast Guard DGPS Service provides 10-meter accuracy in all established coverage areas. Typically, the positional error of a DGPS position is 1 to 3 meters, greatly enhancing harbor entrance and approach navigation. The System provides service for coastal coverage of the continental U.S., the Great Lakes, Puerto Rico, portions of Alaska and Hawaii, and a greater part of the Mississippi River Basin. Many foreign nations are implementing standard DGPS services modeled after the U.S. Coast Guard's system to significantly enhance maritime safety in their critical waterways.

The longwave DGPS transmission frequencies are listed at http://www.navcen.uscg.gov/ado/DgpsCompleteConfiguration

The Ap Index And Understanding Propagation Terminology

The Ap index, or Planetary A index, is a 24-hour averaging of the Planetary K index. The Planetary K index is an averaging of worldwide readings of Earth's geomagnetic field. High indices (Kp > 5 or Ap > 20) mean stormy conditions with an active geomagnetic field. The more active, the more unstable propagation is, with possible periods of total propagation fade-out. Especially around the higher latitudes and especially at the Polar Regions, where the geomagnetic field is weak, propagation may disappear completely. Extreme high indices may result in aurora propagation, with strongly degraded long distance propagation at all latitudes. Low indices result in relatively good propagation, especially noticeable around the higher latitudes, when transpolar paths may open up. Maximum K-index is 9, and the A-index can exceed well over 100 during very severe storm conditions, with no maximum.

Classification of A-indices is as follows:

A0–A7 = quiet	A30–A49 = minor storm
A8–A15 = unsettled	A50–A99 = major storm
A16–A29 = active	A100–A400 = severe storm

Solar Flux (SFI): This flux number is obtained from the amount of radiation on the 10.7-cm band (2800 MHz). It is closely related to the amount of ultraviolet radiation, which is needed to create the ionosphere. Solar Flux readings are more descriptive of daily conditions than the Sunspot Number. The higher the Solar Flux (and, therefore, the higher the Sunspot Number), the stronger the ionosphere becomes, supporting refraction of higher frequencies.

Ionosphere: A collection of ionized particles and electrons in the uppermost portion of the Earth's atmosphere, which is formed by the interaction of the solar wind with the very thin air particles that have escaped Earth's gravity. These ions are responsible for the reflection or bending of radio waves occurring between certain critical frequencies, with these critical frequencies varying with the degree of ionization. As a result, radio waves having frequencies higher than the Lowest Usable Frequency (LUF) but lower than the Maximum Usable Frequency (MUF) are propagated over large distances.

Sunspot Number (SSN): Sunspots are magnetic regions on the Sun with magnetic field strengths thousands of times stronger than the Earth's magnetic field. Sunspots appear as dark spots on the surface of the Sun. Temperatures in the dark centers of sunspots drop to about 3700° K (compared to 5700° K for the surrounding photosphere). This difference in temperatures makes the spots appear darker than elsewhere. Sunspots typically last for several days, although very large ones may last for several weeks. They are seen to rotate around the sun, since they are on the surface, and the sun rotates fully every 27.5 days.

Sunspots usually occur in a group, with two sets of spots. One set will have positive or north magnetic field while the other set will have negative or south magnetic field. The field is strongest in the darker parts of the sunspots (called the "umbra"). The field is weaker and more horizontal in the lighter part (the "penumbra").

Galileo made the first European observations of sunspots in 1610. The Chinese and many other early civilizations have records of sunspots. Daily observations were started at the Zurich Observatory in 1749; continuous observations were begun in 1849.

The sunspot number is calculated by first counting the number of sunspot groups and then the number of individual sunspots. The "sunspot number" is then given by the sum of the number of individual sunspots and 10 times the number of groups. Since most sunspot groups have, on average, about 10 spots, this formula for counting sunspots gives reliable numbers even when the observing conditions are less than ideal and small spots are hard to see. Monthly averages (updated monthly) of the sunspot numbers show that the number of sunspots visible on the sun waxes and wanes with an approximate 11-year cycle.

For more information, see http://prop.hfradio.org.

_tabular.asp. If you'd like to experiment with your own homebrew receiver, check out http://web.abnormal.com/dgps/.

Current Cycle 23 Progress

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-centimeter observed monthly mean solar flux of 76.7 for October 2005, quite a drop from September's 90.8. The 12-month smoothed 10.7-centimeter flux centered on April 2005 is 95.5. The predicted smoothed 10.7-centimeter solar flux for February 2006 is about 74, give or take about 17 points.

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for October 2005 is 8.5, a huge drop from September's 22.1, clearly indicating the end of Cycle 23. The lowest daily sunspot value during October 2005 was zero, occurring on six days: 13, 24, 25, 26, 27, 28. The highest daily sunspot count for October was 17 on the 5th. Note that the month before, the highest count was 50. The 12-month running smoothed sunspot number centered on April 2005 is 31.7. A smoothed sunspot count of 11 is expected for February 2006, give or take about 12 points.

The observed monthly mean planetary A-Index (Ap) for October 2005 is 7, a nice drop from September's 21. The 12-month smoothed Ap index centered on April 2005 is 15.7. Expect the overall geomagnetic activity to be quiet during most days in February. At the time of writing, the forecast holds that February will be a very quiet month with little to no geomagnetic storminess.

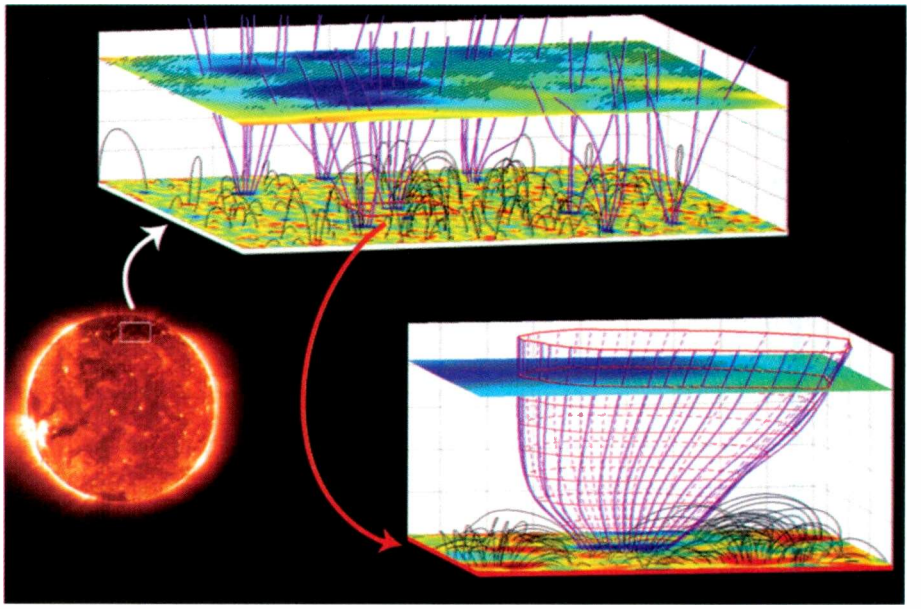

Figure 1. This picture was constructed from measurements which were made on September 21, 1996, on SOHO (see the April 22 issue of Science magazine). The figure illustrates location and geometry of three-dimensional magnetic-field structures in the solar atmosphere. The magenta-colored curves illustrate open field lines, and the dark-gray solid arches show closed ones. In the lower plane, the magnetic field vertical component obtained at the photosphere by MDI (see text) is shown. In the upper plane, inserted at 20,600 kilometers, the Ne VIII Doppler shift is compared with the model field. The shaded area indicates where the outflow speed of highly charged neon ions is larger than 7 km/s. Note the funnel constriction by pushing and crowding of neighboring loops. The scale of the figure is significantly stretched in the vertical direction. The smaller figure in the lower right corner shows a single magnetic funnel, with the same scale in both vertical and horizontal directions. (Source: MPI for Solar System Research)

High Frequency Propagation

Solar Cycle 23 is rapidly reaching the point of the 11-year minimum activity level. This means that the higher shortwave frequencies are not going to offer much excitement. However, since we are in still in the heart of the winter season, the noise level is very low on the HF bands, and at the same time, the average maximum usable frequency (MUF) is increasing as compared to the last few months. During the first three months of the year the earth is at perigee with the sun. This causes long winter nights, which in turn allows the ions of lower layers to drift upward and add to the F_2 region. The F_2 layer contains the maximum ion density (foF_2), which usually defines the MUF for DX paths.

Throughout these winter months, the foF_2 increases slowly day by day until it reaches the highest monthly average of the year sometime during this quarter. Even during the year of the solar minimum, when solar energy variation is small, an enhanced F_2 region can be expected to build up in the winter.

Geomagnetic storms during these months, however, may disrupt the mid-latitude ionosphere. As we approach the Spring Equinox, Earth's magnetic field is sufficiently perturbed by solar wind particles flowing into the auroral zone (between 50 and 70 degrees north geographic latitude) to cause the mid-latitude ionosphere to be depleted. This February, we are unlikely to see any significant solar storm, though we might see periods when a coronal hole could influence some storminess.

Below the auroral zone, during those periods where the solar wind is elevated, the ionosphere develops a trough that extends southward, especially on the dark side of the Earth (at night) for two or three days in a row. At the same time, near the equator, geomagnetic disturbances enhance ionization. This is the reason for the higher MUF and ionospheric tilts that give us transequatorial (TE) propagation. TE is prevalent during the equinoctial months and more so in the spring than in the autumn, and throughout the winter in general.

While rare due to the low solar activity, 19 meters through 11 meters may open shortly after sunrise and remain open until early evening. Morning and evening DX openings between some areas in the Northern Hemisphere on these bands are very short, because the band in question closes on one end of the path before it opens on the opposite end. TE propagation on these bands will be more likely toward sunset during days of high solar flux and a disturbed geomagnetic field (look for days with an Ap greater than 15, or a Kp greater than 3).

Paths on 31 through 15 meters remain in their seasonal peak much like in January, but with longer openings. Continue to look for great openings between North America and Europe in

Optimum Working Frequencies (MHz) - For February 2006 - Flux = 74, Created by NW7US

UTC TO/FROM US WEST COAST	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CARIBBEAN	19	17	14	11	11	10	10	9	9	9	9	9	9	8	14	17	19	20	21	21	21	21	21	20
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CENTRAL SOUTH AMERICA	26	24	21	15	15	14	13	13	12	12	12	12	12	11	19	23	25	26	27	27	28	28	28	27
SOUTHERN SOUTH AMERICA	28	26	24	21	17	16	15	14	14	13	13	12	12	12	12	21	24	25	26	27	28	29	29	29
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EASTERN NORTH AMERICA	15	13	9	9	8	8	8	8	7	7	7	7	7	11	14	15	16	17	17	17	17	17	16	16
CENTRAL NORTH AMERICA	7	6	5	4	4	3	3	3	3	3	3	3	3	3	5	6	7	7	8	8	8	8	8	7
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CHINA	13	11	10	9	9	9	8	8	8	8	8	8	8	10	9	9	9	8	8	8	8	8	8	8
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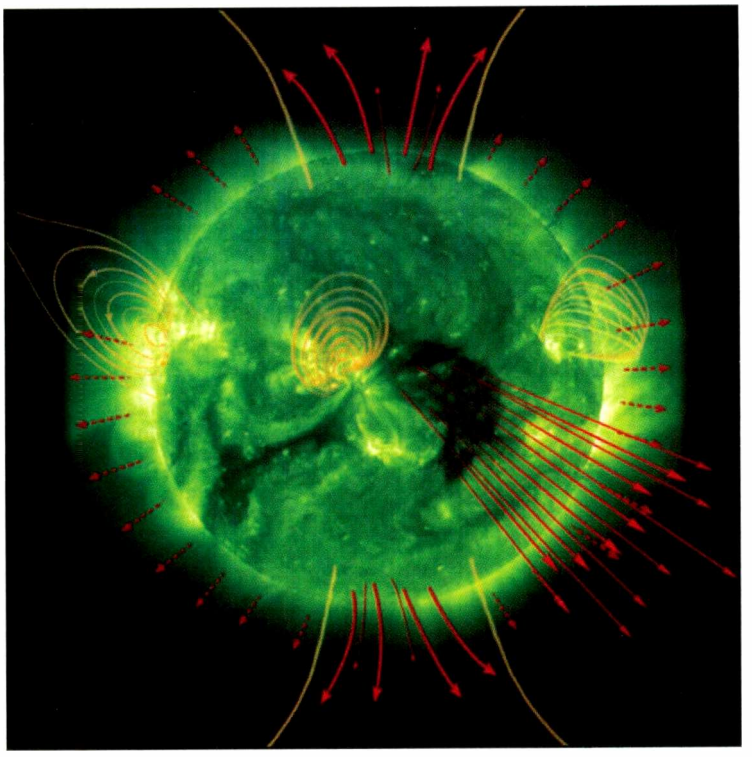


Figure 2. The sun's atmosphere is threaded with magnetic fields (yellow lines). Areas with closed magnetic fields give rise to slow, dense solar wind (short, dashed red arrows), while areas with open magnetic fields—so-called "coronal holes—yield fast, less-dense solar wind streams (longer, solid red arrows). In addition to the permanent coronal holes at the sun's poles, coronal holes can sometimes occur closer to the sun's equator, as shown here just right of center. (Source: September 18, 2003, image from the SOHO Extreme ultraviolet Imaging Telescope, ESA/NASA)

the morning and between North America and Asia during the late afternoon hours. Twenty-two and 19 meters continue to be the best daytime DX bands, with 31 and 25 running a close second. TE paths on 25 through 15 meters will be reliable and open for most of the daylight hours, especially where paths terminate in the Southern Hemisphere.

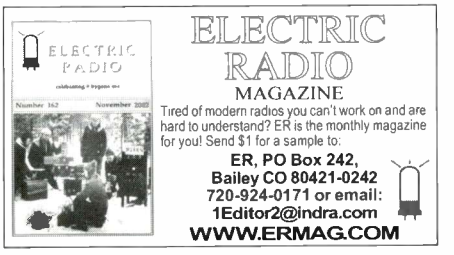
Ninety through 41 meters will be useful almost 24 hours a day. Daytime conditions will resemble those of 25 meters, but skip and signal strength may decrease during midday on days with high solar flux values. Nighttime will be good except after days of very high MUF conditions. Generally, the usable distance is expected to be somewhat greater on the higher of these bands than on 90. DX activity tends to increase later in the evening toward midnight. Look for Africa and South Pacific (Australia, Papua New Guinea, and so on) on 90 through 60 meters throughout the night. On 41, 49 and 60 meters, long path DX is possible along the gray line.

The 120-meter band continues to remain stable, with very low noise levels. Throughout the winter season, high noise may occur during regional snowstorms. The band opens just before sunset and lasts until the sun comes up on the path of interest. Except for daytime short-skip signal strengths, high solar activity has little impact. Geomagnetic disturbances near the Spring Equinox cause signal attenuation and fading on polar paths. Noise will be very noticeable on these lower frequencies. Continue to look for Europe and Africa around sunset until the middle of the night, and then Asia, the Pacific, and the South Pacific as morning approaches.

Signals below 120 meters will remain strong and exciting, except during times of regional storms and high geomagnetic activity. Mediumwave DX is still quite hot throughout February.

Coronal Holes

A major source of solar disturbance during solar cycle minimums is the occurrence of coronal holes and the resulting solar wind storms. When the Earth is under the influence of high-



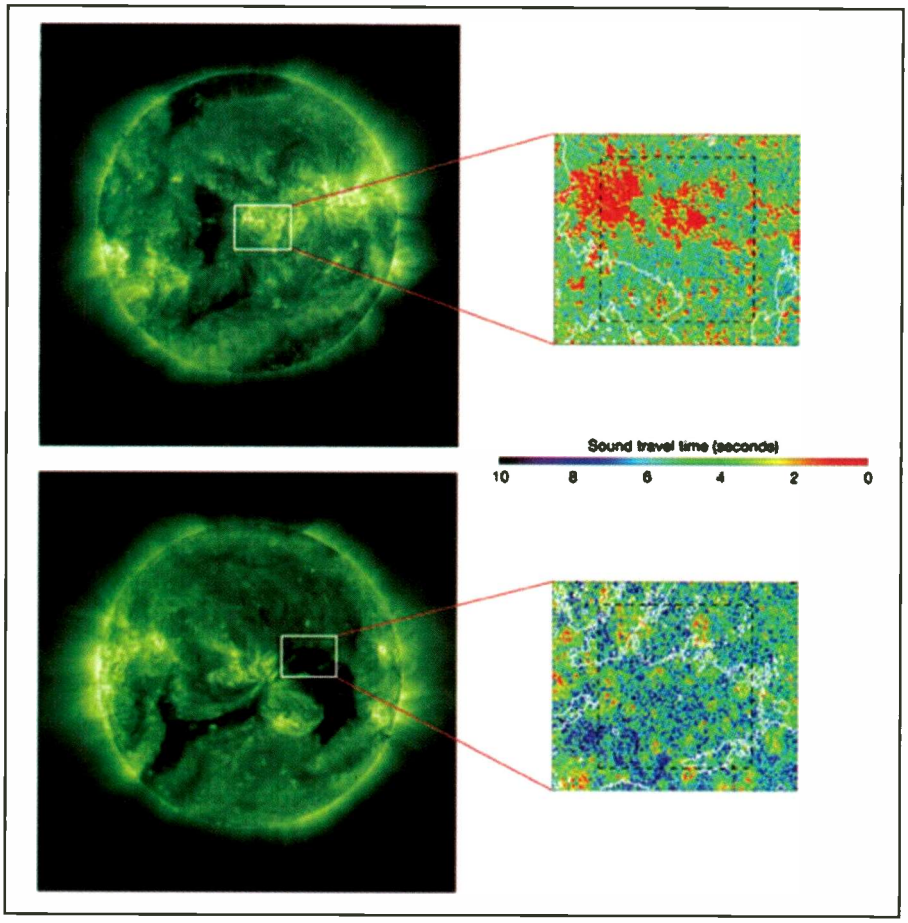


Figure 3. Sampling an area of the sun's upper atmosphere (shown approximately by the white outlines on the full sun images at left), McIntosh and colleague Dr. Robert Leamon used measurements made by NASA's Transition Region and Coronal Explorer (TRACE) spacecraft of a region with strong, closed magnetic fields on July 7, 2003 (top), and another region with weaker, open magnetic field on September 18, 2003 (bottom). The areas in red in the top "time difference" image show a shallow, dense chromosphere beneath an area with slow, dense solar wind outflow; the areas in blue in the bottom image show a deep, less-dense chromosphere below a "coronal hole" with fast, tenuous solar-wind outflow. (Source: Images on left from the SOHO Extreme ultraviolet Imaging Telescope, ESA/NASA; images on the right from Astrophysical Journal, University of Chicago Press)

speed solar winds, we often experience periods of geomagnetic disturbances that can develop into significant storms. That in turn triggers the aurora VHFers look forward to.

A Chinese-German team of scientists has identified the magnetic structures in the solar corona where these fast solar winds originate. They analyzed images and Doppler maps from the Solar Ultraviolet Measurements of Emitted Radiation (SUMER) spectrometer and magnetograms delivered by the Michelson Doppler Imager (MDI) on the space-based Solar and Heliospheric Observatory (SOHO) of the European Space Agency (ESA) and NASA, and found that solar winds were flowing from funnel-shaped magnetic fields that are anchored in the lanes of the magnetic network near the surface of the sun. The fast solar wind seems to originate in coronal funnels with a speed of about 10 km/s at a height of 20,000 kilometers above the photosphere. According to Professor Chuanyi Tu from the Department of Geophysics of the Peking University in Beijing, China, "The fast solar wind starts to flow out from the top of funnels in coronal holes with a flow speed of about 10 kilometers per second. This outflow is seen as large patches in Doppler blue shift (hatched areas in the **Figure 1**)...at a temperature of 600,000 Kelvin."

Together with Professor Marsch, they were able determine that the blue-shift pattern of this line correlates best with the open field structures at 20,000 kilometers.

Solving the nature and origin of the solar wind is one of the main goals for which SOHO was designed. It has long been known to the astronomical community that the fast solar wind comes from coronal holes. What is new here is the discovery that these flows start in coronal funnels, which have their source located at the edges of the magnetic network. Just below the surface of the sun there are large convection cells. Each cell has magnetic fields associated with it, which are concentrated in the network lanes by magneto-convection, where the funnel necks are anchored. The plasma, while still being confined in small loops, is brought by convection to the funnels and then released there, like a bucket of water is emptied into an open water channel.

Because of this discovery, the solar wind plasma is now considered to be supplied by plasma stemming from the many small magnetic loops, with only a few thousand kilometers in height, crowding the funnel. Through magnetic reconnection plasma is fed from all sides to the funnel, where it may be accelerated and finally form the solar wind.

Another group of scientists was surprised to discover that the structure of the sun's cooler, dense lower atmosphere, the chromosphere, could be used to estimate the speed of the solar wind. This was unexpected because the solar wind originates in the corona, and the chromosphere is much deeper, lying just above the sun's visible surface. "It's like discovering that the source of the river Nile is another 500 miles inland," said Dr. Scott McIntosh of the Southwest Research Institute, Boulder, Colorado, lead author of a paper on this research published May 10, 2005, in the *Astrophysical Journal* (see **Figure 2**).

The new work promises to increase the accuracy of space radiation forecasts. When the sun unleashes a coronal mass ejection (a billion-ton blast of plasma) into space at millions of miles per hour, it is likely to trigger geomagnetic storms. The VHF enthusiast benefits from a forecast that accurately identifies a pending storm, because that would signal the possible auroral propagation soon to commence.

The solar wind is gusty, much like winds on Earth, and range in speed from about 750,000 miles per hour (approximately 350 kilometers per second, to 1.5 million miles per hour (700 kilometers per second). You can view the current solar wind speed as measured by sending your Internet web browser to http://www.sec.noaa.gov/SWN/.

Since the solar wind is made up of electrically charged particles, it responds to

magnetic fields that permeate the solar atmosphere. Solar wind particles flow along the invisible lines of magnetic force. When the magnetic field lines stretch straight out into space, as they do in coronal hole regions, the solar wind will move along these magnetic lines at a very high rate of speed. But, when the magnetic field lines bend sharply back to the solar surface, like the pattern you see with iron filings around a bar magnet, the solar wind emerges relatively slowly. For over 30 years this model has allowed space weather scientists to create a crude estimate for the speed of the solar wind.

In the new work, the team has tied the speed of the solar wind as it blows past Earth to variations deeper in the solar atmosphere than had previously been detected, or even expected. By measuring the time taken for a sound wave to travel between two heights in the chromosphere, they were able to determine that the chromosphere is effectively "stretched thin" below coronal holes with their open magnetic fields, but compressed below magnetically closed regions.

Clues On VHF

The team used the observation to derive a continuous range of solar wind speeds from the structure of the chromosphere. The wider the chromospheric layer is, the more it is being allowed to expand by open magnetic fields and the faster the solar wind will blow. This new method is more precise than the old "fast or slow" estimate (see **Figure 3**).

This is a welcome development, since the radio hobbyist can now better assess the probability of geomagnetic activity that would trigger conditions useful for VHF propagation. By knowing more accurately when a solar wind shock wave will arrive, and how intense the plasma cloud will be, combined with the orientation of the magnetic components, the VHF radio amateur scientist can be ready for action. With the VHF radio community ready for these opportunities, more participants will be on-scene to make these openings memorable.

When the interplanetary magnetic field lines are oriented opposite to the magnetosphere's orientation, the two fields connect and allow solar wind particles to collide with oxygen and nitrogen molecules in the upper atmosphere of these ovals. This causes light photons to be emitted. When the molecules and atoms are struck by these solar wind particles the stripping of one or more of their electrons ionizes them to such an extent that the ionized area is capable of reflecting radio signals at very high frequencies. This ionization occurs at an altitude of about 70 miles, very near the *E* layer of the ionosphere. The level of ionization depends on the energy and amount of solar wind particles able to enter the atmosphere.

While correlations exist between visible and radio aurora, radio aurora could exist without visual aurora. Statistically, a diurnal variation of the frequency of radio aurora QSOs has been identified that suggests two strong peaks, one near 6 p.m. and the second around midnight, local time.

VHF auroral echoes, or reflections, are most effective when the angle of incidence of the signal from the transmitter, with the geomagnetic field line, equals the angle of reflection from the field line to the receiver. Radio aurora is observed almost exclusively in a sector centered on magnetic north. The strength of signals reflected from the aurora is dependent on the wavelength when equivalent power levels are employed. Six-meter reflections can be expected to be much stronger than 2-meter reflections for the same transmitter output power. The polarization of the reflected signals is nearly the same as that of the transmitted signal.

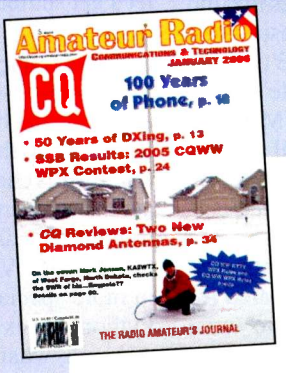
The K index is a good indicator of the expansion of the auroral oval, and the possible intensity of the aurora. When the K index is higher than 5, most readers in the northern states and Canada can expect favorable aurora conditions. If the K index reached 8 or 9, it is highly possible for radio aurora to be worked by stations as far south as California and Florida.

For the daily conditions, you are welcome to check my propagation resources, given below.

I'd Like To Hear From You

You can join in with others in discussing space weather, propagation, and LF, MW, shortwave or VHF listening, at http://hfradio.org/forums/. Be sure to check out the latest conditions, as well as the educational resources about propagation, which I have put together for you at http://prop.hfradio.org/. I also provide a WAP/WML resource for wireless devices. If you want the latest propagation information like the solar flux, Ap reading, and so forth using a cell phone or other WAP device, check out http://wap.hfradio.org/, the wireless version of my propagation site.

And please don't hesitate to write and let me know about any interesting propagation that you have noticed. Do you have questions about propagation? I look forward to hearing from you. Happy signal hunting! ■



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by Joe Cooper, carm_popcomm@hotmail.com

Programming Software Overview—Understanding Which Software Package Is Best For You

As I have pointed out in the columns that have been published over the past year, the "leading edge" of modern radio design has shifted from the use of "real" electronic parts to "virtual" components. These virtual components are created when specially designed software programs are run in a personal computer and, rather than tuning a signal as conventional radios do, they "process" radio signals as digital information.

Due to this significant change in radio technology many hobbyists who have enjoyed building radios in the past are now faced with a dilemma: how do we continue to enjoy "hands on" construction projects when radio circuits are now computer software algorithms? The answer is simple: if that's how radios are now being built, learn how to do that too using the new tools we have available.

Frankly the radio monitoring hobby has faced several major shifts in technology in the past and has managed to survive each one successfully. One example I'm old enough to remember was the big switch that took place between the use of vacuum tubes to transistors, and then to integrated circuits.

Even today there is still a strong contingent of people who proudly claim, "real radios glow in the dark," who take great pride in maintaining their vintage equipment in top form. Likewise, you'll still find a significant group of people who will only use vacuum tube based amplifiers in their high-end audio equipment.

What's really going to bring about the biggest changes in radio monitoring will be the new modes of digital radio transmission that will be taking over the airwaves soon, such as DAB (Digital Audio Broadcasting), DRM (Digital Radio Mondiale), HDC (Hi-Definition Compression) and more. AM and FM radio, which have been with us since the 1920s and 40s, will eventually be retired from use in commercial broadcasting, rendering all of those wonderful analog radios we now own obsolete.

So truly it's best to be ready for what's in store.

So in addition to learning how to use your computer hardware and operating system very well, the best way to be prepared for this new software-based technology is to learn how to write computer software programs.

As I've point out many times, it's actually not that difficult to learn how to be a software programmer, as long as you take your time, work out a goal and keep track of what you've learned.

Again, in last month's column I pointed out that it is not the programming languages that make computer programs work it's the sequence of concepts and the logic built into that software by the programmer that makes them truly functional.

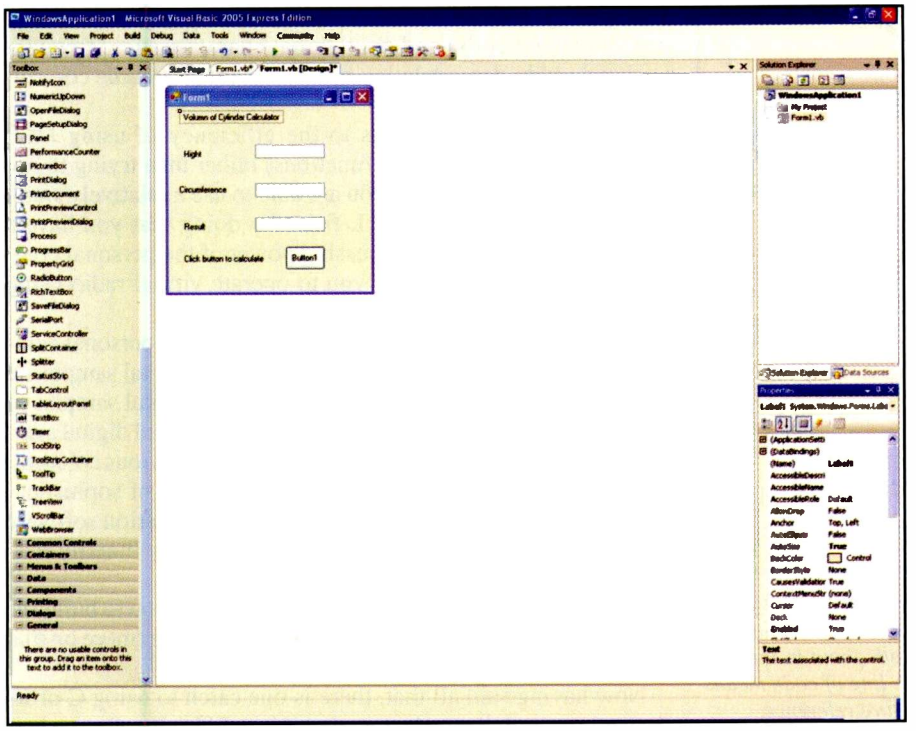
So what I'm going to be introducing you to in this month's column is the way in which you can create your new "workshop" for building Software-Defined Radios (not to mention other software projects that can be of direct benefit to the person who wants to perform computer-assisted radio monitoring). More importantly, what I'm also going to show you is how to set up this "workshop" for free, and that includes the training in how to use the software tools you choose to be part of your new toolkit. So let's get started.

Choosing The Proper "Workshop"

One of the biggest obstacles that most people face when sitting down to the task of learning how to become a software programmer is choosing which language to learn first. Frankly there are a large number to choose from, ranging from the ones used in commercial software programming (FORTRAN, COBOL, C+, BASIC, Visual BASIC, JAVA, to name a few) to ones used in more specialized situations (Euphoria, Smalltalk, Ruby and Python, for example).

Again, what is extremely important to understand is that the primary task that the computer programmer performs is translating human concepts into a form that a computer can "use." You must remember that ultimately the only program that a computer can "understand" is the binary code of 0 and 1 that make up "Machine Language." This set of instructions tells your computer's CPU (Central Processing Unit) what to do. In order for your computer to work, literally millions of 0's and 1's stream through the CPU every second, providing instructions for processing digital information.

Given such a vast number of 0s and 1s involved it's impossible for a human being to be able to write computer programs in Machine Code. The closest that we can get to



Welcome to your new workshop! This is where 21st Century radio hobbyists will build their software-defined radios and other computer-assisted radio monitoring devices. Pictured here is Microsoft Visual Basic 2005 Express edition, showing the cylinder volume calculator I talked about in this month's column.

writing directly in Machine Code is programming in Assembly Language, which uses grouped alphabet characters, called mnemonics, to represent binary code instructions.

Now when all is said and done, what you accomplish by writing a program in Assembly Language is a relatively simple program that takes a numerical value out of your storage memory (RAM), places it into the CPU for processing and then places the results in another memory location (again in RAM).

The results of using this type of programming is an extremely fast CPU processing of a large amount of information, which is important if you are doing a large number of mathematical calculations (say for when predicting weather for all of the continental United States for a week).

However, to be able to create such a program you need to have an extremely complex understanding of the computer hardware you are using and the information you are going to have it process. That task is going to involve a tremendous amount of time and energy, so such work is reserved for critical projects (like weather prediction, nuclear energy and physics experiments, to name a few applications).

So the vast majority of computer software programming used, "high-level" programming languages (such as FORTRAN, COBOL, C+, BASIC, Visual BASIC, JAVA, named before) due to the simple fact that they are relatively easier to work with than either Machine or Assembly languages.

More importantly, rather than simply performing "brute force" processing tasks that are performed using Assembly Languages, such as mathematical calculations, these high-level languages allow for more subtle concepts to be programmed, such as modeling a radio's electronic components in virtual form.

So when you choose a computer software language to perform that task of converting a radio into mathematical formulas, what you must first do is ask which programming language will best convey those modeling concepts in software form. Making a choice as to what language is appropriate for a particular programming situation is more of an art than science, and frankly for the types of situations that you will be encountering, only a handful of choices really need to be considered.

Likewise if you are interested in creating software for radio monitoring applications based upon the Microsoft Windows operating system, then you are really looking at two programming working environments—various versions of C (or more currently C, C+ and Microsoft Visual C++) and Microsoft Visual Basic.

Each of these software programming languages presents its own particular strengths and challenges, so let me introduce you to their essential characteristics and explain how each can be used to help you create useful programs for computer-assisted radio monitoring.

Intro To C, C+ And MS Visual C++

The C programming language was originally developed in 1970 by Ken Thompson and Denis Ritchie at AT&T Bell Labs for use on the UNIX operating system. It was originally used to write system software, which is one of the major components of an operating system that is used for running computer hardware.

Due to the fact that C was originally designed to work closely with computer hardware it was actually designed to be closer to assembly language than to a high-level language like BASIC and was once referred to as a medium-level language.

However, what made C different from assembly language was that rather than creating one executable file for an entire application (which those who remember early Windows or DOS based programs will be familiar with), C programs used a core program that accessed multiple libraries of functions stored in individual files.

You can see that structure if you use your Microsoft Explorer program to look at the content of a directory for most of today's software programs. If you do that you will see that there is one file called an "application" with one or more files called "application extensions" residing in that directory.

The application is written using what is called a "core language," which provides the main functions of the software program, and more importantly, makes use of those previously-mentioned extra files.

Those extra files are called libraries and they contain sub-programs that perform various functions that are useful for the operation of the main software program. Technically they are called "Dynamically Linked Libraries" and you will note that their file extension is "DLL" (with the result being they are often called "DLL Files").

These DLL files become useful due to their re-usability in more than one software program. So rather than having to program a lot of small details over and over again, a programmer can use a previously written DLL in order to save time.

How to say "Hello, world!" in a computer language.

Assembly Language

```
MODEL   SMALL
IDEAL
STACK   100H

DATASEG
        MSG DB 'Hello, world!', 13, '$'

CODESEG
Start:
        MOV AX, @data
        MOV DS, AX
        MOV DX, OFFSET MSG
        MOV AH, 09H       ; DOS: output ASCII$ string
        INT 21H
        MOV AX, 4C00H
        INT 21H
        END Start
```

C++

```
#include <iostream.h>

main()
{
    cout << "Hello World!";
    return 0;
}
```

Visual Basic

```
' A "Hello World!" program in Visual Basic.
Module Hello
   Sub Main()
      MsgBox("Hello World!")    ' Display message on computer screen.
   End Sub
End Module
```

One of the first computer programs that anyone learns is one that prints out "Hello, world!" on a video screen. Here is an example using the three computer programming languages that I talk about in the column. Don't worry about the details of what each line of code means right now. Just notice the differences for future reference.

In fact when you upgrade or add new features to a software program what you are most often doing is simply adding new DLL files to the library of an existing application.

Very often one software company may buy custom made DLL files from another software company that specializes in writing them in order to make their own software perform certain tasks, thus saving valuable programming time.

Likewise, many hobbyist software programmers share DLL files with one another for the same reason; so that people can add expanded functionality to their own software programs without having to spend time programming small details.

The power and flexibility of this type of programming was further enhanced during the 1980s as C became C+ (pronounced C Plus) and then C++ as new features came to be incorporated. These new features provided a very sophisticated programming method called "Object Oriented" (or OO), which models the characteristics of abstract or real things using objects.

Now to put this into terms that are understandable, an object is seen as having two basic characteristics: a state (of being) and (personal) behavior. For example, all pet dogs have a state (of being), that is they have a name, a color, a breed and they are hungry on a regular basis. Likewise the majority of pet dogs exhibit the same (personal) behavior, barking, fetching, and tail waging.

Even inanimate objects have a state (of being), such as the bicycle, which has gears, pedals, two wheels and motion. It even has (personal) behavior, such as braking, accelerating, slowing down and changing gears.

As you can see, once you are able to model something (e.g. small dogs + bark a lot = Jack Russell Terriers, or 10 speed + fast acceleration = racing bicycle) you are able to treat the results as having a "virtual" existence within your software program.

The key point here is that radios as objects have states and behavior too. (Have you experienced the big "ah-ha!" yet?)

So due to the fact that C+ is very close to assembly language it operates very fast with a personal computer, and because of that speed you can model the electronic components (resistors, capacitors and coils) and operational characteristics (frequency, bandwidth, demodulation mode and audio volume control) of a radio in virtual form.

More importantly (thanks to the efficiency of using DLL libraries to perform various functions) rather than trying to run one big software program, you are able to use a relatively small one thanks to the use of DLL files. By doing that you have a great deal of "left over" processing power of the personal computer's CPU that will allow you to operate virtual radio using SD radio software.

Again, you can operate a virtual radio within a personal computer by supplying the software program with digital samples of radio signals. This is accomplished by taking digital samples of radio signals off of an antenna by using a wide band digital sampling device, such as the ones I've described in previous columns.

Now if you want to take C+ to the next level of sophistication the current standard for programming application software for personal computers is C++, which is used by literally millions of computer programmers worldwide.

There is Microsoft Visual C++, which allows you to build the graphic user interface (or GUI) using simple tools (more on that in the next section on Visual Basic).

Now having said all that, there is one catch to using C or its derivatives, and that is the fact that it is a difficult software language for the beginner to learn due to its mid-range language characteristics.

A better choice for those who wish to become good amateur software programmers, and still have the potential for working with Object Oriented Programming (OOP), would be Microsoft's Visual Basic.

As the name implies, its roots lay in the popular (and easier to understand) BASIC programming language, which has a proven track record of use and acceptance by those who want an easier entrance into software development. (And if you are curious, yes there was an "A" and "B" programming language before C, but that's a story for another column.)

Intro To MS Visual Basic

The Beginners' All-purpose Symbolic Instruction Code (BASIC) is a computer language that has been around for 40 years now, having first been developed by mathematicians John Kemeny and Tom Kurtzasat at Dartmouth College in 1964.

BASIC is a high-level language that uses an English syntax like LET, PRINT, IF and GOTO as commands, and in earlier forms provided line numbers that allowed a programmer to keep track of a task they were working on.

While originally designed as a training tool, BASIC has the capability of being expanded for use in more sophisticated tasks. This capability was used by Bill Gates and his business partner Paul Allen to create Altair BASIC in 1975, which was Microsoft's first commercial product. (It was also Gates' BASICA that brought Microsoft into a partnership with IBM due to the fact that company's new IBM-PC needed a programming language. That opened the door for Gates to develop PC-DOS, and later MS-DOS and Windows, thus gaining control of the personal computer world for the next decade).

So again, due to its origins as a training tool, many people have come to feel that BASIC is not a "real" programming language like C++, despite the fact that it is used today in powerful products like Oracle Power Objects and Microsoft Visual Basic.

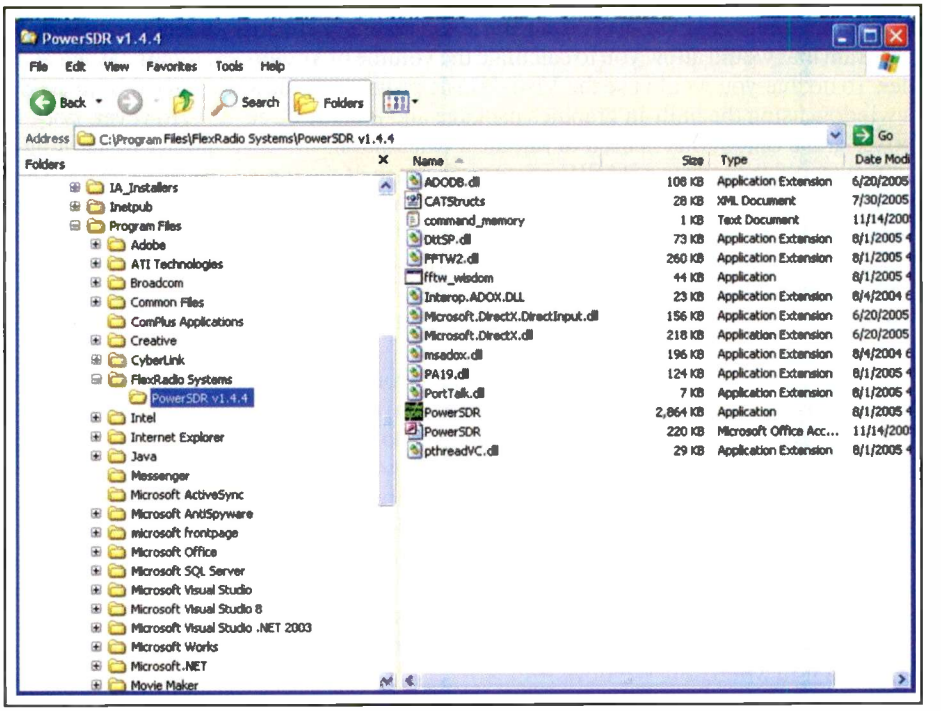
Visual Basic (or VB) was developed by Microsoft in 1987 as a direct competitor to C and C++, and while it was not initially accepted by the programming community, today it is the fastest growing programming language on the market.

The primary strength found in Visual Basic is that you can create software code in minutes that would normally take you days in C+. Visual BASIC does this by allowing programmers to attach software code written in a sophisticated version of the BASIC programming language directly to the graphic elements used in the Windows operating system, such as buttons, pull down menus and text boxes.

So in order to create a software program using Visual Basic, what you essentially do is perform three steps.

First you use a graphic designer in the VB programming software to draw a user's interface with all of the buttons and text boxes you require. Once that is done you then write the software code used to run the program and then "attach" that code to each of the buttons or boxes.

With all of the code attached, you then link the code together so that it performs the task that the software was designed to do. This can be illustrated by very simple example.



This is what happens after you write your code and create a finished software program. You end up with a mix of different types of files. As I outlined in the column, you have two primary types of files in a software application: one application file and many DLL files (plus a mix of additional files that provides documentation for configuring the application). Remember that the DLL files contain sub-programs used to reduce the overall size of the application by splitting it into smaller files. When you update a software application, these are the files that are replaced with new ones.

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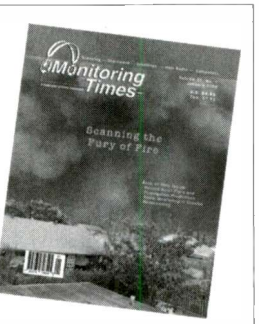

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Say that you wanted to use Visual Basic to create a software program that would allow you to calculate the volume of a cylinder. To do that you would use the Visual Basic program to draw a window using the built-in graphics package and include three boxes and a button that is used to initiate a calculation.

You would then write a BASIC program for each of the three boxe—one to accept the height of the cylinder, another for the diameter and a third for displaying processed information.

Finally you would write a BASIC program for the button that would initiate the actual calculation when it was clicked (assuming that you had put numerical values into the first and second boxes).

That program would use the numerical data from the first to boxes to the formula for cylindrical volume ($\pi r2h$) and then display the product of that calculation in the third box.

Once you finished doing that you would write another BASIC program that would link together the three boxes and to that button, so that when you clicked on the button with your Window's mouse the calculation would be performed and the product displayed.

When you were finished with all of those tasks you would then turn what you had written into an executable program and then run it in Microsoft Windows.

The truth is that most advanced programming techniques comes from learning how to build such simple software programs and then learn to attach more and more features as you progress in your knowledge.

So for many people who want to become hobbyist computer programmers, particularly for computer-assisted radio monitoring projects, Microsoft Visual Basic is an ideal beginning point.

So, Which One Do You Use?

Now the question you might have is, "well you told me earlier that you need OOP software like C+ and C++ in order to be able to model a virtual radio. Can you do the same thing with Visual Basic?"

Fortunately the answer to that is yes.

With the introduction of Microsoft Visual Basic 6.0 in 1998, all of the key components required for OOP (abstraction, encapsulation, polymorphism, and inheritance, which I'll explain in detail in a future column) were included.

Since then each new version of MS Visual Basic (such as the 2005 version) have had further enhancements of OOP included, so as a result you can develop sophisticated software for Software-Defined Radios, or other computer-assisted radio monitoring applications, using this software development tool.

However, as previously mentioned, Microsoft also makes Visual C++, which allows you to create Windows software programs in the same way as MS Visual Basic, but using C++ code instead.

So given the choice between the two programming languages, which one is "the better choice"?

The truth is that today it's becoming "six of one, half dozen of the other" when it comes to comparing. Anything written using C++ will save programming time because you use libraries of pre-written code and you also save time with Visual Basic because you build a significant part of the program using graphic tools, rather than code.

However, the bottom line for most software programmers is the fact that C++ is closer to machine language in form than BASIC, so programs written in C++ will be faster. In that regard it's not surprising that for the best performance of virtual radio circuitry (such as is used in Software-Defined Radios) the language of choice is C++.

However, does that mean that you have to give up the simplicity of learning BASIC if you are new to software programming? The answer this time is no, because the refinements that have been made in the current versions of MS Visual Basic are making performance less and less an issue.

So the answer seems to be to try programming in both environments and see what you think of them. I'm sure your first reaction is "well, where am I going to find the money to spend on two pieces of software, one of which I may not like?"

Well thanks to the fact that Bill Gates wants you to become a software programmer you can download hobbyist versions of Microsoft Visual Basic and Visual C++ (along with several other programming languages) and use them for free!

Not only that, you can also get various types of training programs (ebooks, tutorials, on-line videos) for each of those programming languages directly from Microsoft for the same cost —free! This is an incredibly generous offer that you really should not pass up if you want to begin learning how to program in the Windows environment.

More importantly, there is a time limit on this free offer which will end on November 7, 2006. The thing to keep in mind is that while these are hobbyist versions of the programming languages, they are not toys. Not only can you use them to learn to write useful computer software by using them, you are also allowed under the license agreement that comes with them to create commercial (e.g. you can sell them for money) software packages without having to have a license from Microsoft.

So go to the Microsoft Express Editions at: http://msdn.microsoft.com/vstudio/express/default.aspx.

Take your time and read over the background information on the software that is offered there, which includes Visual BASIC and C++, along with several other important programming languages. Also make certain that your computer has enough hard drive space and operating power to be able to use the programming software properly. For best performance you should have the following computer configuration (or better):

- 1-GHz Pentium Processor
- Windows 2000 with service pack 4 or Windows XP with service pack 2
- 256 Meg of RAM (or better)
- 1.3 GB of available hard drive space

As with anything to do with personal computing, the more RAM, processing power and hard drive space you have the better your computer software will perform, and this particularly applies to using programming software.

What you will discover is that the processing required to actually create a software program (compiling) takes a lot of computing power and will tax whatever system you have to its limits if you don't have power to spare.

Likewise, given the size of the software programs that you are going to be downloading you will find that it will take a very long time if you are using a dial-up modem, so be forewarned.

The first thing you should do is to read the instructional material provided on the Microsoft Express website, particularly the Frequently Asked Questions (FAQ), overview information and

feature tour. That information will allow you to make the right decisions about downloading and installing the software. More importantly, it will also point you in the right direction for learning how to program and connect to on-line communities of people, called forums, who are sharing information on how to use programming software.

The key point is that the quicker you begin to use programming software, particularly if you are doing so while following some type of structured training instruction like that provided by Microsoft, the quicker you will be able to master the skills involved.

As I have always suggested in the past, set reasonable goals for yourself, work at a short but consistent pace (such as an hour a day maximum) and keep a log of what you do with your computer, particularly to keep track of new programming techniques you have just learned.

If you do that consistently then in a surprisingly short period of time you'll find that you are making fewer mistakes and the code that you write will actually produce usable computer software.

Remember as well to enjoy the journey, be proud of your accomplishments as this is a challenging task, and remember that there are real rewards waiting for those who stay with that task to the end.

Next Month

I will be continuing this examination of computer programming, looking at what you get once you download and install one of Mr. Gates' "Express" software development tools.

Yes, it is a little complicated at first, but once I have shown you the layout and structure of the files and how they are viewed and modified in the editor program, you will begin to see the bigger picture of computer programming very quickly.

Do not forget that if you wish to e-mail me with any questions use my e-mail address: carm_popcomm@hotmail.com. As mentioned before, I cannot answer general questions on computers, but will be more than happy to help you with any issues raised in the columns.

Unfortunately the unbelievably terrible storms and hurricanes have continued to hit parts of the United States, including Florida and Indiana. What a year it has been with so many people having to face so many personal hardships. In saying that I would like to suggest that you send donations to the American Red Cross—http://www.redcross.org/donate/donate.html in order to help your fellow American citizens in this time of trouble. There are many other good (and ethical) organizations that you can contribute to, so please use them if you wish.

Once again, do remember our troops overseas and give them your support. As mentioned previously, the "Any Service Person" mail program no longer exists for security reasons. Please refer to the U.S. Department of Defence's official webpage, "Defend America." They have a specific section found at: to www.defendamerica.mil/support_troops.html and it has an amazingly wide range of practical and useful ways that you can directly help.

If you are fortunate to have a home, a job and your loved ones around you in these times when so many don't, please remember to give thanks for your personal blessings by remembering to pass on that blessing to others through regular acts of selfless sharing. ■

INFOCENTRAL *(from page 5)*

the Thai service, the BBC is also expected to end its central European language services such as Polish, Czech, Slovak, Romanian, Hungarian and Macedonian. *The Nation* also reports that the BBC also wanted to shelve the Tamil and Nepalese services, but that was put on hold as the political instability in Sri Lanka and Nepal remained on the international news agenda.

American Military Launch Radio Rasul In Afghanistan

Radio Rasul, an Arabic word meaning "message," is a mobile radio station operated by the 82nd's 1st Battalion, 325th Airborne Infantry Regiment and the 44th Signal Battalion that broadcasts music, news, public service announcements and other information provided by the Wardag provincial government to the local population. The radio station gives the government a way to promote itself and its programs to the local people, the majority of whom don't read and don't have access to televisions, said American Army Lt. Col. David Anders, Commander, 1st Battalion, 325th Airborne Infantry Regiment.

The radio station made its first broadcast September 16 and has been running from 8 a.m. to 9 p.m. every day since then. It broadcasts over FM and has a range of 40 to 60 km. The station is totally mobile and can be used anywhere as long as it has a power source. The programming is pre-recorded and is then beamed out over the airwaves in a continuous loop.

SLBC Staff Protest Against Chairman

Staff at the Sri Lanka Broadcasting Corporation (SLBC) has started protests against SLBC Chairman Hudson Samarasinghe. It's being alleged that Mr. Samarasinghe assaulted SLBC news director Raja Katugampola and threatened his life for broadcasting Premier Mahinda Rajapaksa's election campaign news. Mr. Samarasinghe was admitted to the hospital following the alleged assault. SLBC staff has accused Mr. Samarasinghe of creating "terror-work conditions" at the SLBC, and are urging President Kumaratunga to dismiss him immediately.

A trade union spokesperson said that the Chairman "tries to introduce dictatorship" in SLBC. The Sri Lanka Progressive Front trade union is angry with Mr. Samarasinghe for "crippling" the ruling party presidential candidate's election campaign.

Japanese Abduction Inquiry Group To Start Shortwave Broadcasts

Kazuhiro Araki, head of the Investigation Commission on Missing Japanese Probably Related to North Korea, has told reporters that the group plans to start shortwave broadcasts. The broadcasts, in Japanese, will be beamed to North Korea in the hope of reaching abducted Japanese citizens, who the Commission hopes will respond to the messages. No details were given of the times and frequencies, and whether these will be self-contained broadcasts or inserts into existing Japanese transmissions. (It seems unlikely that there will be any response, given that listening to shortwave broadcasts from overseas is forbidden in North Korea, and in any case making contact would be extremely difficult and dangerous). ■

by Kirk Kleinschmidt, NTØZ, kirk@cloudnet.com

Ready! Set! Communicate!

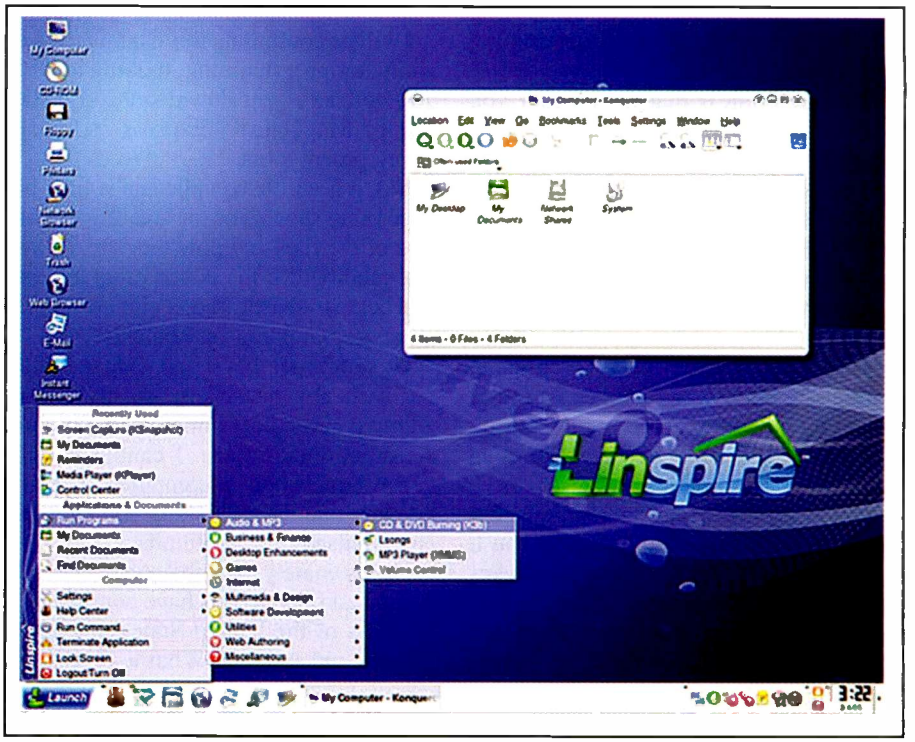
Although I've been—among other things—a computer tech for more than 20 years now, I have only recently begun to take advantage of the various online chat and instant messaging services available on the Internet (and used more effectively by millions of teenagers every day, I might add!). Perhaps it has something to do with the fact that I'm single again, but the conversations (QSOs?) I've been having online (DX and local) are quite a bit more interesting than the bulk of the conversations I have on-air—which is actually a bit upsetting!

Even in these dog days of the current sunspot cycle, when rampant, crazed, 24-hour DX contacts are impossible (and ragchewers exact their revenge on the bands), my ham conversations have become a bit stilted and "cookie-cutter." To be sure, online chatters aren't bound by the constraints of FCC licenses, but they're also not bound by most hams' often unfortunate tradition of limiting our conversations to radios, signal reports, the weather, and gall bladder surgeries, either!

The online "netizens" are real people talking about real things—some interesting, some funny, and some stupid. And there's no reason why we hams can't follow their lead. Imagine how much fun our hobby would be if we were people first and hams second? Wayne Green, W2NSD, the founder and former editor of *73 Magazine*, used to periodically rant about how hams need to be conversationalists first, technology hobbyists second. He was definitely onto something, and his message is still valid today.

Until I visited www.waynegreen.com I didn't remember whether Wayne was still with us! Apparently, according to his recent blog entries, he is—and he's as outspoken as ever. If you're too new to remember "Uncle Wayne," check out his website and see if you can dig up some of his *73 Magazine* ham radio editorials. They're required reading for every budding communicator! Besides, after reading some of W2NSD's stuff, your wildest ham chats will probably still seem tame!

As Wayne and I see it, many hams see our hobby as a purely technical pursuit. Ask anyone and they'll tell you that ham radio has a lot to do with complicated concepts and technology. And don't forget the tests we're all required to pass to get our licenses! Although hams no longer really need to learn Morse code, they do need to bone up on radio and electronics theory.



I've been obsessed with Linux lately, and this month is no different. I've switched to a different flavor of Linux these days, and I've been taking some flack from my computer nerd buddies about my particular choice. The thing is, though, this Linux is designed for Windows refugees and is amazingly easy to install, use, and update. It's called Linspire (formerly Lindows), and you can see more at www.linspire.com. In these days of out-of-control viruses, spyware, malware, adware, etc., your shack PC is up against some pretty nasty stuff if it goes online, and Linux may be a perfect solution. There is some ham software written for Linux, and through the magic of innovating programmers worldwide, Linux can run many PC titles. I'm still testing various ham packages, and I will report on my successes in a future column.

With all of the studying and brainpower involved, you'd think that the whole mess is about technology, right? About knowing when 10 meters will be open to the Pacific, how grounded-grid linear amplifiers are tuned, or how digital signal processing helps dig out those weak DX signals.

Wrong!

That's the great irony about ham radio. For most of us the technology is simply a vehicle for an underlying, deeper reason for participating: communicating with other people who share similar interests (local or faraway).

To effectively participate, we need to learn about the technology involved—and certainly about operating procedures and protocols (that is, *how* to correctly communicate with others using whatever technology is involved)—but once that's learned, we're still faced with simply talking to someone else. Having a conversation. Sharing something of ourselves. Learning something about the person on the other end of the mic, key, or keyboard.

Sure, there are some who become hams for primarily "technical" reasons. They might love to build radios, or study

the intricacies of VHF propagation from a scientific standpoint. But even these folks love to talk to other hams who *share* their particular interest. Just listen to two "home-brewing" hams talk about building *anything* and you'll be convinced.

So it's all really about communicating. And to maximize your enjoyment of amateur radio, you need to be a good communicator. It's not difficult, but a refresher course can often help get the ball rolling!

Before we discuss some ways to have more fun talking with and learning about your fellow hams, let's review several (unfortunately) typical exchanges you could hear on the bands almost anywhere.

The rapid fire exchange between "robot DXers" immediately comes to mind: callsign, signal report, adios. Over and over. Amazingly, it took me 15 years to become bored with this. How long will it take you? (I'm not picking on contesters, just hams who seem to *never stop* contesting!)

The domestic version is just as boring: name, location, signal report, rig, antenna type, see-ya-later. Over and over. Painfully boring! Why bother turning on the rig? Most repeater conversations aren't much better.

Instead of perpetuating the same old thing, why not expand your ham radio horizons? There are millions of interesting individuals out there disguised as ham operators! Dig deeper—you won't be disappointed!

Talk Radio—You're On The Air!

Here are a few tips to help you break the ice. Remember: Don't be shy! If necessary, just blurt something out. If your QSOs are stuck in a rut, dare to do something different! You'll enjoy ham radio in an exciting new way.

• The handiest tool for ham radio conversationalists is a good map or atlas. When you figure out where the other "guy" lives, check out his QTH on the map. That little blue squiggle might seem insignificant on your end, but your new friend might have been trout fishing there since he was a kid. By simply asking about the local geography you'll learn a lot more about that little blue squiggle (or whatever it is) and you'll alert the ham on the other end that a real conversation is about to take place!

• If you're still a bit shy on the microphone and your Morse code skills are non-existent or a bit rusty, check out PSK31 or its digital cousins. These keyboard-to-keyboard modes are a lot like chatting on the Internet, and the extra anonymity can sometimes make all the difference. Besides, PSK31 is a great beginner mode. Low power works wonders and everyone I've met on PSK31 is friendly and welcoming of beginners.

• If you or your QSO partner lives in a "famous place," feel free to get a little conversational mileage out of it. If you're chatting with someone in Winterset, Iowa, try out your best John Wayne accent. It couldn't hurt, could it? I've started many an interesting QSO by mentioning that I live in Little Falls, Minnesota, the boyhood home of Charles Lindbergh (and the stomping ground of Paul Bunyan and his blue ox, Babe). You can, too.

• Asking people questions, on almost any topic, can often spice up an otherwise routine exchange. Be tactful, but ask away. Examples: "What do you do for a living?" "How about those Minnesota Vikings?" "Have you ever been to Japan?" You get the idea. To narrow down the range of possibilities, tailor your probing questions to what you already know about your QSO partner, or to what you intuit or suspect.

• If you or your QSO partner is into the Web, why not post a few pictures that you can mutually refer to as your conversation progresses? You'd be surprised at the number of hams worldwide who have and use the Internet as they converse with you in real time. If a picture is indeed worth a thousands words, with a ham picture website you'll be a chatterbox for sure! You can set up free personal websites in dozens of places, including www.myspace.com and www.geocities.com.

• As long as it's within reason, feel free to let other hams know a little bit about what you're up to. Instead of keying the repeater with "This is W9XYZ, listening," try "This is W9XYZ on a round-the-world motorcycle trip, listening." Which do you think would garner more responses on a typical sleepy repeater?

• Maybe the old-timer's CQ, "This is Bill, W9XYZ, calling CQ from the Louisiana bayou town of Swampy Creek," heard regularly in years past, has some merit. Don't use it while checking into an emergency net, and don't use it all the time, but you might give it a try on an uncrowded HF band just to see what happens.

• Be careful when discussing potentially controversial subjects such as politics, religion, sex, light beer, left-handed golfers, etc. I'm not trying to step on your First Amendment rights, I'm merely suggesting that you be respectful and use common courtesy when bringing up certain topics. Amateur radio *is* diverse, but it's also tolerant and accepting, and the best ham radio discussions build on a common ground of shared interests.

Life-Changing? Who Knows?

Regardless of which techniques you use (there are many more than those listed here), taking steps to make ham radio friends through better conversation will only increase your enjoyment of our hobby. You never know when you'll make a lifelong friend you would have otherwise overlooked because of a "cut and dried" QSO!

See you again next month—or perhaps sooner on the air! You can always drop me a line at *Popular Communications*, ATTN: "Ham Discoveries," 25 Newbridge Rd., Hicksville, NY 11801 or via e-mail at kirk@cloudnet.com. ■

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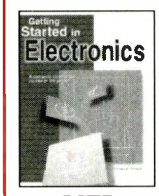

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by Gerry L. Dexter, gdex@genevaonline.com

They're Back...XEYU From Mexico, And Bhutan SW Gets A Cash Boost!

There should be a newly refurbished and revitalized shortwave voice on the air now from the National University of Mexico. XEYU, long an on-again/off-again resident of 9600 has a new 10-kW transmitter and should be hearable by most of us, depending on the existence or absence of competing signals.

VT Merlin Communications, which operates several shortwave transmitter sites for the BBC, has dropped the Merlin name and is now simply VT Communications.

Shortwave from Bangladesh has ceased, at least for now. Bangladesh Betar is reported to be off the air due to transmitter difficulties. They are trying to get back "on line," but this may not happen until they can obtain new transmitters.

It seems earlier reports of the imminent passing of the Bhutan Broadcasting Service from the shortwave scene were premature. In fact, just the opposite is in the offing. Instead of closing up shop, the BBS, with monetary assistance from India, plans to add a 100-kW shortwave transmitter. Unfortunately this doubling of power probably won't make it all that much easier to hear the station, scheduled on 6035 from 0100 to 1600,

Trans World Radio, working with HCJB, now has a broadcasting foothold in Liberia, with a license to operate a mediumwave station there—and the intention to add a shortwave outlet as well. As a guesstimate, this is at least a year away, so don't go hunting for it just yet.

Also on the African scene, we learn that Radio France International plans to increase its efforts to better reach listeners on that continent. It's unclear if this means an increase in power and/or broadcast hours or even new transmitters and sites.

Radio Tanzania-Zanzibar, 11735, is now carrying local the Spice FM in English. This airs from around 1800 but only a few minutes of news in English is aired before they go back to other programming at about 1810.

Australian Upgrades

Those always-elusive stations of Australia's Northern Territories Shortwave Service are undergoing an upgrade. VL8A in Alice Springs was the first to receive attention and went off the air for a few weeks last fall while a new transmitter was installed. Local listeners were advised to tune to one of the other stations (at Katherine or Tennant Creek), which are next in line for a tune-up.

Radio Taiwan International is now being relayed for an hour per day (1100 to 1200) by Radio Nacional-Paraguay on their 9737 spot.

Rotten in Denmark news: Danmarks Radio, which left shortwave a couple of years ago, continues its self-destructive ways. Huge budget cuts are causing language services to be dropped as well as transmitter closings on medium and longwave—even (gasp!) cutbacks on programming over the Internet.

Radio Baluarte, Argentina, on 6215 has been reactivated. It's not an easy catch; it runs until sign off at 0200. The station is located at Puerto Iguazu on the border with Brazil.

One of the really old time South American stations has been reactivated, or perhaps "rejuvenated" is a more accurate word. Emisora Ciudad de Montevideo in Uruguay has turned up on its old 9650 frequency, relaying their 1370 mediumwave station. Their exact schedule is unknown at present.

Reader Logs

Here's the usual reminder that your shortwave broadcast station logs are always welcome. Please be sure to double or triple space items, list them with country name first, and include your last name and state abbreviation after each log. Also much wanted are spare QSLs you don't need returned, station schedules, brochures, pennants, station photos, and anything else you think would be of interest. And how about sending a photo of you at your listening post? Step right up and get your 15 minutes of fame!

Guess we're good to go, so here are this month's logs. All times are in UTC. Double capital letters are language abbreviations (SS = Spanish, RR = Russian, AA = Arabic, etc.). If no language is specified the broadcast is assumed to be in English (EE).

ALASKA—KNLS, 7355 in RR at 1710. (Clapshaw, WA) 9795 signing on in RR at 1600. (Barton, AZ)

ANTARCTICA—Radio Nacional Arcangel, 15476 at 2100 with SS ballad, SS closing anmts at 2102 with ID and mention of Base Esperanza. (Alexander, PA)

ARGENTINA—Radio Nacional, 6060 in SS at 0056. (Charlton, ON) 1045 and 2315 in SS. Also 15345 in SS at 0055. (Alexander, PA) 6060 at 0935, 11710 in SS at 0035 and 15345 in SS at 0002. (DeGennaro, NY) La Red, domestic feed, 8098 LSB at 0630 with play-by-play futbol in SS at 0200. Also 15820 with time pips and news in SS at 2200. (Alexander, PA) (*irregular operation—gld*)

ARMENIA—Voice of Armenia, 9965 in Armenian to South America closing at 0330. (DeGennaro, NY)

ASCENSION ISLAND—BBC Relay, 11765 in SS heard at 0030, 15400 in EE to Africa at 2039 and 17830 at 2018. (DeGennaro, NY)

AUSTRALIA—Radio Australia, 5995-Brandon at 0857 and into Tok Pisin at 0900. Also 7385 at 0708, 9475 to SE Asia at 1108, 9560 to East Asia at 1100, 9590 to Pacific at 1005, 9710 to Pacific at 1005 and 17795 to Pacific at 0003, all via Shepparton. (DeGennaro, NY)

Help Wanted

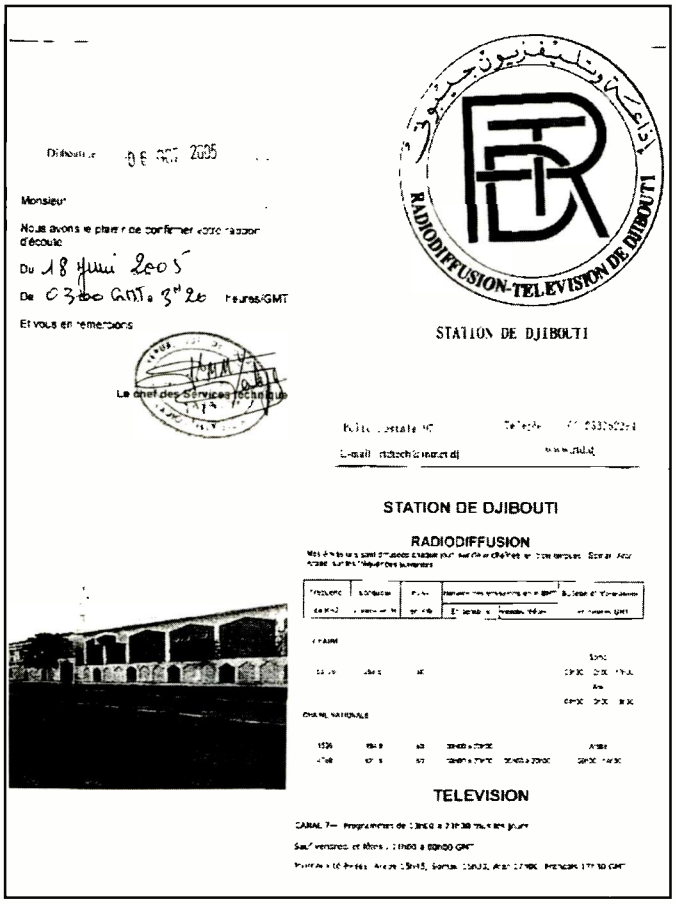
We believe the "Global Information Guide" consistently presents more shortwave broadcast loggings than any other monthly SW publication! (This month we processed 650 loggings!)* Why not join your fellow SWLs, let us know what you're hearing, and also become eligible for our monthly shortwave book prize! Send your logs to "Global Information Guide," *Popular Communications*, 25 Newbridge Rd., Hicksville NY 11801-2953. Or e-mail them to Editor Harold Ort at popularcom@aol.com, or to your "GIG" columnist at gdex@genevaonline.com (please see the column text for basic formatting tips.) Come join the party—we look forward to hearing from you! **Not all logs get used; there are usually a few which are obviously inaccurate, unclear, or lack a time or frequency.*

6020 at 1220. (Northrup, MO) 9580 at 0845 and 15515 at 2115. (Maxant, WV) 9685 with news and sports at 1415. (Barton, AZ) 11550 via Taiwan in Indonesian at 2255. (MacKenzie, CA) 11880 with history feature at 1708. (Burrow, WA) 13680-Shepparton to the Pacific at 2215. (Clapshaw, WA) 15405 in unid Asian language at 1252 and 15515 on auto racing at 0324. (Brossell, WI) Voice International, 7180 via Darwin in Indonesian at 1345. (Strawman, IA) 13685 with chimes at 1258, ID at 1300 and news. (Brossell, WI)

AUSTRIA—Radio Austria Int., on 6155 in GG to Europe at 2150. Also 9870 to ECNA at 0055 and 13730 in GG to Europe at 1059.

Abbreviations Used In This Month's Column

*	— before or after a time (time the station came on or left the air)
(l)	— after a frequency (lower sideband)
(p)	— presumed
(t)	— tentative
(u)	— after a frequency (upper sideband)
v	— variable
//	— in parallel
AA	— Arabic
ABC	— Australian Broadcasting Corporation
AFN	— Armed Forces Network
AFRTS	— Armed Forces Radio TV Service
AIR	— All India Radio
Anmt(s)	— announcement(s)
Anncr	— announcer
AWR	— Adventist World Radio
BSKSA	— Broadcasting Service of Kingdom of Saudi Arabia
CC	— Chinese
Co-chan	— co-channel (same frequency)
Comml(s)	— commercial(s)
CP	— Bolivia, Bolivian
CRI	— China Radio International
DD	— Dutch
DJ	— disc jockey
DW	— Deutsche Welle/Voice of Germany
EE	— English
ECNA	— East Coast of North America
f/by	— followed by
FEBA	— Far East Broadcasting Association
FEBC	— Far East Broadcasting Company
FF	— French
GBC	— Ghana Broadcasting Corp
GG	— German
GMT	— Greenwich Mean Time
HH	— Hebrew, Hungarian, Hindi
HOA	— Horn of Africa
ID	— station identification
II	— Italian, Indonesian
Int	— international
IRRS	— Italian Radio Relay Service
IS	— interval signal
JJ	— Japanese
KK	— Korean
LSB	— lower sideband
LV	— La Voz, La Voix
NBC	— National Broadcasting Corporation (Papua New Guinea)
ORTB	— Office de Radiodiffusion et Television du Benin
PBS	— People's Broadcasting Station
PP	— Portuguese
PSA	— public service announcement
QQ	— Quechua
RCI	— Radio Canada International
Rdf.	— Radiodifusora, Radiodiffusion
REE	— Radio Exterior de Espana
RFA	— Radio Free Asia
RFE/RL	— Radio Free Europe/Radio Liberty
RNZI	— Radio New Zealand International
RR	— Russian
RRI	— Radio Republik Indonesia
RTBF	— RTV Belge de la Communate Françoise
Relay	— transmitter site owned/operated by the broadcaster or privately operated for that broadcaster
relay	— transmitter site not owned by the broadcaster
SCI	— Song of the Coconut Islands (transition melody used by Indonesian stations)
s/off	— sign off
s/on	— sign on
SIBC	— Solomon Is. Broadcasting Corp.
Sked	— schedule
SLBC	— Sri Lanka Broadcasting Corporation
SS	— Spanish
TC	— time check
TOH	— top of the hour
TT	— Turkish
TWR	— Trans World Radio
Unid	— unidentified
USB	— upper sideband
UTC	— Coordinated Universal Time (as GMT)
UTE, ute	— utility station
Vern	— vernacular (local) language
(via)	— same as "relay"
VOAS	— Voice of America
VOIRI	— Voice of Islamic Republic of Iran
WCNA	— West Coast of North America
ZBC	— Zimbabwe Broadcasting Corporation



STATION DE DJIBOUTI

STATION DE DJIBOUTI

RADIODIFFUSION

TELEVISION

Robert Brossell was able to pry a QSL out of Radio TV Djibouti-4780.

(DeGennaro, NY) 13775 via Canada in GG at 1512. (Charlton, ON) 13775 at 1535 in EE. (Maxant, WV)

BELGIUM—RTBF Int., 9770 in FF at 1023 and 17570 via Germany in FF at 1506. (DeGennaro, NY) 17570 via Germany in FF at 1725. (Charlton, ON)

BOLIVIA—Radio San Gabriel, La Paz, 6085 in SS at 1255. (Northrup, MO) Radio La Cruz del Sur, La Paz, 4876.6 in SS at 1020. (Wilkner, FL) Radio Santa Ana, Santa Ana, 4650 at 2345 with orchestral music, indigenous "yipping" music and ID. (Wilkner, FL) Radio Panamericana, La Paz, 6105.5 at 1030 with ID, news in SS. (Wilkner, FL) Radio Eco, Reyes, 4409.7 with ID at 2320 and sudden close at 2343, all SS. (Wilkner, FL) Radio Paititi, Guayaramerin, 4684.7 at 2355 under local noise in SS to 0016 close. (Wilkner, FL) Emisora Camargo, Camargo, 3390.2 at 2320 in SS. Very weak. (Wilkner, FL) Radio Guanay, Guanay, 4761.6 at 2346 with music, strings, percussion, vocalist. May be on an irregular schedule. (Wilkner, FL) Radio Santa Cruz, Santa Cruz, 6134.8 in SS at 0931. (DeGennaro, NY) Radio Mosoj Chaski, Cochabamba, 3310 in QQ at 0902. (DeGennaro, NY)

BOTSWANA—VOA Relay, 4930 with news items at 0421. Also 9885 at 0352 and 12080 at 0426. (Wood, TN) 9885 with news format at 0332. (Brossell, WI) 0354. (D'Angelo, PA) 17895 with Special English at 1608. (Charlton, ON)

BRAZIL—(all in PP) Radio Difusora do Amazonas, Manaus, 4805 at 1005. (DeGennaro, NY) Radio Senado, Brasilia, 5990 at 0900 with talk, short music fills, jingles and ID at 0910. (Alexander, PA) Radio Educadora, Guajara Mirim, 3375 with music and talk at 0910. (DeGennaro, NY) Radio Universo/Radio Tupi, Curitiba, 6060 with religious talks at 0910. (DeGennaro, NY) Radio Difusora Acreana, Rio Branco, 4885 with futbol at 0102. (Taylor, WI) Radio Mauruby, Florinapolis, 9665 with religious sermon at 1055. (DeGennaro, NY) Radio Anhanguera, Goiania, 4915 at 0445. (Clapshaw, WA) 0830. (DeGennaro, NY) Radio Clube Paranaense, Curitiba, 6040 with anmts,

Pirate Radio Maildrops

To help you reach some of the pirate stations we report on each month, whether you wish to contact them for QSLs, general information, or just to send a report on their programming, here's the latest contact information.

Belfast, Box 1, Belfast, NY 14711
Blue Ridge Summit, Box 109, Blue Ridge Summit, PA 17214
Elkhorn, P.O. Box 69, Elkhorn, NE 68022
Huntsville, Box 11522, Huntsville, AL 35814
Lone Pine, Box 929, Lone Pine, CA 93545
Lula, Box 24, Lula, GA 30544
Merlin, Box 293, Merlin, ON, N0P 1WO, Canada
Providence, Box 28413, Providence, RI 02908
Wellsville, Box 422, Wellsville, NY 14895

commls, sports results at 0905. (DeGennaro, NY) Radio Cancao Nova, 4825 with music and talk at 0044. (DeGennaro, NY) 9675 with pops at 0300. (Clapshaw, WA) Radio Nacional Amazonia, Brasilia, 6185 with call-ins at 0030 and 11780 with music, lottery numbers at 0035. (DeGennaro, NY) Radio Rural, Santarem, 4765 with music and talk at 0833. (DeGennaro, NY) Radio Clube do Para, Belem, 4885 with nice dance club music at 0427. (Wood, TN; Taylor, WI) 0440. (Clapshaw, WA) 0815 with talks, commls, music. (DeGennaro, NY) Radio Gaucha, Porto Alegre, 11915 with call-ins at 0119. (DeGennaro, NY) Radio Difusora Roraima, Boa Vista, 4875 with opening greetings to listeners at 0818. (DeGennaro, NY) Radio Nacional, Macapa, 4915 with religious message at 0219. (DeGennaro, NY) 0243. (Brossell, WI) Radio Difusora, Londrina, 4815 with music and talk at 0230. (DeGennaro, NY) Radio Difusora, Taubate, 4924.5 with local news commls, anmts at 1018. (DeGennaro, NY) Radio Brazil Central, Goiania, 11815 with talk on religion at 0035. (DeGennaro, NY) Radio Aparecida, Aparecida, 5035 with man and woman talk, soft vocals. //9630. (D'Angelo, PA) 0045. (DeGennaro, NY)

BULGARIA—Radio Bulgaria, 5900 in BB to East Europe at 0104. Also 9500 in SS to South America at 2315, 11700 in FF to Europe at 1005, 13600 in SS to Europe at 1115 and 15700 in FF at 1107. (DeGennaro, NY) 9700//11700 with opera, ID at 2355. (Burrow, WA)

BURKINA FASO—RTV Burkina, 5030 at 2110 with FF talk, phone-ins, Afro-pops. Gene Scott's University Network not using this frequency lately. (Alexander, PA) 2338 with information program in FF ending with postal mail address at 2358. Then brief anmts and close at 0001. (D'Angelo, PA)

CANADA—Radio Canada Int., 5840 via Horby, Sweden, in AA to the Mideast at 0248. Also 9390 via Horby in FF to Africa at 2257, 11755 via Ascension in FF at 2203, 11945 in FF to ECNA at 1037 and 15455 in SS at 2308. (DeGennaro, NY) 9515 at 1425. (Northrup, MO) 17765 with CBC programming at 1528. (Charlton, ON) CBC Northern Service, 9625 at 1513. (Maxant, WV) CFRX, 6070 with call-in show at 0930. (Maxant, WV) 1305 with news. (Northrup, MO) CKZN, 6160 with DJ and 60s hits at 0715. (Maxant, WV) CFVP, 6030 (p) at 0414 with country vocals and man briefly in English in between. Apparent ad string at 0420. Poor signal. (D'Angelo, PA)

CHILE—Voz Cristiana, 11745 in PP to Brazil at 0019 and 17680 in SS heard at 2113. (DeGennaro, NY) 1545 in SS. (Charlton, ON)

CHINA—China Radio Int., 6040 via Canada in EE to ECNA at 1027. Also 9600-Beijing in EE to Europe at 2101, 9440-Kunming in CC to Asia at 1114, 9665 via Brasilia in SS to Americas at 0306, 9690 in EE to ECNA at 0311, 11660-Kashi in FF to Europe at 2205, 11790-Urumqi in EE to Europe at 2132, 11850 via French Guiana in PP to Brazil at 0042, 11975 via Mali in FF to Africa at 2217, 11980-Kunming in CC to Asia at 1041, 15120 via Cuba in SS at 0035 and 17490-Kashi in EE to Europe at 1457. (DeGennaro, NY) 9580 at 0118 and 13740 at 1528. (Charlton, ON) 9665 via Brasilia in SS at 0350 with transmitter cutting out. (Clapshaw, WA) 9690 via Spain in CC at 0224.

Radio Free Asia issued this special QSL card saluting the annual Winter SWL Fest last March. (Thanks Rich D'Angelo)

(Brossell, WI) Same at 0335. (Wood, TN) CPBS, 7345-Beijing in CC at 1135. Also 7620-Beijing in CC to Taiwan at 1127, 9500-Shijiazhuang in CC at 0947, 11720-Shijiazhuang in CC at 1012, 11800-Beijing in CC at 1015, 11905-Beijing in CC to Taiwan at 1027, 11915-Xi'an in CC at 1031 and 13610-Nanning in CC at 1046. (DeGennaro, NY) 11610 in CC at 2312, //11710. (MacKenzie, CA) China Music Jammer, 15250 against VOA-Philippines at 1248. (Brossell, WI)

CLANDESTINE—Voice of Mesopotamia, 11530 via Moldova in Kurdish at 1546. (DeGennaro, NY) Voice of the Tigray Revolution, 6350 with 0356 sign on with flute IS, vern. talk at 0400. Better on //5500. (Alexander, PA) Voice of Biafra Int., 7380 at 2144 saying Nigeria is the most corrupt country in the world. (Charlton, ON) Radio Liberty, 9750 via Briech, Morocco in Byelorussian with multi-lingual sign on at 2000. (Taylor, WI) Democratic Voice of Burma, 9435 via Germany in presumed Burmese at 0019. (Taylor, WI) Radio Free Asia, Tinian, Northern Marianas, 13625 at 1305 with talks in Asian language. (Brossell, WI) Radio Farda, 9865 via Briech, Morocco in Farsi at 0053. (DeGennaro, NY)

COLOMBIA—Radio Lider, Bogota, 6139.8 in SS with romantic Latin vocals, man anncr with IDs between selections. (D'Angelo, PA) ID at 1000. (DeGennaro, NY) 1240 with news actualities. (Strawman, IA) 0230 with SS ballads, anmts. (Taylor, WI; Alexander, PA) La Voz del Guaviare, San Jose Guaviare, 6035 with music and SS talk at 0902. (DeGennaro, NY) La Voz de su Concencia/Radio Marfil Estereo, Puerto Lleras, 5910 with a variety of music and SS at 0410. Poor signals. (Yohnicki, ON)

CONGO (Dem. Rep)—Radio Okapi via Meyerton, 11690 at 0419 with woman in FF and Afropops. Mentions of Kinshasha. Barely audible. (Wood, TN) 0422 with FF talks, instl. segments and jingle IDs. Into local African language around 0435. (D'Angelo, PA)

COSTA RICA—University Network, 9725 with Dr. Gene Scott at 0341. (Wood, TN) 13740 at 2015. (Maxant, WV) Faro del Caribe/TIFC, 5054.6 at 0051 with long SS talk, music to 0100 ID. (D'Angelo, PA)

CROATIA—Voice of Croatia, 7285 via Germany in Croatian to ECNA at 0036 and 9925 via Germany in Croatian to Americas at 0047. (DeGennaro, NY) 9925-Germany with start of EE at 2215. (Burrow, WA; Maxant; WV) 2220 with poor audio. (Charlton, ON)

CUBA—RHC, 5040 at 0040 in SS, //9600 but not heard the next two nights. (Alexander, PA) 5055 in SS at 0115 with some dead air and woman in SS. (Taylor, WI) (*Something seems to be going on here.—gld*) 6000 with news in SS at 1230. (Northrup, MO) 6060 at 0615 claiming a Miami group planning a terrorist act against Cuba (Maxant, WV) 6060 in EE to ECNA at 0637, 11760 in SS to ECNA at 0023, 11875 ditto at 0053, 12000 in SS at 1100 and 15230 in PP to South America at 2356. (DeGennaro, NY) Radio Rebelde, 5025 in SS at 0852. (DeGennaro, NY)

CYPRUS—BBC Relay, 9410 with "The World Today" heard at 0142. (Brossell, WI) 0213 on keeping Ramadan traditions in the UK. (Wood, TN)

CZECH REPUBLIC—Radio Prague, 7345 at 2230. (Maxant, WV) 2315 in SS to South America. Also 9440 at 2302 and 11655 via Ascension at 0011. (DeGennaro, NY) 17485 at 1658 with schedule, IS and ID and into news at 1700. (Burrow, WA) 1610 on sleep and snoring. (Charlton, ON)

DJIBOUTI—RTD Djibouti, 4780 at 2255 with HOA music, vern. talk and Koran. Off abruptly during Koran recitations. Usually ends around 2000. (Alexander, PA)

ECUADOR—HCJB, 6125 in QQ at 0927 and 12040 in GG at 0055. (DeGennaro, NY) 12020 in EE at 1515. (Charlton, ON) La Voz del Napo, Tena, 3280 in SS at 0855. (DeGennaro, NY)

EGYPT—Radio Cairo, 9990 with news at 2140. (Charlton, ON) 2200 with news, ID. Poor modulation and some transmitter drift. (Burrow, WA) 12050 in AA at 0051. (DeGennaro, NY)

ENGLAND—BBC, 5875 in SS at 0052, 6030 via Oman in AA at 2117, 13660 in AA at 2054, 13745 in RR at 1957 and 17585 in AA at 1509. (DeGennaro, NY) 7325 in SS at 0320. (MacKenzie, CA) 15400 via Ascension at 1854, 17830 at 1912 and 21470 at 1832. (Charlton, ON) Family Radio, 15165 via England in AA at 1937. (Brossell, WI)

EQUATORIAL GUINEA—Radio Nacional, Bata, 5005, 0550 in SS, ID 0551. (DeGennaro, NY) 2100 with vern. talk, drums, Afropops. Off at 2257. (Alexander, PA) 2215 to 2301 close. (D'Angelo, PA) 2250 with seeming church service. NA at 2255. Strong carrier, low audio. (Strawman, IA)

ETHIOPIA—Radio Ethiopia, 7110 with brief bell IS, ID and gongs heard at 0300 before news in presumed Amharic. (Brossell, WI)

FINLAND—YLE/Radio Finland, 6120 in Finnish at 2156, 9600 in RR at 1053 and 11755 in Finnish at 1035. (DeGennaro, NY) 15400 opening in Finnish at 1259. (Brossell, WI)

FRANCE—Radio France Int., 5925 via South Africa in FF at 0301, 6045 in RR at 0314, 7160 via South Africa at 2129 and 11845 in FF at 1021. (DeGennaro, NY) 7150 with their African Service to 0458 close. 15300 in FF to Africa at 1844, 15605 in EE at 1620 and 17605 in EE at 1630. (Charlton, ON) 15605 with EE news monitored at 1705. (Maxant, WV)

FRENCH GUIANA—Radio France Int. Relay, 9800 in SS at 0111 and 17630 in SS at 2110. (DeGennaro, NY)

GABON—Africa Number One, 9580 in FF with ID and address at 1956. Also 17630 in FF at 1513. (DeGennaro, NY) 15475 in FF at 1655. (Clapshaw, WA) 15475 heard at 1728 and 17630 at 1542. (Charlton, ON)

GERMANY—Deutsche Welle, 9545 in GG at 1048, 9735 in GG at 2033, 11865 in GG at 0049, 13780 in GG at 1102, 15205 in EE at 2019, 15425 in RR at 1605 and 21820 in Kiswahili at 1545. (DeGennaro, NY) 6140 in GG at 0900 and 7170 in EE at 1645. (Maxant, WV) 7225 in AA at 0440. (MacKenzie, CA) 15205 in EE heard at 2047 and 17595 in EE at 1634. (Charlton, ON) Deutschland Radio, Berlin, 6005 in GG at 2201. (DeGennaro, NY) Save the Gambia Project, (p) 9405 via Julich, 2014 in EE mentioning the Gambia numerous times. Switch to unid language at 2022 and off suddenly at 2030. (D'Angelo, PA)

GREECE—Voice of Greece, 7475 in Greek at 2247, 9375 in Greek at 2253 and 17705 via Delano in Greek at 2116. (DeGennaro, NY) 9420 in Greek at 0313. (Wood, TN) 12105 in Greek at 1705. (Maxant, WV) 15630 in Greek at 1300. (Brossell, WI) 1932 with futbol.

In Times Past...

And now for a bit of fun. We'll give you a blast from the past here each month; perhaps a logging or station tidbit from the *Pop'Comm* shortwave history book. Here's one for the memory books...

GREECE—Forces Broadcasting Service, Athens, 6045 with music and talk in Greek at 0430. Poor, with QRM from HCJB. Listed as only 5 kW. (Dexter-IA)

Polish Radio celebrated its 80th year in 2005. (Thanks Rich D'Angelo)

(Charlton, ON) Radio Makedonias, Thessaloniki, 7450 in Greek at 2220 and 9935 in Greek at 1437. (DeGennaro, NY)

GUATEMALA—Radio Verdad, Chiquimula, 4052.5 with religious service in EE at 1105. (Wilkner, FL) Radio Buenas Nuevas, San Sebastian, 4800 in SS with ID at 0050. (Taylor, WI) 0200 with news in SS. (Brossell, WI) 0228 with religious talk. (DeGennaro, NY) Radio Cultural, Coatan, 4780 with long talk in SS at 0050. (Taylor, WI) 0159 with SS ID, music and talks. (Brossell, WI) 0220 with short religious music, ID and off monitored at 0232. (Alexander, PA) 1031 sign on. (DeGennaro, NY)

GUAM—Adventist World Radio, 9385 with filler music, IDs from 1729-30 and into "Our World" program. (Burrow, WA) Trans world Radio/KTWR, 9465 in Asian language at 1218. (Brossell, WI) 11840 with 0812 sign on with IS, ID and opening anmts in EE. (D'Angelo, PA)

GUINEA—RTV Guineenne, 7125 in FF at 2133. (DeGennaro, NY)

GUYANA—Voice of Guyana, 3291, 0407 with BBC World Service programs. (D'Angelo, PA) 0857 in EE with ID at 0900. (DeGennaro, NY) 0910 with music, talk on sharing and joy. (Maxant, WV)

HAWAII—KWHR, 11555 with sermon heard monitored at 1234. (Brossell, WI)

HONDURAS—La Voz Evangelica, 4819 at 0202 with songs, anmts, ID, news or actualities. (Brossell, WI; Taylor, WI) 0844 with religious message. (DeGennaro, NY) Radio Luz y Vida, 3250 at 0153 with hymn, ID, more hymn-like music. (Taylor, WI) Radio Misiones Int., 3340 at 0225 with talk in local language, ID at 0302. Mostly just talk. (Alexander, PA)

RADIO PRAHA

www.radio.cz

HUNGARY—Radio Budapest, 6025 with EE to Europe at 2114. (DeGennaro, NY)

INDIA—All India Radio, Port Blair (Andaman Is) (p) 4760 weak with flutes and vocals at 1225. (Strawman, IA) 9915 in EE at 2250, 9445 at 2205, 10330 at 1715 and 13605 at 1745 with EE sign on. (Maxant, WV) 9470-Aligarh in Hindi at 1221. (Brossell, WI) 10330-Bangalore in HH at 0232. (Brossell, WI) 10330-Bangalore in HH at 1152, 11620-Bangalore in HH at 1552, 11715-Panaji (Goa) in EE at 2159, 13605-Bangalore in FF at 1949, 13710-Bangalore in EE at 1053, 15050-Delhi in Sinhala at 1423 and 15175-Bangalore in HH at 1554. (DeGennaro, NY)

INDONESIA—Voice of Indonesia, 9525 with EE program heard at 0830. (Maxant, WV) 11785 in II at 1120. (DeGennaro, NY) RRI-Cimanggis, 9680 in II monitored at 1115. (DeGennaro, NY)

IRAN—VOIRI, 9435 at 0214 on lies in American media, ID "This is Iran—The Voice of Justice." Also 9905 in SS at 0230. (Brossell, WI) 9635//11650 in EE at 1552. (Burrow, WA) 9905 in SS at 0048, 9935 in AA at 0044, 13790 in AA at 2015 and 15150 in AA at 1128. (DeGennaro, NY)

ISRAEL—Kol Israel, 9435 with big band show at 0300. (Wood, TN) 9345 in HH at 2327, 11585 in HH at 2143, 15640 in SS at 2049 and 17535 in Farsi at 1500. (DeGennaro, NY) 11590 in HH at 1725. (Maxant, WV) 11590//15640 in EE at 1913. (Burrow, WA) 15640 in EE at 1901. (Charlton, ON)

ITALY—RAI Int., 7130 in SS at 2120, 9840 in SS at 0104, 11800 in II at 0031, 11855 in II at 1613, 11875 in EE at 2030, 11920 via Singapore in II at 1033 and 17780 in II at 1437. (DeGennaro, NY) 9845 with EE sign on at 1930. (Maxant, WV) 11800 in II at 0109. (Charlton, ON) IRRS, 5775 at 2115 with UN Radio, IRRS ID and address at 2129, then UN Radio news and more UN programming. Off at 2205. (Alexander, PA)

JAPAN—Radio Japan/NHK. 6055 in JJ at 1215. (Northrup, MO) 6110 via Canada in EE at 0505, //5975. (Yohnicki, ON) 6120 in JJ at 1017. (Barton, AZ) 9505 in EE at 1530. (Maxant, WV) 9530 in JJ at 1015, 9540 in JJ at 0954, 9660 via UK in GG at 1105 and 11935 in EE at 0103. (DeGennaro, NY) 11895 via French Guiana in JJ at 2217 and 15355 via Ascension in JJ at 1846. (Charlton, ON) 17870 via Ascension in JJ at 1308. (Brossell, WI)

JORDAN—Radio Jordan, 9830 in AA at 1916. (Brossell, WI) 11690 in EE at 1557 and 15435 in AA at 2057. (DeGennaro, NY) 1445 to 1730 close on 11690 with variety of US and AA pops, phone requests and "Radio Jordan, 96.3 FM" IDs. (Alexander, PA) 1458 to 1500 time pips, ID and news to four minutes past the hour. (D'Angelo, PA) 1508 with regional pops, ID. (Burrow, WA) 1616 with news. (Charlton, ON)

KUWAIT—Radio Kuwait, 9855 with talks in AA at 1917. (Brossell, WI) 2357 in AA to Europe. (DeGennaro, NY)

LIBERIA—ELWA, 4760 at 2230 with religious programming to 2301 close. (Alexander, PA)

LIBYA—Radio Jamahirya/Voice off Africa, 7320 in AA at 0128, ID on the hour and more talk or news. (Taylor, WI) 15660 in AA monitored at 1732. (Charlton, ON) (*both via France—gld*)

LITHUANIA—Radio Vilnius, 11690 in Lithuanian to North America at 0012. (DeGennaro, NY)

MALI—RT Malienne, 4784.4 monitored at 2230 with Afro and FF pops, FF talk. Off with national anthem, //5995. (Alexander, PA)

MAURITANIA—Radio Mauritanie, 4845 in AA at 0037. (DeGennaro, NY)

MEXICO—Radio Transcontinental, 4810 with religious message at 1039. (DeGennaro, NY) Radio Universidad, San Luis Potosi, 6045 with classical music at 1225. (Wilkner, FL) Radio Mil, 6010 with SS talk, ID, pops and ballads at 1040. (Alexander, PA) 1220 in SS with ID. (Northrup, MO) Radio Educacion, 6185 with music program in SS but EE IDs at 0225, 0310. (Alexander, PA) 0645. (Barton, AZ) Chamber orchestra music at 0930. (DeGennaro, NY)

MOLDOVA—Russian Int. Radio, 7125 via Moldova at 0024 in RR. (DeGennaro, NY) 0113 in RR. Also at 0225 in RR. (Taylor, WI) Voice of Russia, 7180 via Moldova with ID at 0028 in SS. (DeGennaro, NY) 0210. (Taylor, WI) 0450 with classical and operatic vocals. (MacKenzie, CA)

MONACO—Radio Monte Carlo, 6040 via Canada in AA at 0310. (DeGennaro, NY)

MOROCCO—Radio Medi-Un, 9575 in FF at 1954. (DeGennaro, NY) 0220 in AA. (Brossell, WI) VOA Relay, 6180 at 0630. (Barton, AZ) 11720 at 2040. (Brossell, WI) 15235 at 1859 and 17870 in Special EE at

1555. (Charlton, ON) RTV Marocaine, 7135 in AA at 2300 and 15345 in AA at 2034. (DeGennaro, NY) 15345 in AA at 1941. (Brossell, WI)

MYANMAR—Radio Myanmar, 5985 at 1320 with haunting vocals/percussion. Occasional anmt in Burmese by woman. (Strawman, IA)

NETHERLANDS—Radio Nederland, 6015 in DD at 0629, 7120 via Madagascar in DD at 2139, 9795 via Singapore in Indonesian at 1108 and 9895 in SS at 0051. (DeGennaro, NY) 11655 via Madagascar at 2034 and 17810 in EE at 1908. (Charlton, ON) 15315 and 17735 at 2000. (Maxant, WV)

NETHERLANDS ANTILLES—Radio Nederland Relay, Bonaire, 17810 in EE to West Africa at 2025. (DeGennaro, NY)

NEW ZEALAND—Radio New Zealand Int., 9885 at 1015 with jazz, event anmts and 15720 with man-woman talk at 0016. (DeGennaro, NY) 11820 with interview at 0540. (Burrow, WA) 0700 with news. (Barton, AZ) Switching to 9885 at 0710. (Maxant, WV) 15720 at 0107. (Charlton, ON)

NIGERIA—Voice of Nigeria, 7255 at 1901 sign on with EE news. Not strong but much better audio than 15120. Occasional ham QRM. Also 15120 at 1815 strong but usual poor, muffled audio with some hum. Close at 1900. (Alexander, PA) 7255 at 2100 with news in FF. (DeGennaro, NY) 15120 with African news at 1705. (Burrow, WA) 1720 with news in vernacular. (Maxant, WV) 1721. (Charlton, ON)

NORTH KOREA—Voice of Korea, 9345 in CC to Asia at 1122, 13760 in SS to the Americas at 0042 and 15180 in SS at 0026. (DeGennaro, NY) KCBS, 11680 with instl music at 1242, KK ID, anthem and off at 1250. (Brossell, WI) Pyongyang Broadcasting Station, 9345 in KK at 1212. (Brossell, WI)

NORTHERN MARIANAS—VOA Relay, Tinian, 7215 in KK at 1340. (Strawman, IA)

OMAN—Radio Sultanate of Oman, 9760 in AA to Europe at 0121, 13640 in AA at 2048 and 15140 in EE at 1439. (DeGennaro, NY) 1432 with woman hosting program of pops. Bells at 1500, AA ID and news read by a man. (D'Angelo, PA)

PAKISTAN—Radio Pakistan, 11570 at 1856 with Koran, talk in Urdu, ID and closing anmts. Off at 1903. (D'Angelo, PA) 11570//15100 at 1600. Weak with talk, possible news and comment. Off at 1614. (Burrow, WA) 15100 at 1429 in Urdu. (DeGennaro, NY)

PARAGUAY—Radio Nacional, 9737 in SS at 0027 with talk on philosophy. (DeGennaro, NY)

PERU—Radio Cusco, 6193.4 at 0240 with canned SS IDs, huaynos. Pretty much covered by BBC slop from 6195. (Alexander, PA) Radio Melodia, Arequipa, 5939.3 at 0800 with SS pops and ballads, anmts, IDs. (Alexander, PA) Radio Tarma, Tarma, 4775 with guitar, SS songs, anmts at 0415. (Yohnicki, ON) 1029 with music, commls. (DeGennaro, NY) Radio La Hora, Cusco, 4855.6 in SS with woman-man talking at 1036. (DeGennaro, NY) Radio Huanta 2000, Huanta, 4747 in SS at 1005 with OA music, ads, jingles. (Alexander, PA) Music and talk at 1025. (DeGennaro, NY) Radio Union, Lima, 6114.8 with LA music, SS anmts and many canned IDs at 0703. (Alexander, PA) Ondas del Huallaga, 3329.5 at 0003 with man shouting "cinco, cinco, cinco—en cinco anos de banda de —" and flute music. (Wilkner, FL) Radio Luz y Sonido, Huanuco (t) 3234.8 at 0935 with OA vocals, SS talk. (Alexander, PA) Radio La Oroya, Oroya, 4904.7 in SS with religious message at 0927. (DeGennaro, NY) Radio Sicuani, Sicuani, (p) 4826.5 at 0915 with Andean music, SS anmts. Poor under swisher QRM. (Alexander, PA) Radio Altura, Cerro de Pasco, 5014 with talk on religion and women's rights at 1005. (DeGennaro, NY)

PHILIPPINES—FEBC Int., 9405 in CC at 1213. (Brossell, WI) 1118 in CC to East Asia. Also 9430 (p) at 0951. (DeGennaro, NY) VOA Relay, 6160 with Far East news at 1205. (Northrup, MO)

PIRATES (USA)—Ragnar Radio, 6925 USB at 2254 with rock, music and sound effects centered on guns, parody on *Sesame Street*'s "Elmo's Got a Gun." Gave ragnarradio@yahoo.com" for reports. (Zeller, OH) Captain Morgan (t) 6923.9 at 2350 with industrial dance music. Sounded like WMPR with Capt. Morgan's transmitter. (Hassig, IL) 0019 with various rock and soul things. Slogan "This is the Pirate Zone with Captain Morgan." Some *Twilight Zone* audio near closing at 0046. (Zeller, OH) 0025. (Balint, OH) Radio Free Whatever, 6925 USB at 0025 with several IDs as "The only thing worth listening to—Radio Free Whatever—coming to you from the Right Coast, 6-9-2-5 upper sideband." (Wood, TN) WMPR-6925 USB at 2008 sign on announcing a test xmsn, then into program of techo dance using the usual "Dance Party" slogan. After 2106 switch to SSTV and then transmitting noise I assume was SSTV as they announced as "WMPR Slow Scan TV." (Zeller, OH) 2342 with techno but lost around 2400. (Wood, TN) 0029 with dance music. Used way too much audio compression. (Hassig, IL) Old Vampire Radio, 6925 USB at 2326 with comedy routines and talks of ouija boards, clips from *Mad Max* on the "John and Billy Show." (Wood, TN) Peter Cottontail Station (working ID) at 0138 sign on with "hello boys and girls—this is Peter Cottontail" in a high-pitched bunny-like voice. No address announced. (Zeller, OH) The Crystal Ship, 6854 at 2352 sign on with Pink Floyd, Blondie and AC/DC. (Wood, TN) KIPM, 6925 at 0050 with story "He Who Shrank" Elkhorn, NE, mail drop. (Hassig, IL) WHGW, 6925 USB at 2245 with drama program and ID. whgw@yahoo.com for reports. (Zeller, OH) Pirate Radio Boston, 6925u at 2158 with rock, lengthy mailbag segment. Stoneham, MA and pirateradioboston@yahoo.com for reports.

QSL
Verification Card

Station Minivan Radio

To Richard A. D'Angelo

This is to confirm your reception of our transmission dated 29 August 2004, 1600 - 1659 hours UTC on a frequency of 13.855 kHz. with 100 K watts.

Via Julich, Germany

Radio Miami International

X

Signature & Official Seal

Rich D'Angelo got a QSL for Minivan Radio via WRMI-Miami after having received a direct QSL.

This Month's Book Winner

To show our appreciation for your loggings and support of this column, each month we select one "Global Information Guide" contributor to receive a free book. Readers are invited to send in loggings, photos, copies of QSL cards, and monitoring room photos to me at *Popular Communications*, "Global Information Guide," 25 Newbridge Road, Hicksville, NY 11801, or by e-mail to popularcom@aol.com. The e-mail's subject line should indicate that it's for the "Global Information Guide" column. So come on, send your contribution in today!

Our book winner this month is **Dave Jeffery** who has received a copy of the 2006 edition of *Passport to World Band Radio*, courtesy of the good folks at Universal Radio. You should have Universal's current catalog on your radio bookshelf. It's easy to get a copy of this gem-filled wish book. Just call 614-866-4267, or e-mail Universal at dx@universal-radio.com or drop a note to them at 6830 Americana Parkway, Reynoldsburg, OH 43068.

PIRATE (Euro)—Mystery Radio, 6220 at 2225 with rock. Extremely weak. (Zeller, OH) 0130 with continuous pops, caned ID at 0216. (Alexander, PA) 0244 with continuous rock and jingle IDs every 10 minutes or so. (D'Angelo, PA) Alpha Lima Int., 15069.7 at 1421 with pop/techno/rap. (Strawman, IA) 1528 with rock/pop and male anncr. Clear ID at 1620 even though the signal was very weak. (Zeller, OH) Radio Black Arrow, 15074.9 at 1640; just bits of music surfacing now and then. (Strawman, IA)

PORTUGAL—RDP Int., 11630 in PP at 0006 with sports results, 15295 in PP to South America with political speech at 2035, 15574 in PP with an interview at 1053 and 17615 in PP with futbol scores at 1414. (DeGennaro, NY) 15560 with futbol at 1945. (Barton, AZ)

RUSSIA—Voice of Russia, 7300-Komsomolsk in CC to Asia at 1148, 7330-Moscow in SS to South America at 0048, 7390-Samara in SS to South America at 0055, 9830-Armavir in SS to South America at 0108, 9860 via Vatican in EE to North America at 0324 and 17645-Moscow in EE to Asia at 1423. (DeGennaro, NY) 9830-Armavir in SS at 0020. (Clapshaw, WA) 9860 via Vatican at 0345. (Wood, TN) 12055-Chita in Asian language at 1241 and 15545 in EE at 0230. (Brossell, WI) Radio Rossii, 9480 in RR at 0150. (Brossell, WI) 0254 with time pips on the hour, ID and into apparent news. (Taylor, WI) 13655-Moscow in RR at 1121. (DeGennaro, NY) Far East Bc. Assn, 7320 at 1500 with slow speed EE mailbag program, e-mail and postal address in Cyprus. (Burrow, WA)

RWANDA—Deutsche Welle Relay, Kigali, 17860 in PP at 2122. (DeGennaro, NY)

SAO TOME—VOA Relay, 7290 with news and features at 0430. (MacKenzie, CA) 0320. Also 11975 at 2145 with "Jazz America." (Brossell, WI)

SAUDI ARABIA—BSKSA, 15205 in AA at 1736. (Charlton, ON) 21600 in FF at 1530. (DeGennaro, NY)

SINGAPORE—Radio Singapore, 6080 with musical opening at 1059, ID and opening anmts at 1100, then news to 1109. (D'Angelo, PA) 1345 with current events program. (Barton, AZ) 6150 with news in progress at 1500. (Burrow, WA) BBC Relay, 15285 in CC at 1250. (Brossell, WI)

SLOVAKIA—Radio Slovakia Int., 7200 in AA at 0312. (Brossell, WI) 9440 in FF at 0205. (Brossell, WI) 11600 in SS at 1447. (DeGennaro, NY)

SOLOMON ISLANDS—SIBC, 9545 at 0630 with a feature on Bali. (Maxant, WV)

SOUTH AFRICA—Channel Africa, 3345 at 0346. (DeGennaro, NY) 0402 with news, ID at 0408. (D'Angelo, PA) 6120 in Swahili at 0257. Later swamped by Spain-6125. (Taylor, WI) 17770 with EE news items at 1504. (Charlton, ON) Radio Sondergrense, 3320 in Afrikaans at 0022. (DeGennaro, NY) 0330. (Yohnicki, ON) Trans World Radio via Meyerton, 7215 in an African dialect at 0335. (Brossell, WI) BBC via Meyerton, 7120 at 0309, //-7160-Ascension. (Brossell, WI) 7205 at 0445. (MacKenzie, CA)

SOUTH KOREA—Radio Korea Int., 9515 in SS at 2047. (DeGennaro, NY) 9560 heard at 0200. (Maxant, WV) (*This is via Canada.—gld*)

SPAIN—Radio Exterior de Espana, 3350-Costa Rica at 0205 in SS with presumed newscast. (Taylor, WI) 6155 ending FF to Europe at 2355, 7275 with futbol at 2110, 9570 in FF at 1950, 11625 in SS at 2149, 11680 in SS at 0015, 13720 in SS at 1056, 15110 in SS at 2011, 15290 in EE to Europe at 2022, 15585 in SS at 1059, 17560 in AA and SS at 2048, 21570 in SS at 1526, 21610 in SS at 1535 and 21700 in SS at 1541. (DeGennaro, NY) 15290 in EE at 2041 and 17860 in SS at 1551. (Charlton, ON) 15325 in RR at 1701. (Burrow, WA)

SRI LANKA—SLBC, 9770 in EE to South Asia with music and comment at 0115. (DeGennaro, NY)

SURINAME—Radio Apinte, 4990 in DD at 0847 with hymns, local news. (DeGennaro, NY)

SWAZILAND—Trans World Radio, 3240 at 0310 with lively African vocals, talk by man in Shona and listener phone calls. Series of IDs and close down anmts plus address at 0327. Multiple IDs and language change at 0330. Also 4775 with long religious talk in GG at 0412. (D'Angelo, PA) 3240 with religious message monitored at 0338. (DeGennaro, NY) 0434 with man in EE on his military service. (Wood, TN) 9500 at 1732 with schedule, IS, music and into news. (Burrow, WA)

SWEDEN—Radio Sweden, 6010 via Canada at 0131 on copper mines in northern Sweden. (Charlton, ON) 0145 with Judy Miller hosting. (Maxant, WV) 6065 in Swedish at 2125. (DeGennaro, NY) 15240 on flooding in Romania at 1246. (Brossell, WI) IBRA Radio, 9675 via Julich in African language at 2012. (DeGennaro, NY)

SYRIA—Radio Damascus, 12085 heard at 2025. Off abruptly at 2026. (Maxant, WV) 2044 in EE with lady anncr. (DeGennaro, NY)

THAILAND—Radio Thailand, 5890 via Greenville at 0058 to 0100 ID and language change. Also 9680 in FF to Europe at 2023 and 11870 in Thai at 1049. (DeGennaro, NY) 7260 in VV at 0113, then IS, EE ID and into Cambodian. (Taylor, WI) VOA Relay, 9645 at 1300. (Barton, AZ) 9700 at 1218 with EE sentences repeated in an Asian language. (Brossell, WI)

TAIWAN—Radio Taiwan Int., 5960 via Florida at 0710 on tourism, Taiwan stock market. (Maxant, WV) 15600-Florida at 2207. (Burrow, WA) 2213. (Chandler, ON) CBS, 9660 in Mandarin at 2358, time pip, ID and back into man/woman alternating short items and music bridges. (Taylor, WI) 11665 in CC at 1430. (Barton, AZ)

TURKEY—Voice of Turkey, 6140 in EE at 0319, 9460 in TT at 2308, 11955 in TT at 1056 and 17790 in AA at 1445. (DeGennaro, NY) 9460 in TT at 0027. (Charlton, ON) 0319 in TT. (Wood, TN) 11850 going into FF at 1930 and 15350 in TT at 1314. (Brossell, WI)

TUNISIA—RT Tunisienne, 7190 in AA at 2124 and 12005 in AA at 1938. (DeGennaro, NY) 7275 in AA heard at 0315. (Brossell, WI)

UKRAINE—Radio Ukraine Int., 5910 in EE to ECNA at 0012. (DeGennaro, NY) 7440 with EE news heard at 0007. (Charlton, ON)

UNITED ARAB EMIRATES—Emirates Radio, Dubai, 15435 in AA at 1609. (DeGennaro, NY) BBC Relay, 12030 in unid Asian language at 1254. (Brossell, WI)

UNITED STATES—AFN/AFRTS, 5446.5u via Florida heard at 0925 with CBS news. (Maxant, WV) 1048. (DeGennaro, NY) Radio Miami Int. 7385 carrying HCJB's DX Party Line program at 2130. (Maxant, WV)

VATICAN—Vatican Radio, 5885 in II at 0604, 7305 in PP to Brazil at 0043, 9645 in EE at 2009 and 13765 in EE at 2005. (DeGennaro, NY) 7305 in SS at 0335. (MacKenzie, CA) 9605 in SS at 0325. (Wood, TN) 11740 with Latin mass at 0630 and 15235 in EE at 1530. (Maxant, WV) 15570 with IS to 1700 and into FF. (Clapshaw, WA) 15235 with Pope Benedict giving a homily during a mass heard at 1534 and 1741 with EE ID. (Charlton, ON)

ZAMBIA—The Voice, 4965 at 0358 with woman in EE with news and time check as "South African time." Sounded like a US morning drive time show. (Wood, TN)

ZANZIBAR—Radio Tanzania-Zanzibar, 11735 at 1755 with Swahili talk, drums, EE news at 1800, back to Swahili at 1810. (Alexander, PA) News at 1800. (Maxant, WV) 1805 with news in EE and 1808 "that's the end of the news from Spice FM." Then back into AA. (D'Angelo, PA) 2045 with songs and anmts in presumed Swahili. (Brossell, WI)

And, once again, order is restored!

A gigantic round of applause to the following folks who did the good thing this time: Joe Wood, Greenback, TN; William Hassig, Mt. Prospect, IL; Rick Barton, Phoenix, AZ; Stewart MacKenzie, Huntington Beach, CA; Mark Taylor, Madison, WI; Brian Alexander, Mechanicsburg, PA; Jerry Strawman, Des Moines, IA; Robert Chandler, Windsor, ON; Charles Maxant, Hinton, WV; Robert Wilkner, Margate, FL; Ciro DeGennaro, Feura Bush, NY; Michael Clapshaw, Port Angeles, WA; Robert Brossell, Pewaukee, WI; Dave Balint, Wooster, OH; George Zeller, Cleveland, OH; Richard D'Angelo, Wyomissing, PA; Michael Yohnicki, London, ON; Mark Northrup, Gladstone, MO and Bruce Burrow, Snoqualmie, WA. Thanks to each one of you! And, until next month, good listening! ■

by Steve Douglass, webbfeat@gmail.com

New Aurora Evidence, Armageddon, And The Uniden BCD396T

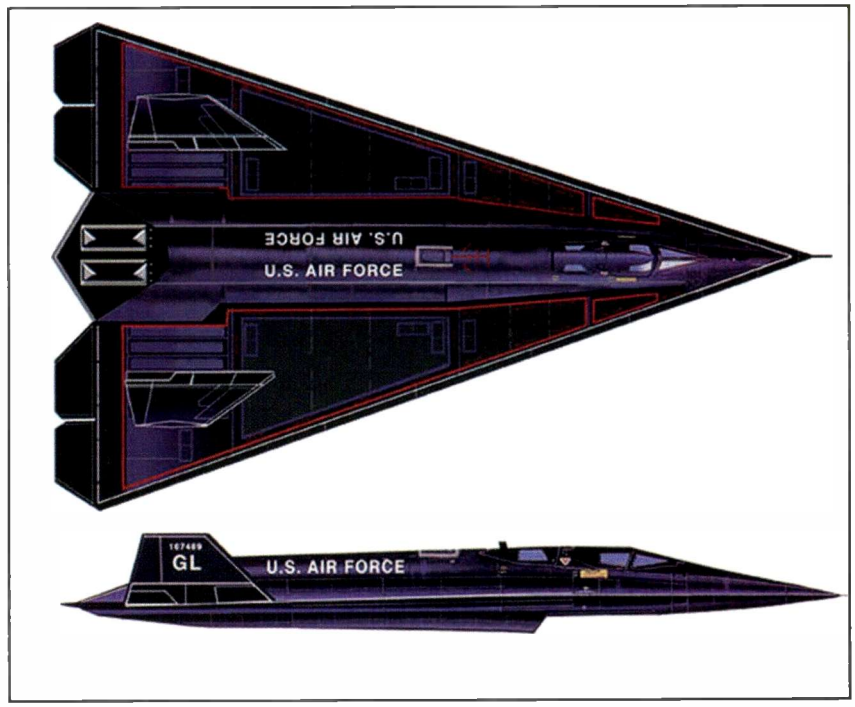
Just where did the year go? It seemed to fly by faster than an F-22 in full after-burner! I guess the older you get the faster it seems to pass. When I was a kid, Christmas took forever to get here, but now one barely has enough time to get the tree up and its over.

But it's early in this shiny new year full of promise and time to clean some of the clutter off my desk and post here some things I've been meaning to write about for, well, almost a year now!

Aurora Redux

Remember Aurora, the almost mythical Mach 5 + methane-breathing unicorn of a spy plane that aviation buffs and journalists thought existed despite non-denial denials issued by the Pentagon in the early 1990s? Well it seems new evidence has come to light, some of it backed up by a radio communications interception.

The most talked about sighting from a reliable and trained observer was the famous "Chris Gibson sighting" of 1989. Gibson (an accomplished aircraft observer having served 12 years with the Royal Observers Corps) witnessed a strange wedge-shaped aircraft being refueled by a KC-135 and accompanied by two F-111 chase planes flying over the North Sea. At the time Gibson was an oil engineer working on a North Sea drilling platform. Because of Gibson's credentials the sighting stirred much interest in aviation press.



Is this Aurora? This illustration is based on the last known sighting of the purported Aurora hypersonic aircraft made by Mienrad Erberle and Steve Hauser in September 1999. (Illustration by Steve Douglass)

This is what I wrote about the campaign to discredit the Chris Gibson sighting in my book, *The Comprehensive Guide To Military Monitoring*, and on my old website, "Project Black":

Soon steps were made from within the Defense Department to debunk the evidence. The USAF went so far as to hire experts at the Massachusetts Institute of Technology (Lincoln Laboratories) to discredit the skyquake evidence. They analyzed one of the seismic tracings recorded from Catalina island and in a report stated that the aircraft in question was a run-of-the-mill F-14 Tomcat on a flight test mission off the California Coast.

This explanation didn't fly with the aviation press because according to an earlier study released by the USAF Flight Test Center, sonic booms emitted by an aircraft flying at 50,000 feet only extend about 25 miles from the point of origin. Some of the seismic sensors recording the sonic booms were located 80 miles inland. Besides the sonic signatures weren't classic sonic-boom "N" waves but rather a series of booms, rapid rolling booms unlike those of any conventional fighter aircraft.

Then Secretary of the Air Force, Donald Rice, went so far as to issue a blanket denial in a letter to the *Washington Post*. He said in the letter, "Let me reiterate what I have said publicly for months. The Air Force has no such program either known as 'Aurora' or by any other name. And if such a program existed elsewhere, I'd know about it—and I don't. Furthermore the Air Force has never created or released cover stories to protect any program like 'Aurora' I can't be more unambiguous than that. When the latest spate of 'Aurora' stories appeared I once again had my staff look into each alleged sighting to see what could be fueling the fire. Some of the reported sightings will never be explained simply because there isn't enough information to investigate."

Rice went on to say, "Other accounts such as the sonic booms over California, the near collision with a commercial airliner and strange shapes loaded into Air Force aircraft. are easily explained and we have done numerous times on the record."

So were these denials the end of Aurora story? Not hardly. Just prior to Rice's letter to the *Washington Post*, sharp-eared military-radio monitoring hobbyists intercepted a radio phone-patch to the Air Force Special Projects office.

On the 12th of October, 1992 at 2310 GMT, on the (then) Mystic Star frequency of 6.812 MHz, a General Hogle was heard talking to an aide in the Air Force's Public Affairs Office saying "We need to develop a response to inquiries. The guts of this should be we that we have looked at the technical aspects of the sightings and what the logical answers for them are. You can quote Dr. Mori and then site the Lincoln Labs physics and the FAA's efforts to debunk the other incidents. Go through three or four of the sightings, take each one on and conclude with a paragraph that says the fantasy of Aurora doesn't exist."

They went on to discuss the Chris Gibson North Sea sighting, "Someone saw something accompanied by three F-111s. The Secretary wants us to talk to McMahan and say it was an F-117."

Although *Jane's* editor (and Motorbooks International author of *Aurora*), Bill Sweetman was able to confirm the conversation did indeed take place and that General Hogle was a high-ranking Air Force Special Projects brass hat. Who McMahan was, was a mystery, until now.

Tenacious journalist Bill Sweetman has never been one to let sleeping dogs lie and sent me a missive revealing that another important part of the Aurora puzzle has fallen into place, now placing serious doubts on the Aurora denials by Secretary Rice.

Bill writes (in an e-mail copied to me and Chris Gibson):

Chris,

I fell down an Internet rabbit hole today and found this guy:

"Mr. Tom McMahan has over 35 years of experience in aerospace government and industry, specializing in advanced technologies such as stealth and counter stealth. He spent 25 years in the Air Force and had oversight responsibility for all Air Force special access programs at the time of his retirement in 1993."

Reference: http://www4.nas.edu/webcr.nsf/0/c60f11befdc99980852570a60057cdc3?OpenDocument

So who cares?

If you remember, after your sighting was published in 12/92 and the USAF whizzed all over it from the highest levels, Steve Douglass published an intercept of a transmission from a special air mission flight (SAM 204) that had the AF Secretary, Don Rice, and the top uniformed AF flack, BG Woody Hogle, on board. Hogle later confirmed to me that the intercept was genuine. One key phrase, from Hogle to the SecAF Public Affairs office on the ground:

"The Secretary wants us to talk to McMahan and say it was an F-117."

We didn't know who McMahan was at the time, but now we do.

Now, Hogle said then that he recalled using the words "see if it was an F-117" rather than "say it was an F-117"—the latter sounding like Rice had directed his flacks to issue a cover story. But it made no sense either way. Rice, as SecAF, should have known that no F-117 had been in the UK in 8/89 when the sighting took place, because no F-117 had landed outside the US by then.

Anyway, just another interesting data point...

So What Became Of Aurora?

Insiders say the true name of the project (a two piece-mothership-recon drone system) was in reality "Brilliant Buzzard" and never became fully operational due to serious technical issues and the fact that it was horrendously expensive and logistically difficult to operate.

Supposedly the Aurora mothership is in flyable storage at Groom Lake but the pulse-detonation wave engine drone has seen service over Afghanistan, Iraq, and North Korea, which may account for various "donuts on a rope" and sonic boom reports coming from U.S. servicemen returning from the Middle East and from citizens in the North Korean capital.

Armageddon And The Uniden BCD396T

My friends are getting their ducks in a row and preparing for the worst. They are stocking up on dry goods and readying the fallout shelter.

Why? Because I bought my first IBM-compatible PC.

For some reason they seem to think that one of the sure signs that the apocalypse is near is the day I decided to get a PC. In fact I think I once said, "If a PC was the last computer on earth, I wouldn't touch one to safe my life."

Yes, I'm one of *those*, a despicable Macintosh worshipper! Considered in IBM circles to be an elite computer snob who thinks PC users are so unenlightened and slaves to a system rife with problems that they can't see past their keyboards and realize to use a Mac is pure bliss.

When I hear my PC using friends complaining about how Windows has crashed for the fifth time that day and every time they turn the thing on they have to do battle with an invasion of hard drive killing viruses or insipid spy ware, I usually grin and say, "You wouldn't have any of those problems if you were on a Mac!"

However, as near perfect as a Macintosh is, there are some things it just won't do. One of them is running the new and exciting radio scanner software for the latest state-of-the-art uber-scanner receivers. Having just acquired a shiny-new BCD396T and knowing that it would be years, or never, before someone got around to writing Mac compatible software for it, I decided to do the previously unthinkable: get a PC. Plus I actually found one at the price I wanted—free!

One of my buddies, Frank "Bubba" Murphy gave me a two-year-old PC that was destined for the dumpster. There was nothing wrong with it (just a bit outdated), so I called on another friend of mine (and my personal computer guru) Mike Dunlap who (with his cache of spare parts gutted from other machines) built me a fairly decent PC, including maxing out the ram, adding a bigger hard drive, CD burner, DVD ROM, and even a router connecting it to my Macintosh and the Internet.

Michael even installed several scanner control programs, including Uniden's E-Scanner software (for the BCD396T) and Buetel's ARC 396. So with everything installed I now have computer control of the BCD396T, which should take advantage of the full capabilities of this new scanning receiver.

But, until I've had time to get a working knowledge of Windows XP and these new programs, you'll have to wait until next month to see how it all works out.

In the meantime...

Things I'd Like To See And The Uniden's "RunkTracker IV"

I've been getting to know Uniden's new BCD396T scanner for over a month now. Despite the fact that it is a very good scanner that could do double duty as a portable and a base, there are some features of this receiver I would like to see tweaked or improved on future scanners in this line.

Many of you have no doubt read about the Uniden 996T slated to come out this spring. So before the software is written in stone for this promising new mobile/base scanner, here's what I'd like to see incorporated. Keep in mind this is just a wish-list and I have absolutely zero influence on the designers at Uniden.

• Improve alphanumeric display to include the frequency: What I love about my Uniden 785D is that it displays both the frequency and alpha tag so I can see at a glance who is saying what on which channel. The display on the BCD396T only displays the alpha-tag and this can be confusing. If for example you have the same tag for different frequencies (such as Albuquerque Center) you can't tell if it's on UHF or VHF, unless you designate it as such, but sometimes you run out of room.

• Password protect: Although the Uniden BCD396T has a cool feature known as "screen masking" that enables you to hide the info on the screen from prying eyes, I would like to see a password protection system, one that would not allow unauthorized use of the scanner. It would only take a few lines of

Recently released photo of the Uniden BCD996T due out this spring. (Photo courtesy Uniden Corporation)

simple code that would require you to enter a key so the scanner would not turn on or allow access to data stored within.

• Antitheft system. These new scanners are not cheap and unless you have an unlimited income, few of us can afford to plunk down more hard-earned bucks to replace a stolen Uniden BCD396T, so an antitheft replacement system would be nice. Maybe one could register the scanner with Uniden (who holds the list of who owns what) and if the scanner is stolen or lost, by sending it to Uniden it could be placed back in the hands of its rightful owners. This way a thief doesn't acquire your name and address and the police (or anyone who finds the scanner (such as an honest pawnshop owner) could just contact Uniden who returns the scanner to you. If Uniden is worried about added cost, this could be an optional pay service, one I'm sure many scanner owners would subscribe to.

• Protection and accessories: I just hate it when the crystal on my display gets scratched or my scanner gets dinged from everyday use and bumps and accidental drops. How about including a custom hard (or even soft case) to protect the scanner as a purchasing option? Many aftermarket companies are cashing in on the success of Apple I-pod sales by manufacturing cool I-pod accessories, including cases, earphones, interchangeable faceplates, and FM transmitters.

• Drop-in charger and data dock: Digital cameras have these and they are just smart. A drop-in data and charging station would have enormous appeal. Plug in chargers and data cables have the tendency to wear out and those rubber grommets that cover the ports do not last long.

One More Idea!

On several Uniden user Internet forums I have noticed that some owners are complaining that the stenciling on the scanner is rapidly rubbing off with only minor use. I have noticed this was also the case on my BCD396T, and it now says "RUNKTRACKER IV" instead of TRUNKTRACKER IV.

Although this is a minor cosmetic problem and not a big enough concern for me to send the scanner back to the manufacturer, Uniden has stated that anyone who has encountered this problem can send the scanner in and they will replace the faceplate. I like my BCD396T so much that I don't think I'll send mine in until I can bear to part with it for a few weeks. Until then, I've covered both the display and labels with transparent tape to keep both from getting scratched.

News You Can Use: Glamour Shot

Speaking of Uniden, the pending release of the Uniden BC996T has scanner buffs tongue's wagging and drooling over the just-released first photos of this cool-looking mobile scanner. For years I have complained that manufacturers have paid little attention to looks, but this is not the case with the Uniden 996T. What a great design! Modern, well laid out, and well lit. You can even change the color of the illumination of the keyboard and display. More on this unique scanner in the near future.

Iraqi Jam

Armed forces in Iraq charged with the art of electronic warfare (battling against IEDs, enemy-jamming, and hunting down insurgent clandestine radio broadcasts and tactical communications) are finding themselves engaged in a war with a new enemy, the overcrowding of the radio spectrum. The problem is now hindering U.S. operations so badly that US Central Command has moved the problem to the front burner and is calling for some kind of spectrum structure to be implemented.

Forces engaged in the hunt for radio-triggered explosive devices are finding themselves hindered by other forces using autonomous-jammers (hoping to flood the airwaves with signals so radio activation of the devices will not work) and also other electronic warfare emitters such as those aboard EC-130 Compass Call aircraft. The RF pollution has grown so intense it has even affected uplinks and downlinks from unmanned Predator aircraft and civilian radio and TV broadcasts, which are very important in getting vital information to the Iraqi populace.

To combat the problem, Central Command is speeding up development of the EWCC (Electronic Warfare Coordination Cell) to carry out daily updating (and coordination with EW units) who will issue each day a restricted frequency usage list.

Lt. Gen. Walter Buchanan, chief of the 9th Air Forces recently commented,

> The EWCC is something I've been fighting for a long time. This is the first time that I have seen electronic fratricide reach the point that it has. In some cases when jammers are on, a soldier cannot use his radio. But if we create a narrow notch in the jamming that allows him to transmit, an insurgent may exploit this notch to trigger an IED.
>
> The solution is careful coordination of all forces in the area concerning all emitters including EW jammers, surveillance systems including tactical radio transmitters from soldiers in the field and those used to control Predator UAVs. The EWCC will implement that solution.

Fighting Firewalls With Trojan Horses

Progress is proceeding rapidly in the development of the first U.S. Navy EA6B Prowler squadron to be equipped to deploy information warfare weapons, including the ability to hunt out and find enemy wireless information networks, invade them and use them against their own users. Found networks would be seeded with false information, worms, viruses, zombies, Trojan Horses and other computer attack tools that would leave an enemy communicating with U.S. intelligence analysts as often as they do with insurgents.

The ALQ-218 electronic attack system will go to war on board the EA6B

ICAP (improved capability) II system of the VAQ 139 Cougar squadron, hopefully to deploy in the first quarter of 2006.

Stealth Network Attacks

Pentagon think tanks are exploring new ways to probe terrorist communications networks using stealth aircraft the enemy will not know are there. Electronic communication packages that can find and read terrorist communications nets (including computer and voice circuits, satellite and cell networks, and frequency hopping transmissions) are being developed for use aboard stealthy aircraft like the F-22, B-2, and F-35. In contrast to the active attacks like those of the EA6B ICAP, stealth aircraft employed with such systems can probe an enemy network and collect data without the enemy being any the wiser.

Often the mission of these stealthy flying electronic sponges would be to enter enemy territory unseen and undetected, performing passive-surveillance which involves pulling information in, using active electronically scanning electronics packages. The information would be then analyzed by intelligence analysts with the goal being to invade and exploit said networks undetected.

Dispatches

Dennis Dean of Bay City, Michigan, sent in a news clipping detailing the dismantling of the Navy's big ELF (extremely low frequency) transmitting facilities in the Chequamegnon National Forest. "Its not quick or easy or a clean process. It is messy, dirty and takes time," says Tim Ward, operations manager for the facility located near Calm Lake.

The Navy made the decision to dismantle project ELF before the federal BRAC (Base Realignment and Closure) decisions were released.

"What makes the closure complicated is what to do with 1,500 poles spread across 42 miles of forest," Ward said. Works done so far includes removal of all the radio transmitters and the sensitive electronic equipment from the 12 buildings and two sites and taking down 400 tons of aluminum antenna wire strung onto the poles. Ward added, "There is still miles of buried copper wire at the ends of the antenna that was part of the grounding system. Some wildlife officials want at least some of the antenna poles left standing to support nests for raptors," Ward said.

Mike Crenshaw of La Grange, Georgia (admitted computer hater and master plumber) sent in a list of his VHF/UHF MILCOM loggings. Although space does not permit printing the whole list, here are a few of his choice loggings

50.25 (FM)	Raven UH-60 Blackhawks, Lawson AAF Columbus, GA
119.050	Lawson AAF Tower
120.750	Dobbins NAS Tower
120.750	Lockheed Test Flight, Marietta GA.
132.400	Lawson AAF
142.200	Raven UH-60 Blackhawks, Lawson AAF Columbus, GA
143.800	AZA/ACM/Bulldog MOA, Miller, GA
225.450	Raptor F-22 Air-to-Air Lockheed Test Flight, Marietta GA
225.925	Peach Ops, Robins AFB
228.900	NORAD/OAKGROVE CAP
235.550	FRYER drop zone, Lawson AAF

Erik Orange of Cleveland, Ohio, writes:

I always look forward to reading your column each month to pick up new MILCOM monitoring tips. My main MILCOM base receiver is a Uniden BC780 connected to a Diamond discone. The fast scan speed along with the excellent VHF and UHF sensitivity makes it a great receiver for mil air activity. I only wish it had more than 500 channels!

My main MILCOM handheld receiver is a Yaesu VR-500 coupled with a Diamond RH-77CA whip. Although the slow scan speed leaves something to be desired, the VR-500 has good UHF ears and works great as handheld HF receiver. Using just the whip, I have no problem picking up aerial refueling on UHF, and can easily hear activity on 11.175. I have also had good luck with the VR-500 as I begin to experiment with SATCOM (240–270 MHz). I wouldn't mind seeing satellite comms as one of your future topics, too.

Erik, we will indeed be covering military SATCOM communications in a future issue.

George Baitzel sends us this quick missive:

The land station noted by SJ on 12359U is VAX498 in Burlington, Ontario, and is Herb Hilgenberg's "Southbound Two" (II) with alt. active freq. 8294U. This is a sail boater trf net with Herb acting as a wx-location manager for the benefit of "yachties" in the Caribbean, Gulf of Mexico and Eastern Atlantic areas. Freq. chg from 8 to 12 seems to be consistent at 1940Z. Interesting trf esp during hurricane season.

Thanks, George!

Renewing Our Commitment

In this still new year, let us all resolve to get more serious about our UTE monitoring and pledge to share the data we collect with others who share this exciting hobby. Don't forget you can e-mail loggings, clippings, frequency lists, and photos to the e-mail address listed above. Sometimes your loggings may get lost in the tons of SPAM I receive each day, but don't give up hope if you get no immediate response, and try, try again. What you monitor and how you do it, and especially, who you *are* is very important to our readers and me.

Remember, without your input and feedback, this column is operating in a vacuum, nothing in, nothing out! See you again next time!

Reader's Logs

0000 (Frequency MHz): STATION, Anytown, USA, summary of traffic heard in MODE at 0000Z. (monitor/sometimes location)

518.0: NMR, USCG, San Juan, Puerto Rico at 0600Z and NMA, USCG, Miami, FL at 0800Z w/NAVTEX bulletins, SITOR-B. (SJ)

3150.0: UNID YL/EE with 5-ltr grps. Two msgs, one of 92 groups, one of 31 groups. Msgs repeated, but then off suddenly during repeat. A bit of QRM from a digital signal now and then. USB at 2222Z. (CG)

3167.0: LIMA, HOTEL, A6G, C2Z in USN Link coordination net at 1039. (MC)

3167.4: 6TI, 9PW, 4KH USN ships in comms in JAX OPAREA at 0145. (MC)

4270.0: UNID YL/EE with 5-ltr grps in USB at 2211Z. (CG)

4271.0: CFH, Canadian Forces, Halifax, NS w/wx forecast at 2348Z as Hurricane Ophelia approached, ITA2, 75 baud, 850 Hz. (SJ)

4295.0: FUE, French Navy, Brest, France w/marker at 2355Z, RYRY and SGSG strings, dual 0-9 count, ITA2, 75 baud, 850 Hz. (SJ)

4316.0: NMG, USCG New Orleans, LA, computer-generated male voice w/wx forecast at 2325Z in USB. (SJ)

4583.0: DDK2, Hamburg Meteo, Germany w/wx forecast in English, ITA2 at 50 baud, 425 Hz, //7646.0 & much better 10100.8, then into standard marker at 0015Z. (SJ)

4372.0: 0XX and 3TX in comms in VACAPES OPAREA monitored at 2114. (MC)

5091.0: UNID YL/EE with "JSR" rpted for several minutes, then "message" twice, "group 30" twice, "text" twice, then into 5-ltr grps. USB starting at 2203Z. (CG)

5211.0: WGY912 (FEMA, Mount Weather, VA) standing by for checkins at 2317. (MC)

5320.0: USCGC SHEARWATER with radio check at 1229. (MC)

5320.0: USCGC TYBEE position report to Sector Atlantic City at 2326. (MC)

5708.0: SENTRY 22 (E-3 AWACS) ALE initiated p/p to RAYMOND 24 at 2354. (MC)

5732.0: OMAHA 321 (CBP UH-60) wkg HAMMER to report they are off from Columbus, GA en route Columbia, SC at 2231. (MC)

5385.0: NNN0MRE, USN MARS station w/msg count, PACTOR at 2328Z. (SJ)

5732.0: OMAHA 747 (CBP UH-60) connected via SERVICE CENTER to HAMMER reporting they are supporting FEMA assessment in NC during Hurricane Ophelia monitored at 2116. (MC)

5820.0: UNID YL/EE rpting "YHF2." USB at 2135Z. (CG)

6317.0: WLO, Mobile R., AL in QSO w/unid. vessel on 6265.5 at 2316Z, position report on Hurricane Maria, alphabet twice, QUICK BROWN FOX string, 0-9 count and END TEST, SITOR-A. (SJ)

6358.5: PBC36, Dutch Navy, Goeree Island, Netherlands, ITA2 marker at 2340Z: "04B 06A 08A 12A 17X 22X PBC," 75 baud, 850 Hz //8439.0. (SJ)

6483.0: PBB, Dutch Navy, Den Helder, Netherlands w/marker, ITA2, 75 baud, 850 Hz at 2340Z. (SJ)

6496.5: CFH, Canadian Forces, Halifax, Nova Scotia w/wx data, ITA2, 75 baud, 850 Hz at 2354Z. (SJ)

6694.0: HALIFAX MILITARY wkg CANFORCE 2416 (CC-130) at 1248. (MC)

6761.0: LIFTR 02 wkg BOLT 91 (KC-135R, 6 AMW) at 1640. (MC)

6855.0: UNID YL/SS with 5-fig grps. AM at 2115Z. (CG)

7313.5: AFA2AJ Virginia, AFA2SO Kentucky, AFA2MH Georgia, AFA2VA Virginia in USAF MARS 2S1 Net monitored at 1241. (MC)

7527.0: CG 1701 (HC-130, CGAS Barbers Point) departing Mobile en route San Antonio requests guard from CAMSPAC at 0142. (MC)

7643.5: NOVEMBER CHARLIE & NOVEMBER in USN Air Defense Net at 2218. (MC)

7657.0: 93A landing at U1 secures guard with PANTHER at 2121. (MC)

8301.6: STINGRAY 14 (HU-25) ops and position report to Sector San Juan monitored at 2230. (MC)

8379.0: C6QZ5, *DOLE COLOMBIA*, 30,106 ton Bahamas-registered container ship w/AMVER/PR at 1850Z, 120 mi E of Myrtle Beach, SC en-route to Wilmington, DE. WCZ7837, *DELTA MARINER*, 3,950-ton U.S.-registered Ro-Ro cargo ship w/AMVER report at 2050Z. DYHS, *TAMOYO MAIDEN*, 17,297 ton Philippines-registered general cargo ship w/same at 2234Z. All stations SITOR-A. (SJ)

8419.0: WLO, Mobile R., AL in QSO w/unid. vessel on 8379.0 at 1323Z, wind forecast "Copyright 2005, Wilkens Weather Technologies, L.P.," SITOR-A. (SJ)

8463.0: CKN, Canadian Forces, Esquimalt, BC w/marker at 2345Z: "NAWS DE CKN ZKR FI 2740 4155 6254 8318 12380 16558 22182 AR," ITA2, 75 baud, 850 Hz. (SJ)

8502.0: NMG, USCG, New Orleans, LA w/male giving wx forecast at 1730Z, live, not computer-generated, USB. (SJ)

These great shots of the space shuttle Discovery riding piggy-back on NASA's 747 shuttle carrier are courtesy of Christopher Rausch who photographed the dynamic duo on landing and takeoff at Altus Air Force Base, Oklahoma.

8670.0: IAR, Roma R., Italy, with modified CW marker at 2345Z: "VVV VVV VVV DE IAR IAR IAR K 8 12 16 MHZ - ." (SJ)

8971.0: TRIDENT 25 (P-3C) wkg GOLDENHAWK at 1922. (MC)

8980.0: CG 2129 (HU-25) p/p via CAMSLANT to District 7 Miami Ops regarding downed aircraft SAR they are working near Bimini at 1412. (MC)

8983.0: CG 2127 (HU-25) departing Mobile en route Corpus Christi requests guard from CAMSLANT at 1909. (MC)

8992.0: LL 60 (P-3C, VP-30) p/p via Offutt HF-GCS to VP-30 Duty Office heard at 2124. (MC)

8992.0: BOYS CLUB p/p via Puerto Rico HF-GCS to CREATION. Terminates their services at 0038. (MC)

9025.0: CG 1503 (HC-130, CGAS Elizabeth City) ALE initiated call to E-City Air at 0007. (MC)

9165.0: HLL2, Seoul Meteo, South Korea at 1205Z, first time heard on any freq., but weak at just 3 kW, FAX. Unid. station w/handsent CW 5 number groups at 0320Z, full numbers except "T" for "0." (SJ)

10100.8: DDK9, Hamburg Meteo, Germany, w/wx forecast in English at 2058Z, ITA2 at 50 baud, 425 Hz. (SJ)

10242.0: CG 1711 (HC-130, CGAS Clearwater) p/p via SERVICE CENTER to Elizabeth City Air regarding status of CG 2005 heard at 2334. (MC)

10648.0: ADOBE 51 p/p via Puerto Rico HF-GCS to Travis AFB CP & Meteo heard at 2321. (MC)

10780.0: Cape R., Cape Canaveral, FL, calling LIBERTY STAR at 1234Z morning of planned DISCOVERY shuttle launch, USB. (SJ)

10993.6: CG 1705 (HC-130, CGAS Clearwater) wkg SHARK ## at 2054. (MC)

11205.0: SHARK 43 (C-130) checkin with SMASHER monitored at 1247. (MC)

11232.0: DRAGNET VICTOR (E-3 AWACS) p/p via TRENTON MILITARY to BLACK WIDOW OPS at Luke AFB at 2312. (MC)

11232.0: KING 25 (HC-130) p/p via TRENTON MILITARY to Moody AFB Meteo at 1947. (MC)

13257.0: CANFORCE 2301 (CC-130) p/p via TRENTON MILITARY at 1932. (MC)

13907.0: CG 1718 (HC-130) departing New Orleans en route CGAS Houston requests guard from CAMSLANT at 2145. (MC)

13927.1: REACH 0457 p/p via AFA3HS Kansas to HILDA regarding mechanical problem requiring divert to Kelly Field at 1938. (MC)

13927.1: TURBO 11 (KC-135, 22 ARW) p/p via AFA1RE Maine to SHOCKER CONTROL at McConnell AFB at 2349. (MC)

13927.1: EVAC 5249 (C-141C) p/p via AFA3HS Kansas to Air Evac Squadron, Andrews AFB reporting inbound patients for Walter Reed Hospital at 2136. (MC)

14396.5: AAR7AL (SHARES Central RCS Net Control) and NNN0VUV (SHARES SW RCS) taking check-in from AFA2KM, Florida during Hurricane Ophelia at 0034. (MC)

15867.0: JULIET 14 p/p via SERVICE CENTER to Elizabeth City Air during Hurricane Ophelia at 1558. (MC)

11565.0: UNID YL/EE with "EZI2," long pause, then "EZI2" rpted. USB starting at 2130Z. (CG)

12390.0: GYA, Royal Navy Fleet Weather and Oceanographic Centre, Northwood, England w/tabular TAFs (Terminal Aerodrome Forecasts) at 1854Z for 13 Middle Eastern airports, including Bandar Abbas (OIKB) and Shiraz (OISS), Iran, FAX. (SJ)

12479.0: V7ET2, *CROWLEY SUN*, 9,200 ton Marshall Islands-registered Ro-Ro cargo ship w/AMVER rpt. at 1615Z. 3FUV3, *NEREO*, 99,355 ton Panama-registered crude oil carrier w/AMVER/PR at 1623Z, south of Jamaica, headed to Puerto La Cruz Pilot St., Venezuela. 9VFZ, *IKAN SEPAT*, 28,503 ton Singapore-registered bulk carrier w/ID at 1840Z, garbled msg. All stations SITOR-A. (SJ)

12482.0: C64D6, *LAKE RANGER*, unlisted vessel w/AMVER/FR at 1431Z for arrival at Long Beach, SITOR-A. (SJ)

12486.5: HPUD, *MSC LARA*, 38,270 ton Panama-registered container ship w/extensive AMVER rpt. at 1628Z, off W coast of Mexico, departed Manzanillo headed to Japan w/detailed route leg data for next 16 days, SITOR-A. (SJ)

12490.0: S6NK2, M/T *EAGLE TACOMA*, 107,123 ton Singapore-registered crude oil tanker w/AMVER rpt. at 1550Z, en-route from Texas City, TX to Cayos Arcas on Yucatan Peninsula, Mexico. 3EQH5, *MARINA ACE*, 17,319 ton Panama-registered vehicle carrier w/AMVER/PR at 1706Z, east of Nassau headed toward Jamaica. 3FJR6, *MORNING SKY*, 45,888 ton Panama-registered bulk carrier w/same at 1604Z. VRVK4, *DARYA RANI*, 45,654 ton Hong Kong-registered bulk carrier w/AMVER rpt. at 1750Z. A8FZ3, *SANKO GALAXY*, 52,500 ton Liberia-registered bulk carrier w/same at 1804Z, 100 mi S of Cuba. 3ECG9, *VICTORIA BRIDGE*, 65,100 ton Panama-registered container ship w/same at 1812Z, 200 mi E of Nassau en-route to NYC. 3FUV5, *NEREO*, 99,355 ton Panama-registered crude oil carrier, w/AMVER/PR at 1831Z for departure from Puerto La Cruz, Venezuela en-route to Corpus Christi, TX, heard 19 days earlier on 12479.0 kHz en-route to Puerto La Cruz. All stations SITOR-A. (SJ)

12492.5: XCPI, *NUEVO PEMEX III*, 44,575 ton Mexico-registered crude oil tanker w/lengthy SS telex at 2139Z incl. crew roster, detailed cargo info. Same vessel again w/crew roster only at 2347Z same day. XCGV, B.T. *GUADALUPE VICTORIA II*, 45,350 ton Mexico-registered oil products tanker w/lengthy SS telex at 2301Z to PEMEX office in Salina Cruz, Oaxaca, Mexico about fuel consumption, cargo, etc., signed by ship's captain. Both stations SITOR-A. (SJ)

12503.5: UFJI, *AKADEMIK MSTISLAV KELDYSH*, 1,901 ton Russia-registered research vessel w/traffic at 2005Z to Kaliningrad R. UATX, *KAPITAN SUKHONDYAYEVSKIY*, 1,810 ton Russia-registered trawler w/same at 2035Z. Both stations SITOR-A. (SJ)

12545.4: Unid. vessels simplex QSO at 0120Z, males in Fujian/Taiwan dialect (Minnan) Chinese, somewhat frantic-sounding, USB. (SJ)

12568.5: UBAU, *ALEKSANDR MIRONENKO*, 3,372 ton Russia-registered trawler w/position report in Cyrillic at 2010Z, ITA2 at 50 baud, 850 Hz. (SJ)

12584.5: WLO Mobile R., AL w/auto-response to HELP+ command from unid. vessel on 12482.0 at 2310Z, SITOR-A. (SJ)

12666.5: FUO, French Navy, Toulon, France w/marker at 2150Z: "THE QUICK BROWN FOX JUMP OVER THE LAZY DOG" (no "S"), instead of FUG, FN, Sassaic, France that is usually here, ITA2 at 75 baud, 850 Hz. Heard again here a few days later w/same marker at 2045Z, but in Reverse mode, back to Normal mode 6 days later around the same time of day. (SJ)

12823.5: CTP, NATO, Lisbon, Portugal w/marker at 2038Z: "NAWS NAWS DE CTP CTP QSX 04 06 08 12 MHZ AR," ITA2, 75 baud, 850 Hz. (SJ)

12840.5: PBC312, Dutch Navy, Goeree Island, Netherlands w/marker at 2150Z: "02A 04B 06A 08A 12A 17X 22X PBC," ITA2 at 75 baud, 850 Hz. (SJ)

13375.0: LINCOLNSHIRE POACHER, British MI-6 numbers station, YL w/ EE 5 number groups x2 at 1820Z after musical sign-on, //16084.0 in USB. (SJ)

15034.0: CHR, Trenton Military, Ontario w/Canadian Forces VOLMET wx broadcast at 1658Z, live male voice, USB. (SJ)

15920.0: CFH, Canadian Forces, Halifax, NS w/marker at 1510Z, perfect reception: "NAWS DE CFH ZKR F1 2822 3394 4155 6260 8303 12377 16576 22182 AR," ITA2, 75 baud, 850 Hz. (SJ)

15988.0: DDK7, Hamburg Meteo, Germany w/CQ & standard "RYRY" marker w/frequencies at 1525Z, also 5 number groups for wx observations at 1720Z, ITA2, 50 baud, 425 Hz. (SJ)

16135.0: KVM70, Honolulu Meteo, HI w/chart sent lengthwise, fair reception at 0243Z, FAX. Nothing heard on //freqs. (SJ)

16687.5: Unid. vessel w/brief tfc in SS, SITOR-A at 1721Z. (SJ)

16696.5: DSNC5, *HANJIN NEW ORLEANS*, 70,337 ton South Korea-registered bulk carrier w/AMVER rpt at 1702Z. 3FXF6, *CROWN JADE*, 10,332 ton Panama-registered refrigerated cargo ship w/AMVER/SP sailing plan at 1910Z for departure from San Juan en-route to Lisbon. Both stations SITOR-A. (SJ)

16699.0: Unid. vessel w/crew roster & report on crew member "MUTILADA EN SU PARTE SUPERIOR" in SS hearrd at 1738Z, SITOR-A. (SJ)

16747.0: Unid. w/news in EE at 2020Z, SITOR-B. (SJ)

16747.5: Unid. Philippine station w/EE news headlined TANJAY at 1438Z, currency exchange rate quoted as "1 GEORGE BUSH – 56.00 GLORIA," plus a few Tagalog words at signoff, SITOR-B. (SJ)

16951.5: 6WW, French Navy, Dakar, Senegal w/marker at 2120Z, the usual "LE BRICK GEANT," 0-1 countdown and RYRY/SGSG strings, ITA2, 75 baud, 850 Hz. (SJ)

22542.0: JJC, KYODO News, Tokyo, Japan, w/next morning's JJ paper at 1500Z, FAX at 60 lpm, first time heard on this freq., //17069.6 & 17430.0 (9VF252, Singapore). (SJ)

This month's star contributors are Mark Cleary (MC), Chris Gay (CG), and Steven Jones (SJ). A hearty thanks to all. ■

by Peter J. Bertini, radioconnection@juno.com

Signal Tracing Techniques: Put Your Signal Tracer To Work!

Our last column covered the ins and outs for two representative signal tracers: a Heathkit model T-4 and a Heathkit model IT-12 signal tracer. I suggested how to select a nice working unit and gave a few hints on what is needed to keep these instruments running reliably for many more years to come.

This month I'm going to show you how to use a signal tracer, how to familiarize yourself with what the instrument can do, and how to use the instrument to trace the signal path through a radio from the antenna to the speaker! Like any other skill, there is a learning curve, and for that reason I advise starting with a known working radio. This lets you learn what the signals should sound like at various stages as you become comfortable using the signal tracer. It's difficult for a novice restorer to dig into a dead radio, using unfamiliar test equipment without wondering if the radio or his interpretations of the test instrument indications are at fault! Learning by doing is good experience and builds your confidence before tackling more difficult endeavors.

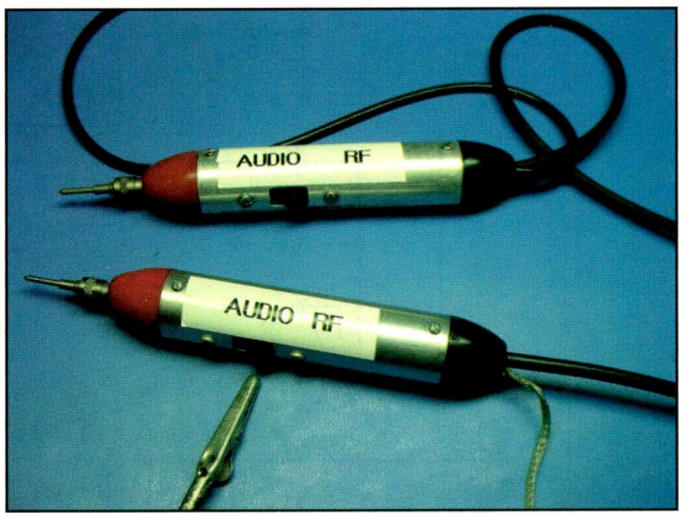


Photo A. The RF probe switch determines whether the signal tracer is being used for audio or radio frequency signal tracing. Some audio will pass through the probe if it is accidentally left in the "RF" position, however.

A Basic Radio

I've drafted a partial schematic for a simple five-tube radio; this drawing is shown in **Figure 1**. Note that the power supply details are left out for brevity, and hence one of the five tubes—the rectifier—is not shown. On the other hand, the circuitry is reminiscent of most basic All American 5 AC/DC radios that were produced from the 1940s up into the '60s.

The radio can be broken into two sections for the purpose of signal tracing. Points A through G are RF signal points, and to test these points for signals the signal tracer probe (**Photo A**) would be set to the "RF" position. In RF the probe switch places a small signal diode in the probe path. The diode acts like a wideband, un-tuned crystal radio, and will detect and demodulate any RF signal, and the recovered audio will be heard on the signal tracer's internal speaker.

Where To Start

Let's begin by setting our test bench up as shown in **Photo B**. Front and center is the radio that needs troubleshooting. Let's assume that we've checked all the tubes, and that we've done a preliminary restoration by replacing all of the wax capacitors and out of spec resistors. We've checked the cathode, plate and screen grid voltages, and everything, so far, looks good. The radio still doesn't work, and the next logical step is to systematically isolate the problem to a particular stage to make our repair task a bit easier!

The test gear is a Heathkit T-4 signal tracer, a Heathkit SG-8 signal generator with a companion RCA frequency counter, and, the most important item on the bench, an RCA Isolation Transformer. Since this is a hot chassis AC/DC radio, it is vital that the chassis be fully isolated from the AC lines, otherwise there is a good chance that the chassis could be *live* with 125 VAC to the nearest ground! Only the radio is plugged into the isolation transformer, both the signal generator and signal tracer are transformer powered and their chassis's are isolated from the AC lines.

First Steps

First, set the probe to RF, and set the signal tracer audio level at about one-third clockwise. The speaker switch should be "on," and the noise switch "off." Refer to **Photo C** for a review of these controls.

Coupling The Signal

If there is a strong, and very local, station nearby, you should be able to connect the probe ground lead to the chassis and the probe tip to pin 7 of the 6BE6 converter tube (**Figure 1**), and by tuning the dial to that station's frequency you should be able to hear the station on the signal tracer speaker. If not, the signal is probably too weak, and we'll need to couple in a stronger signal from an outside antenna, or we will have to use the signal generator to produce a strong signal.

If the radio doesn't have an external antenna connection point, you can add one to a radio using a ferrite bar loopstick antenna by winding several turns of wire over one end of the bar, and using these leads for connecting to a ground and antenna, or to the signal generator, as needed. As a last resort, a long external antenna can be coupled into the antenna circuit by using a small 5 to 10 pF capacitor in series with the antenna lead at

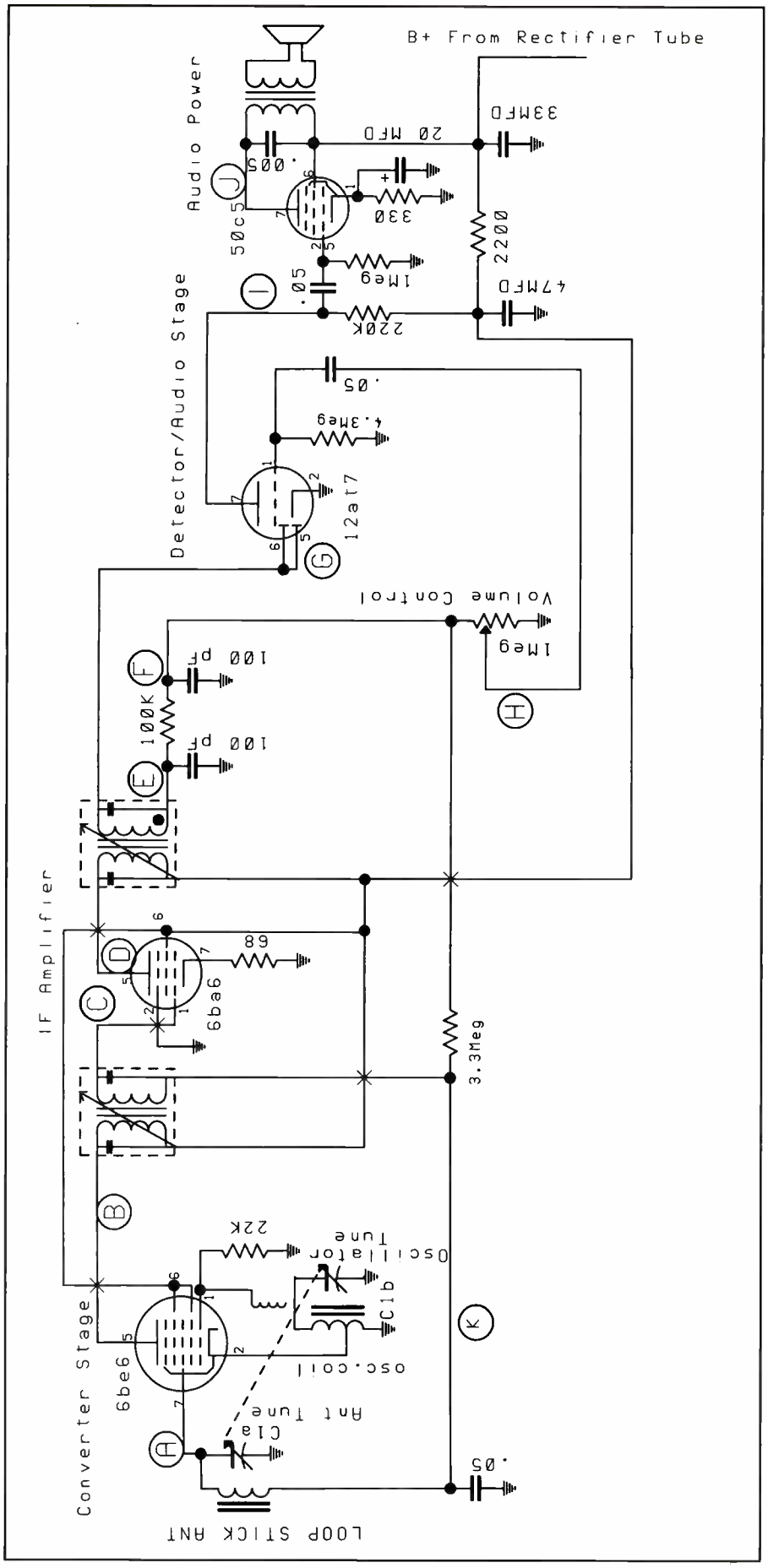


Figure 1. This basic AC/DC radio schematic is marked with alpha characters to denote points for a logical troubleshooting path from ← antenna to speaker.

point A on the drawing. This will detune the radio's RF stage slightly, but it will work for signal tracing purposes.

If everything is working as intended, most of the local stations should be heard on the signal tracer as the set is being tuned across the dial. The next step is to move the probe to point B, the converter stage output. If no signals are heard here, the converter stage may not be working. A VTVM (vacuum tube volt meter) with a 1-megohm probe should show a few volts of negative self-generated bias voltage on pin 1 of the 6BE6 if the local oscillator stage is oscillating.

A sensitive frequency counter with a pickup loop can be used to sniff for LO signals near the local oscillator coil, or another radio can be used to listen for the LO signal (it will radiate a signal 455 kHz higher than the radio is tuned to). For example, a set with a 455-kHz IF that is tuned to 1,000 kHz will radiate a LO signal at 1455 kHz. Also check the DC voltages on the plate and appropriate grids of the 6BE6. No plate voltage could indicate an open plate winding in the first IF transformer.

The IF Stage

If the signal is heard at points A and B, it should be heard at point C as well. If no signals can be heard at point C, then either the first IF transformer is bad or grossly misaligned.

Most IF transformers are color-coded; the plate signal lead will be blue, the IF stage grid lead will be green. Miniature IF transformers usually will have a green dot near the grid terminal solder lug. The signal tracer probe would be moved from points C to D, from D to G, or until no signals were heard on the signal tracer. A loss of signal between C and D would indicate a bad IF amplifier stage, and the first step is verifying that the 6BA6 stage has the correct plate and screen voltages.

Again, the second IF transformer could be defective or grossly misaligned if no signals are detected at point D. Remember that the set's selectivity is improving as the probe is moved from points B to G, and some retuning of the radio or signal generator might be needed to keep the signal peaked in the IF band-

Photo B. Here's an example of a test bench being used to signal trace a problem in an old radio. The test gear includes the signal tracer, a signal generator, and an AC line isolation transformer. The isolation transformer should always be used to power the radio, regardless of whether the set is an AC/DC type with a hot chassis or a transformer-operated design.

Photo C. Here's a view of the front panel controls referenced in the text.

pass. As you progress from the antenna through the mixer, IF amplifier, etc., the cumulative receiver gain will increase and the audio level on the signal tracer will have to be adjusted accordingly.

Detector Stage

The last point where an RF signal will be heard is at point G. This is the detector diode that recovers the audio information (demodulates) from the modulated RF carrier. The two 100-pF capacitors, with the associated 100 k-ohm resistor, form a low pass filter. This filter removes any remaining artifacts of the IF signal, and allows only the recovered audio and rectified DC from the detected carrier to pass. In some sets, the filter is an integral internal part of the last IF transformer, and some sets use a much simpler RC filter.

How The AGC Voltage Is Developed

From point E forward, the signal tracer probe needs to be set to "Audio" to continue following the signal through the remaining stages. As mentioned earlier, the detector recovers two things from the modulated carrier at the IF frequency: first, the demodulated audio, and second, a DC voltage resulting from the half-wave rectification of the IF signal. This is a negative voltage that is proportional to the signal strength. This voltage is used to provide the AGC (automatic gain control) voltage for the radio.

The DC voltage passes through the 3.3 meg-ohm resistor, and that resistance along with the .05 capacitor forms another filter that removes any audio components from the AGC voltage, leaving a pure DC voltage. As the signal increases, the voltage increases, but because the voltage is fed to the control grids of the converter and IF stages, the increased negative voltage also reduces the stage gain. This forms a closed loop feedback system, which works to keep the signal level constant at the detector as the signal fades and peaks, keeping the audio level fairly constant. Point K can be used to monitor the AGC voltage using a high-impedance meter (VTVM or digital meter) for alignment purposes.

Audio Tracing

The only remaining points that can be monitored with the tracer are for audio at points E, F, G, H, I, and J. No audio at point E could indicate a detector problem (pins 5, 6, and 2 of the 12AT7), or it might indicate that the second IF transformer secondary is defective. There might be a cathode-to-plate short for one of the diode sections; a good tube tester would isolate this fault in a bad tube.

If there is audio at point H, but not at point I, then the first audio amplifier stage is the source of the problem. If audio is heard at point F, but if nothing is heard at point H it could indicate that the audio potentiometer is defective. Audio loss between points I and J would show a problem with the 50C5 audio power stage. Again, the first step is to measure the DC voltages on the 50C5 cathode, screen grid and plate. Other possible trouble spots include the tone capacitor across the audio transformer primary winding being shorted, an open primary winding, bad socket or tube, or even a defective speaker!

Troubleshooting By Isolation

Most of these steps are a form of troubleshooting by substitution. The signal tracer is used to systematically replace various sections of the receiver until the problem is isolated. For example, with the probe at point F, the signal tracer is in effect substituting for all of the receiver's audio stages. Going back to the RF position, and probing point G has the signal tracer substituting for the receiver's audio stages, and the detector stage as well.

Shortcuts

Let's continue with a more practical example—a Zenith 5516 chassis from my

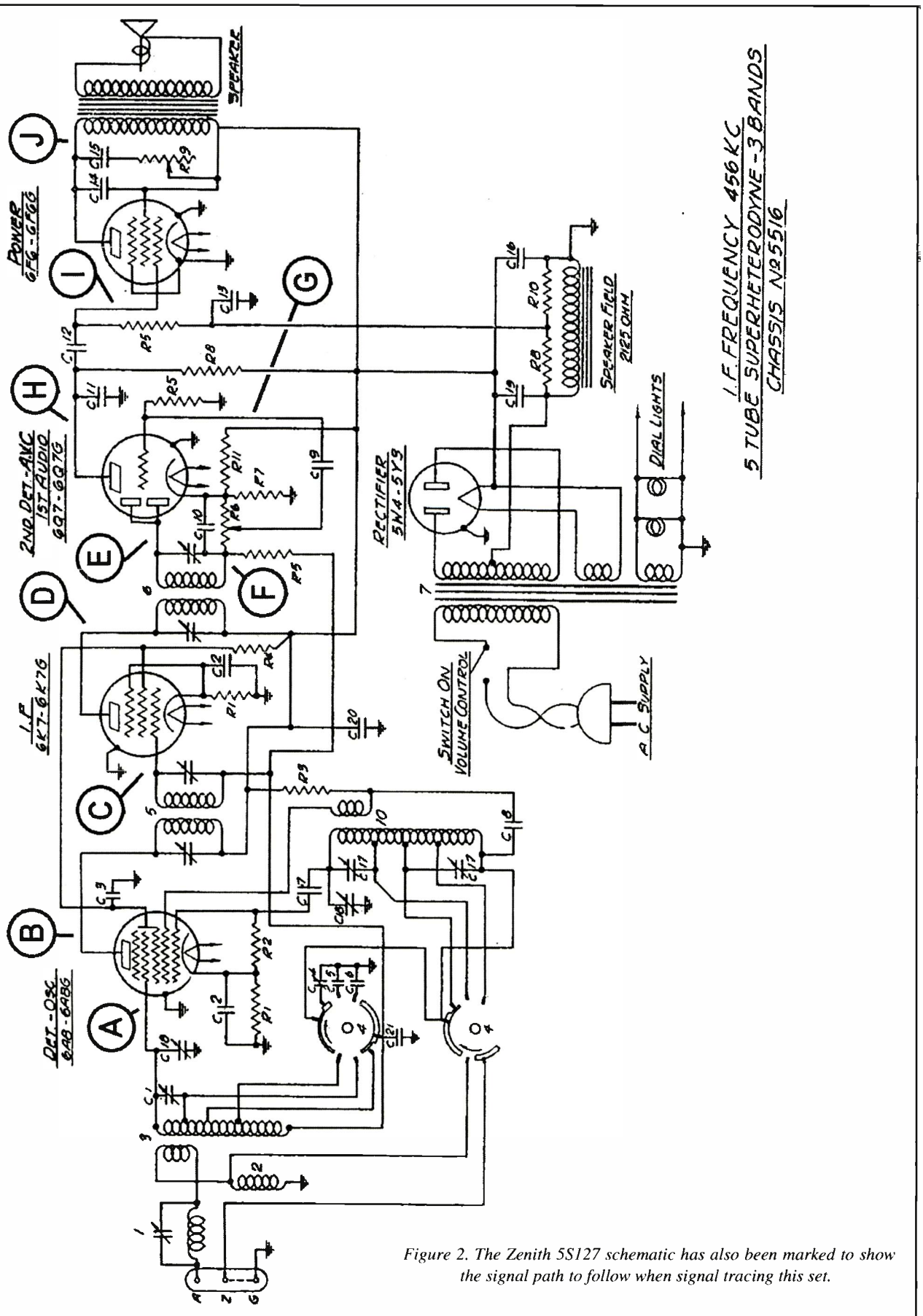


Figure 2. The Zenith 5S127 schematic has also been marked to show the signal path to follow when signal tracing this set.

Photo D. The tube grid caps often provide very convenient monitoring points for the signal tracer!

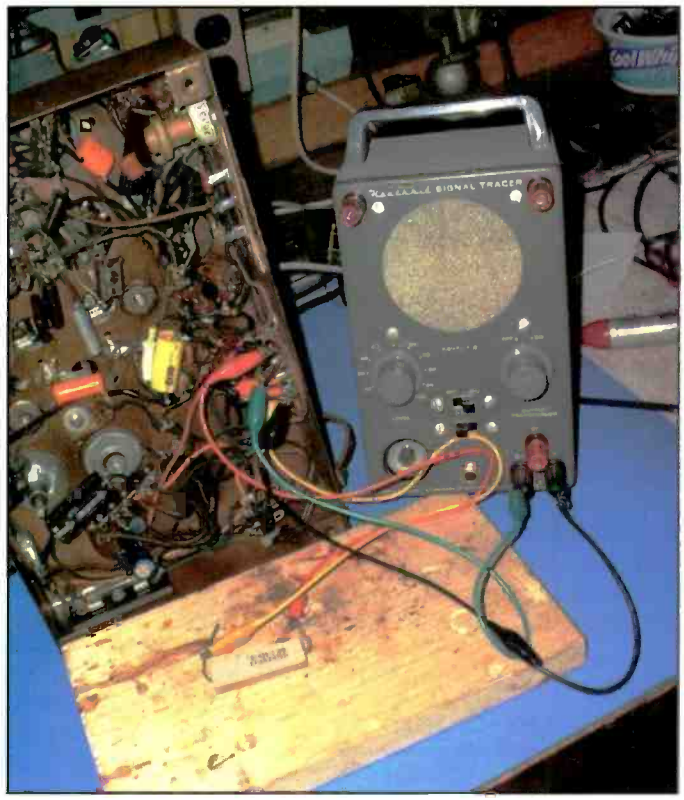


Photo E. Subbing the Zenith speaker, transformer, and field coil.

Zenith 5S127 tombstone radio. The set's schematic is shown in **Figure 2**, and I've annotated the test points in alphabetical order to show the logical sequence for the signal tracing through the radio from antenna to speaker.

Here's a neat shortcut: Points A, C, and G are accessible at the tube grid caps for the 6A8 converter (point A), the grid cap of the 6K7 IF amplifier tube (C), and the grid cap for the 6Q7 first audio stage (G). Using these points means you can quickly isolate the problem to a point before or after one of these stages without turning the chassis over! This technique is illustrated in **Photo D**.

The Zenith is a bit easier to signal trace, since it is pretty easy to inject a signal from the signal generator, or to ensure strong signals by connecting a long external antenna to the A and Z terminals on the receiver antenna connector. Points A, B, C, D, and E are all probed for *RF* signals, while points F through J will be audio, and the probe should be switched to the Audio position for those test points.

Speaker Substitution

Suppose you suspect the audio transformer, or even the dynamic speaker has problems, and you'd like to do a quick test to verify your suspicions. **Photo E** shows the Heathkit T-4 temporarily wired into the Zenith so it substitutes for the set's electrodynamic speaker. Alligator clip leads are used to connect the T-4 audio transformer and speaker to the 6F6 plate and the B+ contacts on the speaker jack on the chassis rear apron. A 2000-ohm power resistor is being used to replace the field coil in the speaker; the 2000-ohm resistance matches the *hot* resistance of the field coil windings[1]. Also note that the actual resistance of a field coil increases as it warms in use; often a schematic will indicate whether the shown field coil resistance is a *cold* or *hot* resistance. The T-4 must be switched to "off"; the power switch disconnects the T-4 audio transformer primary from the instrument's circuitry for this use.

Noise Switch

Finally, these Heath signal tracers have a noise switch feature that can be quite useful in finding noisy components! When

Photo F. Here's the noise switch feature being used to test a suspect carbon resistor.

the noise switch is on, and the probe is in the Audio position, the instrument couples a 130-VDC level to the probe through a 68 k-ohm isolating resistor. Any part placed between the probe tip and ground lead that breaks down under voltage will generate large amounts of noise in the tracer's speaker!

This feature is especially useful to find noisy carbon resistors. Often a RC resistor in an audio stage will go noisy, and this test is a good means to find and isolate the part. **Photo F** shows a resistor being tested for noise. It might be a good method to check the newer molded IF transformers for silver migration problems as well. Placing the probe between the winding connections and the metal shell of the IF transformer should quickly show if silver migration leakage exists between the mica capacitors to ground.

On Target?

You can reference the Heath T-4 assembly manual for additional guidance, while more advanced restorers might want to obtain a copy of John Rider's *Servicing By Signal Tracing*[2]. This well-written 360-page book was first published in 1939, and had at least five additional printings. It should be readily available from used book vendors.

I've reached my allocated space for this month, so to conclude I'll take this opportunity to ask whether these columns on signal tracing were of any benefit to you. Where they too technical or boring, or what could have I done to make them better? What other information was needed? Drop me a line and let me know.

Until next time, keep the soldering irons warm, and those classic old tube radios glowing!

References

1. The actual field coil resistance is 2125 ohms, but the 2000-ohm power resistor is close enough in value to work without any problems. The power supply filtering relies on the inductance of the field winding more than the DC resistance of the windings; substituting a resistor for the field coil may increase hum in some cases.

2. *Servicing By Signal Tracing*, by John F. Ride, John F. Rider, 404 Fourth Ave, New York, New York, publisher. Copyright 1939. ■

Tuning In *(from page 4)*

to offer up someone as a viable candidate for director. Not only is Bill Price a good man, kind and considerate, he's so smart; not just book smart, but smart in the sense that he gets things done with little fanfare. He's educated and he's passionate about radio. And in so many ways radio is key and essential to the business of disaster preparedness and security. I just know he'd ensure all the responsible agencies would get the radios they need to stay in touch and communicate effectively, and he'd personally try them out. Hey, if you can't have fun at work, what good is it?

On second thought – better not give him a microphone for more than a minute – just long enough to say, "testing, testing, testing." What's that, three seconds? Good enough.

Bill also meets one of the main requirements for High Office: he knows people. His friend Norm comes immediately to mind. If he and Norm can rig up half the things Bill tells us they have, we've got a director to die for! Maybe that's not quite what I mean, but you get the idea. Bill brings the expertise, knowledge and people skills to the job and along with friends like Norm, his able-bodied assistant who brings some coax, a few radios from the attic and antennas, and before you can say Category Five, we've got a working demo made-for-TV-moment of how radios should work in an emergency.

I've spoken with Bill about this idea. We really don't fault Brown when it comes to being able to roll from one Big Job into another, and really think he's probably a good guy with a lot to offer - somewhere. What's troubling to us is that the poor fellow at the dispatch center, who, like you and me, makes mistakes once in a while, and won't ever be able to rise to Brown's level of incompetence or write a best seller.

Bill has already typed his letter of acceptance as Homeland Security Director (he's always prepared!), and that he tells me he'd like to personally hand-carry it to President Wayne Green in a couple of years.

On second thought, some things are better left to our imagination. Only in America!

Washington Beat *(from page 41)*

and data privileges on 3.55 to 3.7 MHz, 7.05 to 7.125 MHz, and 21.05 to 21.20 MHz at 100 watts output and on 28.05 to 28.3 MHz at 50 watts output. The League wants the FCC to provide HF phone and image privileges to Technicians on 3.9 to 4.0 MHz, 7.2 to 7.3 MHz, and 21.35 to 21.45 MHz at 100 watts output, and on 28.3 to 28.5 MHz at 50 watts.

These recommended privileges take into account the FCC's proposal to adopt the ARRL's so-called "Novice refarming" plan in WT Docket 04-140, according to the League. The same privileges for a reconstituted Novice license had been proposed by the ARRL earlier.

Army Awards Contract For Handheld Radios

The Harris Corp. has been chosen to produce more than 1,300 Falcon III dual AN/PRC-152 Multiband Handheld Radio and Vehicular Adapter Amplifier systems for the U.S. Army's Communications and Electronics Command. The amount of the contract, announced late in 2005, totals $37.8 million, with a June 2006 delivery expected.

"The AN/PRC-152 vehicular radio systems will allow the U.S. Army to have the vehicular radio functionality and output power that they rely on for long-range communications, with the portability of a tactical handheld for quick-dismount scenarios," said Dana Mehnert, vice president and general manager of U.S. Government Products, Harris RF Communications Division.

The AN/PRC-152 is a multiband handheld radio transceiver, a 50-watt, long-range power amplifier, and an integrated handheld battery charger, Harris says. "As delivered, the AN/PRC-152 provides interoperability with key waveforms, including SINCGARS, HAVEQUICK II and VHF/UHF AM & FM. With the AN/PRC-152 mounted in the vehicular adapter amplifier, the system provides a 50-watt output in the VHF (30–90 MHz) band," an announcement on Harris' web site reported. "Multiband operation is made simple with a separate antenna port for the 90–512 MHz band."

The company's four operating divisions focus on government communications, tactical radio, broadcast, and microwave systems. Harris has marketed systems and service to customers in more than 150 countries. Additional information about Harris Corporation is available at www.harris.com. Harris is headquartered in Melbourne, Florida. ■

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by Bill Price, N3AVY

N3AVY Is Alive And Well (Thanks To Loyal Friends!)

No, I didn't almost die (well, not that I'm aware of, anyway) but the beloved ham license and that pretty neat callsign were in limbo for a while, but finally, the license has been renewed. While I must thank the people in Gettysburg and Washington D.C., I also owe a tip of the hat to Tom and Karen Mitchell (a ham-couple from seven-land who share other special interests with me), my friend John (who knows his own last name), several readers who nudged me via e-mail, and of course, Norm, who nudged me to the point of arranging to bring me a rig and antenna which I promise to use so long as he does not cause injury to himself, to me, or to any dairy animals during the installation.

And before I go any further, I'd like to tell loyal (and patient) reader Dwight Hanson, KB7AJE, that I am looking for a pencil and paper so that I can send him a proper answer to his letter, which is thumb-tacked RIGHT IN FRONT OF MY FACE until I write him an answer!

Now for those of you who face an upcoming expiration of your ham license, fear not! It was Tom and Karen who actually copied the link and included it in an e-mail to me and assured me that it was quick and easy, and didn't cost a dime to renew. They were right, of course, and I now have (written on the wall, so I don't lose it) some kind of FCC or FBI internal identification number so that I can either renew my ham license or get arrested with just the click of a mouse.

"And I learned that I am a dinosaur in more ways than I thought before I renewed my license."

And I learned that I am a dinosaur in more ways than I thought before I renewed my license. I now realize that my Advanced class license ceased to exist and I am grandfathered into existence because they have taken pity on me, I guess, or they have taken pity on the Extra class licensees and don't want me cluttering up their frequencies. Too bad. I passed the extra class code test the same day I passed my Technician, General, and Advanced class code test. I just happened to get a lousy bunch of questions on theory and regulations that day. Something about the permissible height of the ionosphere during an invasion by aliens from another planet, and I put seven when the answer should have been nine. Oh well, some day I'll take that part again. Can't do it online. Gotta get a volunteer examiner.

I just know that when Norm reads this, he's gonna apply to become a VE and then he'll come down here and pester me to take that !@#$%^! Extra class exam until I pass it. And to know Norm is to know that he would NEVER think of slipping me an answer or helping in any way. I know him too well. I think I remember watching him give someone a novice test a long time ago when we worked together, and to watch him agonize, twisting and straining his face with enough body English to shoot a pool cue across a football field, as if he was trying to transmit the right answer to the poor test-taker through the air, yet knowing that he couldn't help the applicant. It was too painful to watch. (Yes, the test-taker did pass, by the way.)

"I can see it now. As soon as the weather breaks, he'll be down here with a ream of computer printouts, with every possible combination of sample test questions for me to practice with."

I can see it now. As soon as the weather breaks, he'll be down here with a ream of computer printouts, with every possible combination of sample test questions for me to practice with. There will be no rest. In fact, there will probably be no sleep until I ace every practice test to his satisfaction and go find a local VE to administer the test.

And y'know what I'd REALLY like?

Internet CW.

Not that silly Internet long-distance stuff. Nosiree! I remember (here he goes again) back in Coast Guard radio school in Groton, Connecticut (when dinosaurs roamed the Earth), all the instructors and administrators had code keys and speakers by their desks, connected to a master oscillator. They called one another, or everyone, by using each operator's two-letter "opsign" such as "JS DE JP K" (which for the uninitiated means "JS, this is JP, over." Of course, being Coast Guard radiomen with a history of working the commercial ships, these guys were proficient—and being instructors, they were extra proficient. Those of us going through the school's six-month curriculum were duly impressed.

I guess I don't need Verizon or Vonnage to set anything up for me—I could just set up an audio chat with Norm (he's the only one crazy enough to be on the "other end" of a CW chat room with me) and use a key and an oscillator. Hey—no static, no bad conditions, no QRM, QRN (am I speaking a foreign language here?)

But seriously, folks (I love saying that) I think that, once Norm sets me up with the rig he promises to bring from the frozen tundra once the weather breaks, it's time for me to get back on the air, at least often enough to start a little "lunatic net" where loyal readers can practice their CW skills and exchange funny stories; I just think CW is too important to let it die.

Meanwhile, I'm dulling up some of my biggest drill bits so I can help him mount some of the biggest, ugliest, most ungainly antennas on that nice new chick-magnet of an SUV he's driving. Maybe I can show him how my .45 can punch a nice .451–diameter hole in a fender or a roof without the hassle of finding a drill bit or an extension cord, or how a Remington 30-06 can give him a nice mounting hole from up to 200 yards away, if he's not too fussy about exact antenna placement. ■

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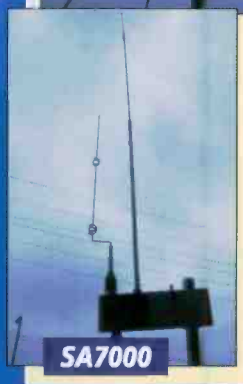

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