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Radio World®

The Newspaper for Radio Managers and Engineers

February 3, 1999

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Why Groups Invest in USADR

Top Groups Say USADR Stock Purchase Shows IBOC DAB Support, But Doesn't Lock Out Other Systems

by Leslie Stimson

LAS VEGAS With the announcement that nine of the top 10 radio groups have invested in USA Digital Radio, the company has raised its profile among competitors, broadcasters and receiver manufacturers. Reaction was strong and immediate to the news that the nation's largest groups purchased stock in the company, which is developing technology for what its engineers say is the future of radio (**RW**, Jan. 20).

Two other companies developing in-band, on-channel DAB, Lucent Digital Radio and Digital Radio Express, downplayed the significance of the announcement, while the broadcasters that invested in USADR gave varied reasons for doing so.

Receiver manufacturers, which IBOC DAB proponents must court in order to secure agreements to license their IBOC technology to manufacture hardware, generally were optimistic that the investment will give viability to IBOC DAB technology.

See USADR, page 10 ▶

Suppliers Tackle Y2K For EAS

by Lynn Meadows and James Careless

WASHINGTON While origination errors or relay failures may interfere with the Emergency Alert System on Jan. 1, 2000, reports from manufacturers to the Society of Broadcast Engineers indicate that EAS will continue to transmit messages in emergencies after Dec. 31 of this year.

Private industry and government agencies are scrambling to ensure their hardware and software is "Y2K compliant" and will function accurately when revelers head home after their 1999 New Year's Eve festivities.

Radio stations, especially those

See EAS, page 8 ▶

NEWSWATCH

NAB Forms Spectrum Force

NAPLES, Fla. NAB announced it is forming a task force on radio spectrum integrity. Because many FCC rule proposals involve radio spectrum, including in-band, on-channel DAB, low-power radio and FM technical rules changes, the association decided to form a group to work with the commission to "ensure that new services will not harm" the radio spectrum, according to an announcement. Bonneville International Corp. President and Chief Executive Officer Bruce Reese is to chair the task force.

NAB Radio Board Chairman Bill McElveen announced the formation of the task force at NAB's winter board meeting last month.

Helicopter Nearly Hits Unlit Tower

WASHINGTON Following another case in less than a month in which a helicopter nearly hit an unlit tower, the FCC has again warned tower owners to comply with its tower antenna marking and lighting rules.

The commission said that on Dec. 21, 1998, a helicopter ambulance almost hit an unlit radio tower near Arcadia, Fla. The 500-foot structure, said the FCC, was under construction and without the required temporary warning lights.

Towers that are 200 feet or more must be lit at the top; that applies during construction as well. More specific formulas apply for towers close to airports.

The helicopter company notified the FCC, which made sure the tower was promptly lit. An FCC investigation into the matter continues.

The commission recently issued an antenna warning to antenna owners in November 1998 because of a similar incident in Texas.

New Ownership Forms Ready

WASHINGTON New broadcast station ownership reports, that would, for the first time, include race and gender information, are available from the FCC (Form 323). All old versions of the form are no longer valid. All stations are required to file the form at some point this year. The forms can be obtained from the FCC's Web site, *www.fcc.gov*

Hicks, Muse Gets More Outdoor

The Hicks, Muse, Tate & Furst affiliate for investment in Latin American outdoor advertising companies, International Outdoor Advertising, has acquired three companies: Heres S.A. in Chile, Heres Uruguay and Publibus in Uruguay. Hicks, Muse has significant holdings in broadcast group owners Capstar, Chancellor and LIN Television, and is becoming one of the largest participants in outdoor advertising in South America.

Since 1996, Hicks, Muse has invested or committed to invest about $1.6 billion in equity capital in Latin America.

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New Owners Plot Course at LPB

by Brian Galante

FRAZER, Pa. Often when a company is purchased, the once-familiar inner structure can change into something unfamiliar.

This apparently is not the case following the recent purchase of LPB Inc. The company, founded in 1960 by Dick Crompton, is an international manufacturer of low-power broadcasting systems, consoles and automation systems. The company, called LPB Communications under its new owner, will continue to produce LPB equipment and add new products.

Tom Spadea, president of LPB Communications, and Edward W. Devecka Jr., former president of LPB Inc., made the announcement in October.

Manufacturing, marketing

Spadea said Devecka, who bought the company from Crompton in 1988, was ready to reduce his role and "bring in someone who could expand the manufacturing and marketing of LPB," as well as capitalize on the company's foundation in the industry. Devecka will continue to work as communications sales manager.

Although Spadea, 26, declined to disclose the purchase price of LPB, he said, "The terms were a win-win for everyone." The purchase of LPB, he said, will allow the new company to invest further in product development and marketing. As LPB Communications, the company will continue as a standalone operation.

Operations

For several years Spadea ran operations and sales for Just-In-Time, a screw manufacturing company owned by his family. Spadea had been searching for an opportunity to expand the operations and sales of an established American manufacturer. While he was not necessarily looking to enter the radio industry, he said, he has always been fond of the medium.

"I am excited to be in an industry that has had such a profound impact on national and international life," said Spadea, who recalled listening to old recordings of "The Shadow" and "War of the Worlds" as a child. "What I loved then and still love today is how radio forces you to use your imagination to bring the audio images to life. ... I am proud LPB has played a role in radio's past, and am excited that we can play a role in its future."

Spadea owns LPB Communications with several family members and friends. "The focus will be to improve our production processes to reduce lead times and generate cost savings we can pass on to our customers," Spadea said, adding that the purchase will enable the company to "move ahead of the competition before they catch up to where we are today."

LPB Communications claims more than 4,000 consoles and close to 500 automation systems in operation around the world. Spadea said the company plans to release a Windows NT version of its SALSA Automation system next spring.

Custom stations

"We already have beta versions of the package programmed, but we will not release the software until it has the reliability of a Signature Console," said Spadea, referring to one of the company's established audio products.

The company has built custom radio stations for colleges, government institutions and commercial radio stations.

LPB also makes a line of low-power AM transmitters for commercial night operation, carrier current and radiating cable installations for college campus radio stations, race tracks and sports arenas.

Spadea said, "The big challenge that LPB faces is re-establishing itself with the domestic customer base that has not heard much from LPB over the last few years. (We need) to get the word out to the industry that we are still here and stronger than ever."

Tom Spadea

The company's headquarters will remain in Frazer, Pa.

"We will probably expand our offices and production areas sometime in 1999," Spadea said.

According to Spadea, there are no plans for staffing changes. "I have made a commitment to the employees of LPB — the average length of service is over 15 years — to not displace any workers," he said. "The people in the shop at LPB have supported the products over the last 38 years.

"In many cases, people call LPB with questions on consoles and transmitters that were purchased 10 or 15 years ago, and they can talk to the person who actually built and tested their product," he said. Often, the original manuals or replacement parts for older products are also available.

BUSINESS DIGEST

PR&E Goes With ABG for Distribution

by Leslie Stimson

CARLSBAD, Calif. Pacific Research & Engineering has contracted with Audio Broadcast Group to distribute PR&E products. The alliance is notable because it marks the first time PR&E has gone outside the company to expand its sales and marketing channels.

Single-source suppliers

The companies said the deal allows them to take advantage of consolidation opportunities, as radio groups look for single-source suppliers to handle studio build-outs, from equipment purchase to installation.

Under the terms of the agreement, which became effective Jan. 4, ABG becomes the exclusive outside representative of PR&E products, complementing PR&E's sales force of seven people.

ABG
Audio Broadcast Group Inc.

PR&E President Don Naab said, "When I joined the company in June of 1998, it appeared to me that an association with a rep firm would expand our base of distribution. We chose to find somebody to provide clients with service, and not just move product out the door."

PR&E spokeswoman Tracy Rodman said nearly all of PR&E's product lines of consoles and studio furniture are custom-made, so the deal will allow PR&E's 130 employees more time to focus on product quality and distribution. She also said the agreement allows PR&E to move towards offering more turnkey and integration services.

Executives for both companies said offering systems package is a primary goal, and the radio markets to which each company traditionally has catered are complementary. PR&E traditionally has focused its sales efforts in larger markets, ABG has focused in the past on systems integration in medium to small markets.

Company heritage

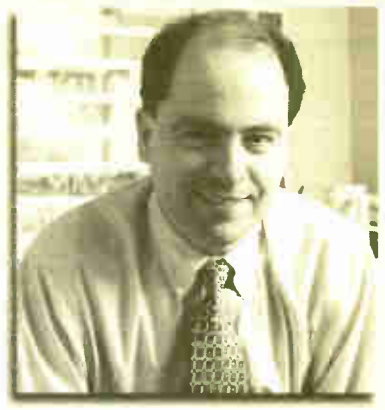
ABG has been a dealer/distributor for 38 years. PR&E has been in business for 30.

While the agreement makes ABG the exclusive dealer/distributor for PR&E's entire product line, the deal does not affect ABG's contracts with other manufacturers to distribute their products.

ABG Vice President of Sales and Marketing Dave Howland said, "This gives customers more product choice. We see ourselves as a direct extension of PR&E's Engineered Systems Division ... offering an entire studio package."

Guy Wire on the 01-01-00 Problem

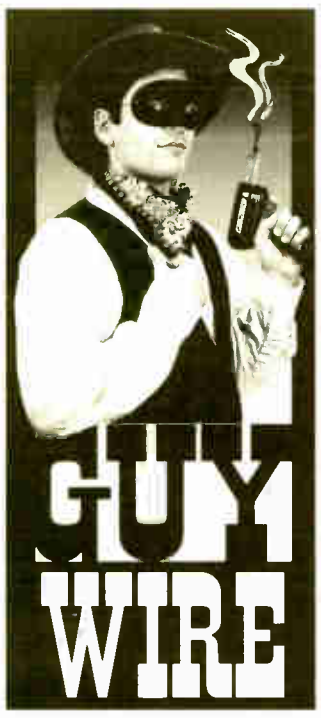
From the Editor



Paul J. McLane

What are you doing to protect your station from the so-called Y2K problem? Did you read the NAB primer by Dorann Bunkin in our Dec. 9 issue and begin to plan your strategy? Does the story on page 1 of this issue regarding Y2K and EAS concern you? Are you in touch with your equipment and business suppliers, to ask them if they are ready for Jan. 1, 2000?

Or are you taking a wait-and-see attitude toward it all, in the belief that the "problem" is overblown?



Our online columnist Guy Wire is among the skeptical. The opinions of this anonymous radio engineer appear regularly on our Web site. In light of all the Y2K coverage, including the article in this issue, I thought you would enjoy reading what Guy Wire has to say. The following are excerpts of a recent column; you can see his/her full commentary at *www.rwonline.com*

Disaster area?

Guy writes:

"Like you, I've been spammed by dozens of online hustlers pushing products to protect from Y2K fallout. And I'm sure thousands of gullible folks have been sucked in by the fearmongers. Too bad. Lots of hard-earned money is being wasted.

"Let me tell the story of what happened to one of the stations in our rather decentralized group regarding Y2K scare tactics.

"It seems the local sales manager there had a big computer store account, along with a rather aggressive salestype who offered to do a quick 'Y2K compliance survey' of the station's computers. This was about six months ago. The place was full of 386s and 486s, along with a few Pentiums in sales graphics. The GM and GSM, of course, had high-end Pentiums. The network only served accounting and traffic, running on a 10 Mb LAN and 586 server. After spending about an hour looking over the station's arsenal of PCs, the guy declared the station a 'Y2K disaster area.' Obviously the GM was disturbed, but had the good sense to get a second opinion.

"It turns out that the only a few of the 386s would not support Y2K, and they were merely doing word processing in completely non-critical areas. All of the 486s supported Y2K, although about half of them would not transition automatically. Big deal. Merely reset the date and time the morning of Jan. 1 in BIOS or at a C: prompt. The 586 LAN server and all Pentiums were fully Y2K compliant. The salesman was really looking for a big upgrade order, taking advantage of a potential buyer's fear and ignorance.

"What we learned from our 'Y2K disaster area' station was that there were no real hardware compliance issues at all.

"Evaluating Y2K compliance for software applications takes a little more time to flush out. Unless your station uses some home-grown platform, you'll find that all main-line suppliers of radio traffic and billing software are making Y2K their top priority, so you'll have plenty of help and resources to solve that one. Just be sure to contact the supplier quickly and get their Y2K compliant version, allowing plenty of time for testing and simulation.

"For most of the popular platforms, Pacing and Projection reports are already running into Y2K transitions, so if your management values such reports, time is rapidly running out. The same is basically true for the mainstream payroll platforms.

"Most groups have by now already done their due diligence at the corporate level regarding these two most vital software platforms and are now implementing software patches, updates and in some cases complete platform changeouts to be ready for Y2K.

"But if you work for a smaller local owner who hasn't been paying attention, sound the Y2K horn loudly in their ear and get busy.

Minor black holes

Guy continues:

"Even most radio stations are now running standardized software suites for word processing, spread sheets and databases. I would guess over 98 percent are running Microsoft Office, LotusSuite or Corelsuite. All the PC trade mags have covered Y2K compliancy with the various Windows-based versions of these packages. They're virtually all Y2K-compliant, with some minor 'black-hole' areas which all three companies have mostly solved via patches available free on their vast Web sites.

"If by chance you're still running some old DOS-based program versions, you may have problems, especially with stuff like Paradox, Dbase, Wordstar, Multimate, and others by companies long out of business. Again, the Web is your best resource to find specificY2K info on such relics.

"The biggest area of heartache will likely come with stations which bought custom or little-known software applications based on DOS platforms some years ago for things like contests and winners, 'paper-less studio' software, snow-closings, talk-show databases, public affairs program reports, etc., etc. They've worked well for years, and station management just didn't see the need to update to a Windows version, let alone a Y2K version. You're likely to spend lots of time testing Y2K with such rascals, and find they won't cut Y2K. Now, you could have a real problem.

Who wrote this?

"Can you still find the company or the author who wrote the application, or at least somebody who can rewrite the source-code to make it compliant? If not, the only other choices are to find and purchase a compliant program off the shelf which can do the same task, or basically start over and find a software developer or conversion guy who can rewrite the application to work on an updated Windows platform. That could be both time-consuming and expensive.

"For those folks still fond of old non-Y2K compliant software, you've got to decide if compliancy is really that important.

"If it is, it's probably best to kiss goodbye to your old friend, dig into your jeans, and invest in a modern replacement. If that's still too hard to swallow, just set your PCs RTC back exactly 27 years, and you'll find everything will be just fine, except of course for the year. Days of the week and calendar days in every month repeat in exact cycles every 27 years."

Thanks, Guy. You can read more on this topic, and check out past Guy Wire columns, at *www.rwonline.com*

READERS FORUM

Letters received are the property of **RW**, and may be edited for space considerations.

Micro-radio musings

Dear **RW**,

Here is a reply to Don Schellhardt's "Micro-Radio Micro-Guide" nonsense (Guest Commentary, Dec. 23, 1998).

I'm tired of reading articles advocating micro-radio which do not answer these questions:

1. Where is the spectrum space going to come from?
2. Do you propose degrading existing interference protection rules to accommodate micro-radio?
3. Do you propose making obsolete a large number of poor-quality receivers now in the hands of the public?

In most medium-sized and larger markets, no FM channels are available which comply with current FCC interference protection rules. Proposed changes probably will not make any new channels available in most markets. Even under the reduced protection standards for translators, channels are not available for low-power transmitters.

If you can find a frequency which appears to work under translator rules, usually you discover that a religious broadcaster already has applied for a satellite-programmed translator for that channel. Under the FCC's first-come, first-served rules, that frequency is not available for any conflicting applications. Hundreds, if not thousands, of applications nationwide are pending. Construction permits have been granted but not built for many more similar translators.

Some advocates of micro-radio have claimed that modern FM receivers do not require the same amount of interference protection as older radios. Nonsense. Have any advocates of degraded interference protection rules checked the performance of typical Walkman-type or radio headphone receivers? A lot of poor-quality receivers are in the hands of the public today.

It's time for advocates of micro-radio to stop being theoretical and get real.

Fred Krock
Engineering Supervisor
KQED-FM
San Francisco

AT 4060 tube talk

Dear **RW**,

While I would not argue with Ty Ford's assessment of the Audio-Technica 4060 tube mic (**RW**, Dec. 23), I question his choices for comparing the noise floor of this mic.

Audio-Technica AT4060 Mic

He writes, "It was noticeably quieter than a Neumann U 89, U 87 and Gefell UM70." The U 89 has never been known for extremely low self-noise and the U 87 he mentions is the older (30-year-old design) version. The current U 87 Ai has a noise floor 7 dB below that of the 4060 at 12 dB-A vs. 19 dB-A in the AT. Both the Neumann M 149 Tube and the new M 147 Tube also have this 12 dB-A self-noise figure.

In Audio Media magazine, Rick Chinn points out that "the 4060's equivalent noise level is close to that of many vintage microphones. Today's transistorized microphones are much quieter, which is no surprise."

Neumann has invested considerable design expertise into minimizing self-noise in our microphones. This has become an increasingly important parameter. Thus, I felt it necessary to set the record straight for your readers.

Karl Winkler
Product Manager
Neumann/USA
Old Lyme, Conn.

Ty Ford responds:

As is my custom, I choose microphones that I think would be most universally known so that a proper comparison among condensers could be appreciated by as many readers as possible. In the future I would welcome any assistance you might offer in providing me with other benchmark microphones than the U 87 and U 89.

More Perfect Paul problems

Dear **RW**,

I wanted to write in response to Eric V. Berger's Readers Forum comments in the Dec. 23, 1998 issue regarding the National Weather Service and Perfect Paul. Like Mr. Berger, I find the audio quality of Perfect Paul to be less than desirable.

What makes it worse for me is that I have a hearing impairment caused by nerve damage. I can hear high frequencies better than low. Perfect Paul's audio quality sounds extremely muddy and indistinguishable to my ears. I find some relief if I listen through headphones, but not by much. I can only wonder what the quality sounds like to those with greater hearing problems than myself.

Also, it takes twice as long for the hourly weather conditions to be announced when Perfect Paul does the job, as opposed to a live human. After about the third or fourth city report, Perfect Paul becomes downright annoying.

If it had been up to me, I would have replaced the NWS's old audio system with a digital audio workstation and maintained the human announcers. While such a system might cost more than Perfect Paul, the overall quality of the product would undoubtedly be more acceptable to radio station re-broadcasting and to those of us with hearing impairments.

Thanks, NOAA, for taking a step backward in replacing old tape-cart technology. The price paid isn't worth the sacrificed quality of Perfect Paul.

Robert Bass
Mesquite, Texas

Call-letter confusion

Dear **RW**,

Thanks for one of the best guffaws I've had in ages — and a great memory from an earlier day in my radio career.

"The Historical Dictionary of American Radio" (**RW**, Dec. 23, 1998) listed Todd Storz' St. Louis station as KXOX, when it was, of course, KXOK. This call-letter confusion with CBS' giant KMOX is nothing new.

When I did middays at KXOK in the early '70s (following the inimitable Mort Crowley), the sales department held a big meeting for about 50 members of an association of independent supermarket owners. As the presentation touted the dollar advantages of the proposed ad campaign, a slide came up on the screen promising a big increase in sales by advertising on the "Big 630 — KXOX."

As I recall, Sales Manager Wally Clark was *not* pleased.

Jack Mindy
President
New York Talk Network
Rochester, N.Y.

Winter Prep

Once again, much of the United States is experiencing unusual, often harsh winter weather. Once again, it is radio to the rescue with school closing announcements and road condition updates.

Credit goes to stations that break format and deliver critical information during storm cycles. Some dedicated morning jocks and news directors still camp out at the station the night before the big storm.

Digital technology for radio has enhanced the efficiency of reporting snow closings. The Internet connects us to weather service providers and radar images. Software entrepreneurs have written school closing database programs. Radio Computing Services, for instance, recently created Storm Center, which allows school officials to call a password-protected phone number and automatically cancel classes without interrupting the newsroom staff.

When winter roars, radio always has roared back.

But improved technology also allows some stations to neglect this responsibility. And if a storm strikes on a weekend, the dynamics of the situation can change.

While traveling through Pennsylvania, for example, an **RW** editor was surprised by a winter squall and whiteout. Tuning in a severe weather update proved futile; most AM stations in the market were locked into satellite talk programming. Most FMs ran syndicated shows.

One live station simply reread the stock National Weather Service forecast, already hours old. The weekend DJ apparently never looked out the window.

Winter does not care what day it strikes, but listeners sure care if we in radio are not there for them. The turn-on-a-dime programmability of radio must not be compromised, even on weekends. Keep a roster of trained part-timers within reach. Let your digital product manufacturer know what you need for effective weather coverage within your system. See that your station backup components are functioning and your talent knows what to do when the EAS box goes off.

Not everybody dials up 162.55 MHz to listen to Perfect Paul. Your community depends on your station, so be ready, seven days a week.

— RW

Write to Us

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Correction

In the Dec. 23, 1998 **RW**, the Web site address for Applied Magic was incorrect. The correct Web site address is *www.applied-magic.com*

Radio World
Vol. 23, No. 3 February 3, 1999

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Radio World (ISSN: 0274-8541) is published bi-weekly by IMAS Publishing (USA), Inc., P.O. Box 1214, Falls Church, VA 22041. Phone: (703) 998-7600, Fax: (703) 998-2966. Periodicals postage rates are paid at Falls Church VA 22046 and additional mailing offices. POSTMASTER: Send address changes to Radio World, P.O. Box 1214, Falls Church VA 22041. REPRINTS: Reprints of all articles in this issue are available. Call or write Michael Crossett, P.O. Box 1214, Falls Church, VA 22041; (703) 998-7600; Fax: (703) 998-2966.

—PRINTED IN THE USA—

Next Issue of Radio World February 17, 1999

IBOC: 'A New Listening Experience'

In October, USA Digital Radio asked the FCC to seek public comment on its petition to implement digital AM and FM broadcasting in the United States. The following are excerpts from its Petition for Rule Making. The first part appeared in ***RW*** *Jan. 20.*

An Acrobat version of the full text of the petition is available online at www.fcc.gov/mmb/ *or can be downloaded from* www.fcc.gov/Bureaus/Mass_Media/Filings/rm9395.pdf

Footnotes with source references and other details are omitted here but are available in the online version.

V. SYSTEM REQUIREMENTS FOR TRANSITION TO DIGITAL

Although a system could provide exceptional performance in any one area, USADR believes that the optimized system which will best serve the public interest must correctly balance these various system attributes.

A. General IBOC DAB Requirements

Audio Quality

To achieve enhanced audio quality, a DAB system must deliver a new listening experience to the public. For FM, USADR refers to the improved level of sound quality as "virtual CD-quality." For AM, USADR uses the term "FM-quality" or "FM-like" to describe the attainable level of quality equivalent to current analog FM. Enhanced audio quality is also achieved through improved robustness which results in higher immunity to signal fading, noise, and impairments.

Compatibility

System compatibility requires that the DAB system take into account both the limitations imposed by the existing transmission environment and the modes of reception of AM and FM radio. The system must be able to operate in an environment with significant co-channel and adjacent channel sources of analog and digital interference. The system must also operate without noticeably increasing interference to host co- and adjacent channel analog transmissions.

Coverage

The IBOC DAB system must provide service to the existing analog coverage area, while maintaining compatibility with the existing AM and FM broadcast infrastructure. Coverage must take into account actual station coverage based on geographic and interference limitations. In many cases, actual coverage differs from the coverage that can be predicted based on the Commission's rules.

Analog Reception

The IBOC DAB system should improve broadcasting not only through the digital signal, but also for AM and FM analog reception. IBOC DAB receivers are implemented in digital circuitry where there is low (or no) marginal cost to improve analog reception when operating in the hybrid mode. Reception is improved because rejection of the adjacent channel interference is greater and noise for the analog signal is lower.

Auxiliary Services

Existing FM subcarrier services should be upgraded in the transition to DAB. The IBOC DAB system provides for auxiliary data and audio services which will essentially upgrade the services currently offered using existing FM subcarriers.

Flexibility

The transition from analog to digital has the potential for consumer confusion and disruption if not properly managed. Although IBOC technology is inherently more flexible than a non-IBOC solution, the IBOC system should be designed to maximize listener and broadcaster flexibility in order to allow market forces to guide the transition.

Cost

Both broadcasters and listeners will need to acquire new equipment in order to implement DAB. The IBOC DAB system should be designed to permit much of this capital investment to be made in the normal course of equipment replacement cycles if the broadcaster or listener so chooses. Reasonable conversion costs should also be emphasized.

Graceful Degradation

As a digital receiver approaches the edge of coverage, its signal quality deteriorates abruptly. In fact, audio quality can change from virtually unimpaired to non-existent almost instantly. This "all-or-nothing" quality drop-off could annoy listeners who are accustomed to graceful analog degradation (or perhaps even cause them to suspect equipment malfunction). As a result, the IBOC DAB system should provide a means of gracefully degrading the signal as the edge of coverage is approached or as the signal quality is impaired.

Channel Acquisition

Digital receivers that are designed to be robust in a mobile environment typically have extended acquisition times. When a listener opts to change a channel on a digital receiver, there is usually a significant period of time — perhaps on the order of a few seconds — before the associated audio is heard. This delay is due to processing that is specific to digital receivers (such as de-interleaving and decoding). The IBOC system should have a means of quickly acquiring the signal upon re-tuning or re-acquisition in a manner that is equivalent to what listeners are used to when tuning between analog stations.

B. Transition Issues

For every radio station, there will be three separate modes of operation. Stations can continue to broadcast in the present analog mode. During the transition period to digital, each station will have the opportunity to upgrade to the second mode of operation — the hybrid mode. The hybrid mode will support simultaneous transmission of station programming in both analog and digital. At some date in the future, each station will be able to turn off its analog signal and operate in the third mode of operation — the all-digital mode.

Each broadcast station will decide when it switches from analog to hybrid, and from hybrid to all-digital. As a result, there will be an extensive transition period during which stations will be operating in different modes. In such an environment, it is inevitable that there will be situations where a station operating in any of the three modes will have co-channel or adjacent channel interferers operating in various combinations of analog, hybrid, and digital modes. The IBOC DAB system must ensure all three modes of operation can co-exist.

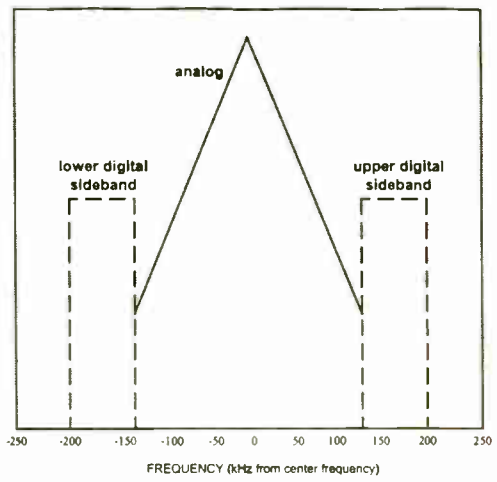

Figure 2: Hybrid FM IBOC Signal

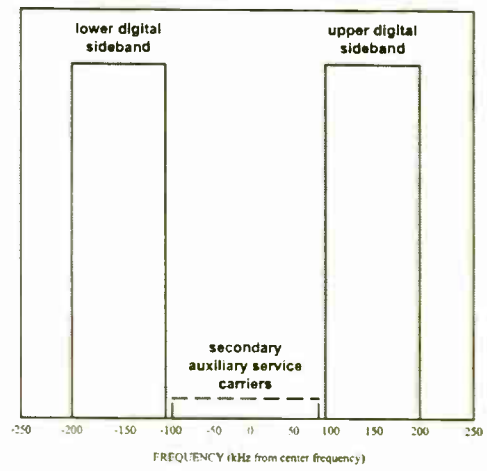

Figure 3: All-Digital FM IBOC Signal

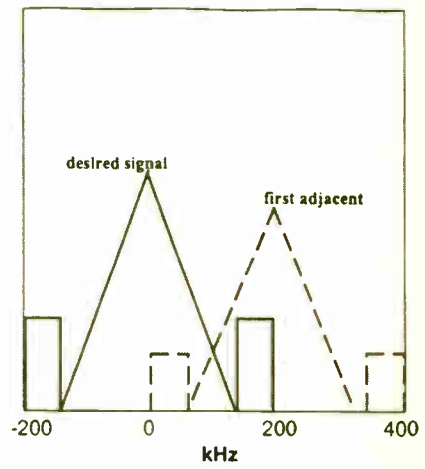

Figure 4: Interference Scenario Showing Hybrid First Adjacent

The IBOC DAB system should provide forward and backward compatibility for listeners. The first digital receivers sold will operate in the interim hybrid phase, as well as the future all-digital environment. DAB receivers will be forward compatible because the digital transmission can be upgraded in the future without rendering obsolete earlier generations of digital receivers. Receivers will also be backward compatible because they can incorporate existing analog technology, permitting continued listening to analog broadcasts. Thus, a listener can make its own decision when to upgrade to hybrid or all-digital.

VI. USADR FM IBOC DAB SYSTEM

A. System Description

See FILING, page 7 ▶

▶ FILING, continued from page 6

The USADR FM IBOC DAB system is comprised of four basic components: the modem, which modulates and demodulates the signal; the codec, which source encodes and decodes the audio signal; forward error correction ("FEC") coding and interleaving; and blending. USADR has designed and integrated these core functional areas to produce a system which complies with the requirements for IBOC DAB described in Section V above.

USADR evaluated several modulation techniques for the IBOC DAB FM system before selecting Quadrature Phase Shift Keying ("QPSK"). QPSK permits robust performance and provides sufficient throughput for virtual CD-quality digital audio. It permits the use of advanced FEC coding techniques which exploit knowledge of the non-uniform interference environment. QPSK is also simpler and more robust than higher-order forms of modulation, particularly in a multipath environment. Since QPSK has a bandwidth efficiency of two bits per second per Hertz, it supports an information bit rate that is sufficient for transmission of virtual CD-quality audio in the bandwidth available.

USADR reviewed whether to use a multi-carrier or single-carrier approach to transmit the digital signal, and chose a multi-carrier approach called Orthogonal Frequency Division Multiplexing ("OFDM"). OFDM is a scheme in which many QPSK-modulated carriers can be frequency-division multiplexed in an orthogonal fashion such that each carrier does not interfere with each adjoining carrier. OFDM offers a high level of robustness to multipath.

The FM channel bandwidth does not have the capacity to support a sufficiently high data rate to provide virtual CD-quality audio without some form of compression. As a result, an audio codec (coder-decoder) must be employed to overcome these bandwidth limitations. USADR uses the MPEG AAC codec in its IBOC DAB systems. The AAC codec compresses a digital bit stream to 96 kbps, delivering audio that the listener will perceive to be virtually the same quality as a CD. Use of the AAC codec meets the raw throughput requirement of the modulation and FEC coding techniques. In addition, special error concealment techniques employed by the codec help to ensure graceful degradation of the received digital signal. In addition to its ability to meet the USADR system's audio compression requirements, MPEG AAC offers the advantage of being an open system based on the MPEG family of ISO standards.

FEC and interleaving greatly improve the reliability of the transmitted information. Advanced FEC coding techniques introduce codes into the transmitted digital signal to reduce lost information. Special interleaving techniques spread errors over time and frequency to assist the FEC decoder in correctly decoding of the transmitted signal. This combination, together with superior modem performance, increases the robustness of the signal to allow the IBOC DAB system to deliver virtual CD-quality audio beyond the FCC-protected signal strength contour in both fixed and mobile environments.

The USADR system employs time diversity between two independent transmissions of the same audio source to provide robust reception during the outages that are typical in a mobile environment. When the primary digital signal is corrupted, the receiver blends to the backup audio which, by virtue of its time diversity with the primary signal, does not experience the outage. The blend feature also provides a means of quickly acquiring the signal upon tuning or re-acquisition.

1. Hybrid mode

The FM hybrid mode of operation is shown in Figure 2. Low-level digital sidebands are added to each side of the analog signal. These digital sidebands provide the "primary digital service." USADR has conducted simulations and analyses which verify that restricting the digital carriers to the 70-kHz regions between 129 and 199 kHz from the center frequency on either side of the analog spectrum minimizes interference to the host analog and adjacent channels without exceeding the Commission's existing spectral mask. This bandwidth is wide enough to support a robust hybrid IBOC service that mirrors the coverage area of existing radio stations. The dual-sideband OFDM structure also enables the use of frequency diversity to further combat the effects of multipath fading and interference.

2. All-digital mode

The all-digital mode differs from the hybrid mode primarily through deletion of the analog signal at the center of the channel, leaving the two digital sidebands, as shown in Figure 3. The power of the sidebands is increased, making them more robust than the hybrid mode DAB sidebands; however, each remains within the current FCC spectral mask. The number of OFDM carriers is also increased such that each sideband occupies a bandwidth of 100 kHz. The additional 30 kHz in each sideband carries backup audio, additional auxiliary services, or additional FEC overhead. Low-level OFDM carriers added to the central 200-kHz region can support multichannel sound or enhanced auxiliary services. These carriers support the secondary digital services.

The all-digital mode is similar to the hybrid mode in that the digital signal is split into two sidebands. However, the energy in the all-digital signal is not concentrated around the center of the channel as it is in the existing FM signal. There are a number of reasons for this "split" structure.

See FILING, page 11 ▶

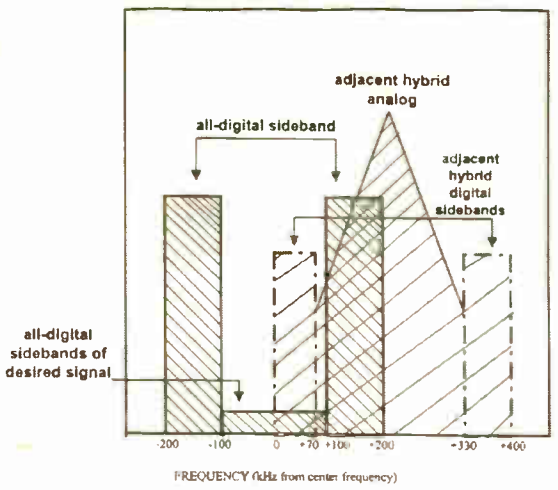

Figure 5: Hybrid and All-Digital Compatibility

Dec. 31 and the Y2K/EAS 'Test'

▶ EAS, continued from page 1

that rely heavily on computers, need to make sure all equipment and computer hardware and software is "Y2K compliant."

SBE survey

The SBE asked makers of EAS equipment whether their EAS equipment is Y2K compliant. The answers are displayed on the SBE web site at *www.sbe.org*. All manufacturers reported their devices would work. In some cases, users must upgrade current software or firmware.

For instance, the current version of software for the Burk Technology EAS Encoder/Decoder is Version 1.01.

Users will need to upgrade to Version 1.2 before the end of the year. Burk said information would be available shortly on its Web page at *www.burk.com*

Frank Lucia, director of emergency communications in the FCC Compliance and Information Bureau, said he asked a number of manufacturers about their EAS equipment Y2K readiness last spring. What he and the SBE heard was the same: the equipment will continue to work, but a problem may arise when logs are printed.

"We don't consider that a critical operational problem," Lucia said.

Log reports

The Endec Max 1822 from Sage Alerting, for instance, needs no upgrade to continue functioning in the year 2000. Harold Price, Endec project manager, said the only problems are logging issues found when reprinting previously received alerts.

"The year is displayed at 100, 101, 102, etc., instead of 2001, 2002, 2003 in some parts of the reprint log reports," said Price. He said logs printed in real time will be correct.

Price said the problem could be fixed by upgrading to firmware version 5.111. The original firmware version was 5.27. Sage issued one free version after ironing out bugs and adding new features. That version is 5.88. There will be a charge to upgrade to 5.111. Price said it is "fairly standard to charge for Y2K compliant upgrades."

Price said that the Endec Pro and Endec DJ Software that run under Windows 95, 98, 3.11, and NT would work in the year 2000. But no EAS manufacturer can ensure that the basic input/output system (BIOS) and other support software in the user's computer are Y2K compliant.

The EAS1 unit manufactured by Gorman-Redlich will be Year 2000-ready, providing it is running software V6.4 or higher. According to the Gorman-Redlich report to the SBE, the problem in earlier versions will only be noticed if a message originates on Dec. 31, 1999 and expires on Jan. 1, 2000.

MTS Communications

MTS Communications reported that its PC-based Encoder II EAS encoder for Windows 95/98/NT fetches the date from the system clock so the accuracy of its date will rest with the PC operator.

Skip White, vice president of Software Engineering for MTS Communications, told the SBE that the MTS System 3000D is ready for the year 2000 with no hardware or software modifications. The only "but" is that users will have to reset the clock and calendar shortly after midnight on Saturday, Jan. 1, 2000. The BIOS chip does not know how to handle the change from 1999 to 2000 and will make the day Tuesday, Jan. 1, 1980.

"The only incorrect information would be contained in the log, which will show the correct month and day of the month, but the name of the day of the week will be incorrect as will the year," White wrote in an e-mail message.

TFT Inc. reported that its EAS 911 series of encoders and decoders will "not be affected by any year 2000 issues." Marty Callahan, president of HollyAnne Corp., wrote the SBE that the company's Altronix Envoy messaging equipment and software, MIP 921 encoder/decoder and software, HC971 hub controller and CEMS 1000 character generator were Year 2000-compliant.

Leap year and Y2K

To make life more complicated, the year 2000 also is a leap year. Some astute users are wondering how their EAS equipment will function on Feb. 29 and beyond.

Callahan said the analysis of Y2K compliance for the HollyAnne equipment included checking for functioning in both leap and non-leap years. FCC rules specify that the EAS preamble code string includes the day of the year but not the actual year. Because there can be up to 366 days in a year, three characters are allotted.

For that reason, Eric Hoehn, emergency communications chairman for the Washington D.C. area and chief engineer for radio at WETA(FM), said the problem in the year 2000 for some EAS encoders and decoders might occur not on the first day of the year but on the last. The first day, he said, will simply appear as "001" in the code string, but some may have to reset the date at the end of the year, and after Feb. 29, 2000, some logs may be off by a day.

Price, project manager for the Sage Endec, said the Endec will function fine in leap years. However, the 5.88 version of the Endec software assumes the year that a log is printed is the same year the warning was sent.

Price used the example of a printer running out of paper overnight on Jan. 1, 2000. If someone prints out a report of Dec. 31 EAS activity, the program will assume the date he or she is printing is in 2000, a leap year, and print Dec. 30. The updated version would print the date correctly.

"This is all based on the FCC wanting to save four characters," Price said jokingly, meaning the alert string should have contained the year. He said this gives a good glimpse into how frustrating coordinating time can be in the EAS units.

Emergency planners do not appear alarmed about EAS functioning in the year 2000.

"Individual stations will have to make sure there is not something in their building that could trap them," said Richard Rudman, chair of the Los Angeles County EAS Local Emergency Communications Committee and southern region vice chair for the California EAS State Emergency Communications Committee.

"Any station having automation equipment deserves to be off the air if they do not certify and test. The fallback, of course, is to shut off the automation and run manually. Some small-market automated stations could be in trouble, but the answer is the same right now: no one really knows," Rudman said.

Tom Ditt, state EAS coordinator for North Carolina, said the question of what will happen in the year 2000 has surfaced several times in his office.

"I just do not think the world is going to stop at 12:01 on Jan. 1 in the year 2000," he said. If power is out for a couple days, he said, it is not much different from losing power from an ice storm.

Ditt said that the 10 LP1 stations in North Carolina all have generators. He said radio and television stations are in business to make money and not likely to be off the air on Jan. 1.

Burk Technology EAS Encoder/Decoder

Mark Stennett, vice president of engineering for Capstar and the former local emergency communications chairman for Sacramento, Calif., said stations running EAS in manual assisted mode may have a better chance of catching unintended erroneous messages.

'Snowball the message'

"This scenario does not especially have to be a Y2K problem, it could happen any time. Y2K could contribute to the confusion in my opinion, and EAS could snowball that message where no one is home to catch it," Stennett wrote in an e-mail.

EAS is but one of many systems and sources of supply that radio managers are pondering in making their plans. Another is power.

Power suppliers are taking the approaching year seriously. Tom Kazas, spokesman for Virginia Power, said the company had been working on Y2K readiness since 1996, forming a Corporate Y2K Team in 1997 to inventory the company's computer-based systems and components. The company has spent between $40 million and $50 million preparing for 2000. Kazas said about 99 percent of the critical components should be Y2K ready by July.

Power assurances

Engineers uncomfortable relying on the assurances of local power company officials could also plan to have a generator on hand Dec. 31. With software upgraded as necessary and generators at the ready, engineers should be able to enjoy the historic moment.

In only 38 more years, the industry will have to face the Y2038 problem. After Jan. 18, 2038, dates cannot be represented by systems that use the standard of counting time as seconds from Jan. 1, 1970.

Said Price of Y2038, "We are looking into solutions now, and will probably make a change in the years to come, probably in conjunction with FCC-mandated changes to EAS that are likely to occur in the next 39 years."

All EAS suppliers said their devices would work. In some cases, users must upgrade software or firmware.

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Circle (80) On Reader Service Card

What New Backing Means to USADR

▶ USADR, continued from page 1

Eleven radio groups and a media investment firm purchased stock in what is now called USA Digital Radio, Inc., a privately-held company (**RW** Jan. 20). USADR has not revealed how much each company invested.

USADR was established in 1991 as a partnership between CBS, Westinghouse Electric and Gannett. The new additional owners include Chancellor Media, Citadel Communications, Clear Channel Communications, Cox Radio, Cumulus Media, Emmis Communications, Entercom Communications, Heftel Broadcasting, Jacor Communications, Radio One and Sinclair Broadcast Group. Joining them is media investment firm Chase Capital Partners.

Day-to-day focus

USADR President Robert Struble said, "Before, we were spending essentially what CBS and Gannett were giving us." While the company's day-to-day focus of developing technology would not change, he said, the investment is "an additional source of money."

"This is an extremely strong statement by the industry that digital is coming and that USADR technology is the way for that to come about," Struble said.

DRE and Lucent downplayed the significance of the investment. Executives at both companies said, and Struble agreed, that the investment does not preclude stations from testing any IBOC system.

Lucent executives said it is company policy not to comment on business plans of other companies. Nick Karter, vice president of business development for LDR, said of the investment, "It may raise the awareness of digital broadcasting in general, which would stimulate demand. I've seen it happen in other industries."

Lucent spokesman Dave Bickle said, "What's important is when people can see which system works best. Only through field tests, as have been shown in many industries that involve radio, will you get actual hard data that gives people justification for a decision. We think it's important to remember that field tests will be taking place. Results will be logged, and then the standards bodies will have data necessary to make the decision."

When pressed on whether Lucent planned to seek broadcast investor funding, both said Lucent was not prepared to comment.

DRE President Norm Miller said DRE had not sought similar broadcast investment. DRE receives funds through an alliance with integrated chip maker TriTech Microelectronics and private investors.

Miller said the USADR investment raised several questions.

"If an IBOC system other than USADR's is shown to demonstrate superior performance, will the 12 equity investors be unwilling to implement that system? The concern is related to the issue of protecting one's investment in a particular technology."

Most of the investors contacted by **RW** did not rule out testing a system different than USADR's on their stations.

Miller also questioned whether the investors were aware that DRE has received notice of allowance of all claims in its fundamental IBOC patent application". He said, "We believe USADR's currently described IBOC system will be impacted by these patents." Miller did not elaborate.

USADR and Lucent have approved IBOC patents and several that are pending. Lucent's patents include those for its PAC algorithm audio compression technology.

"One of the things that differentiates us is a full portfolio of technologies we bring to the table, such as audio coding and some of the other capabilities, wireless expertise," said Karter. He said the PAC audio coder is "integral" to the Lucent IBOC system.

Broadcasters gave varied reasons for investing in USADR.

Emmis President and Chief Executive Officer Jeffrey Smulyan said, "We felt getting behind a standard was good for the industry." He said Emmis stations would be more inclined to test the USADR system, but he did not rule out testing another system.

Cumulus Media Vice Chairman Lew Dickey said Cumulus has confidence in USADR's ability to deliver a technology that will work. But he was cautious about giving one company a total endorsement.

"Our investment does not mean we have chosen sides on this. ...We think there are several companies that can do this. We would not rule out an investment in Lucent if they came along and asked us," Dickey said. "We want to create the most powerful and flexible and dynamic application, because ultimately, that's how we will create value for our shareholders. We want a killer application for our shareholders. ... A Cumulus shareholder enjoys the rights to spectrum at 220 stations. If technology can make that spectrum more valuable, we're all for it."

We felt getting behind a standard was good for the industry.

— Jeff Smulyan

Dickey said he hoped all of the competing players "resolve their differences and agree on a single standard that takes the best technological developments of each group in order to create the most powerful and ultimately, the most profitable application for broadcasters."

Entercom Executive Vice President John Donlevie his company had met with USADR and Lucent and that the USADR investment was strategic. "We think they're ahead of the pack. We think they're further along with better technology that's more compatible with the needs of broadcasters."

The receiving end

Officials of both USADR and Lucent met with receiver manufacturers at the Consumer Electronics Show in Las Vegas. DRE did not attend, although DRE has made overtures to the manufacturers as well.

When asked what receiver manufacturers want to build their confidence and commit production lines, Karter said, "It goes back to commercial viability, the broadcast commitment to IBOC. They want to see it deployed."

Several manufacturers who spoke to **RW** at CES said are following the developments of both satellite-delivered and IBOC DAB. Satellite-delivered proponents CD Radio and XM Satellite Radio have been courting the manufacturers, as they plan the rollout of satellite services in the next two years.

IBOC technology, which is farther from the hardware stage and has yet to meet with regulatory approval, is more of an unknown to receiver manufacturers. But this is a critical year for IBOC proponents looking to line up hardware licensing agreements. And manufacturers say much has to be accomplished before that can happen.

Clarion Director of Product Planning Jack DeBiasio said of the USADR investment, "Being able to have more capital to move forward makes sense. What is really going to make the difference for IBOC to radio manufacturers is the collaboration ... to get together and organize a working group ... that supply tuners as well as supply products for retail and OEM. ... If someone comes up with a plan that is cost effective to implement, that's who's going to win."

Cost also is a major consideration, DeBiasio said. "Consumers weren't even willing to spend $60 for AM stereo radio. That wasn't any additional programming, it was just better quality. My dream would be $50 to $100 at retail, which means we have a long way to go."

Pioneer Electronics takes credit for helping to develop the Eureka-147 technology in Europe, and is supplying prototype receivers in Canada (**RW**, Jan. 20).

"From a brand standpoint, we're positioned to adopt an IBOC platform when it's approved and standardized," said Russ Johnston, Pioneer vice president of marketing in the Car Electronics Division. "Pioneer is waiting for the platform to be developed. We have nothing to design against right now." Pioneer is talking to all three IBOC proponents, he said.

Pioneer is one of three manufacturers that has signed licensing agreements with XM Satellite Radio. Johnston said both kinds of DAB can co-exist. "They will both be available and the consumer will may want both types of products out there at the same time. Will it be the end of the traditional broadcaster? I don't think so. I believe it will help them speed up their decision-making process on implementing a system, which is very much needed based on the track record the industry had with RDS."

Gene Kelsey, Panasonic Consumer Electronics vice president and audio group general manager, said his company wants to look seriously at both types of DAB to determine customer interest and demand.

USADR's FM System

▶ FILING, continued from page 7

First, the split sideband spectrum maximizes compatibility with adjacent channel digital sidebands. The all-digital signal does not interfere with adjacent channel digital sidebands from systems operating in either the all-digital or hybrid modes. This effectively eliminates interference between primary digital services. Second, splitting the signal enables the use of frequency diversity to combat the effects of multipath fading and interference. Third, the dual-sideband format is a natural extension of the hybrid mode. The all-digital mode is virtually identical in complexity to the hybrid mode, and requires little additional receiver processing.

3. Compatibility

During the transition to the all-digital period, analog-only, hybrid, and all-digital stations may exist next to each other on the dial; thus, each must be compatible with the other. Interference, especially digital-to-digital, should be minimized. The USADR IBOC DAB FM system is designed to achieve this result.

Figure 4 shows a potential scenario in which a desired hybrid signal and an upper first-adjacent hybrid interferer can co-exist. This is a typical interference scenario during the interim hybrid period. The figure shows that there is no interference between the hybrid digital sidebands. However, the analog portion of the first-adjacent hybrid signal interferes with the upper digital sideband of the desired hybrid signal. In an effort to reduce analog interference to the digital sideband, USADR has developed a technique known as First Adjacent Cancellation ("FAC"). In addition, the use of frequency diversity and advanced FEC coding techniques further improve the performance of the desired digital signal under these conditions.

Figure 4 also shows that adjacent hybrid digital sidebands may increase the noise level in the analog portion of the desired hybrid signal. However, in typical receivers, this interference should be no worse than that currently engendered by first adjacent analog signals.

USADR's system is designed so that hybrid and all-digital signals are compatible. Figure 5 shows a potential scenario in which a desired all-digital signal and an upper first-adjacent hybrid interferer can co-exist. As in Figure 4, the analog portion of the first adjacent hybrid signal interferes with the upper digital sideband of the desired all-digital signal. Since the all-digital sidebands will have more power than the hybrid sidebands, the all-digital signal will be more robust than the hybrid signal when subject to this same level of interference.

Figure 5 also shows that the upper digital sideband of the desired all-digital signal interferes with the desired analog portion of the adjacent hybrid signal. However, broadcast of the higher-powered all-digital signal is not permitted during the interim hybrid period. After then, there will be many IBOC DAB receivers that will receive the interference-free digital transmission. The all-digital signal has been designed to protect newly introduced DAB receivers, rather than older analog receivers; therefore, the digital-to-analog interference is not a primary concern. Note that this analysis also applies to analog-only, rather than hybrid, interfering signals.

The USADR design ensures that the newly introduced primary digital services do not interfere with each other. This is illustrated in Figure 5, which shows that the upper sideband of the all-digital signal does not overlap with the lower sideband of the first-adjacent hybrid signal. Note that there is an overlap between the low level carriers used for secondary auxiliary services in the desired all-digital signal and the lower digital sideband of the first-adjacent hybrid signal. Although the acceptable power level of the low level carriers precludes interference to primary digital sidebands of adjacent channel signals, the low level carriers are still subject to interference from them. Advanced FEC coding techniques help to overcome this interference. Although the carriers used for secondary services do not enjoy the same coverage area and robustness as the all-digital primary sidebands, acceptable levels of performance are achievable within the station's protected contour, except in the presence of two large first-adjacent signals.

Finally, during the all-digital period, the USADR IBOC DAB design ensures adjacent all-digital signals can co-exist. Figure 6 shows a scenario in which a first-adjacent all-digital signal resides next to a desired all-digital signal. As discussed above, there is no interference between primary digital services; the upper desired sideband in Figure 6 does not overlap with the lower sideband of the first adjacent signal. Likewise, the secondary auxiliary services of the desired signal are too low in power to interfere with the primary lower digital sideband of the first adjacent signal. The lower sideband of the first-adjacent signal does interfere with the secondary auxiliary services of the desired signal, which, as discussed above, will nonetheless achieve acceptable performance.

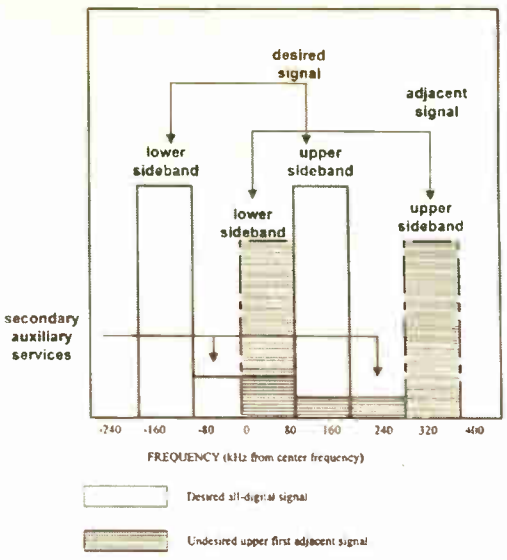


Figure 6: All-Digital Compatibility

Because there is no overlap of digital sidebands when all broadcasters are transmitting in the all-digital mode, adjacent-channel interference between primary services will be eliminated. The sidelobes of the all-digital and hybrid sidebands are minimized by employing special sidelobe reduction techniques in the modulator. In addition, USADR is working closely with transmitter manufacturers, who can produce transmitters with sufficient sidelobe attenuation to protect adjacent channels.

The next installment will appear in the Feb. 17 issue of ***RW****.*

Workbench

Radio World, February 3, 1999

Remove or Mark PCB Oil Sources

John Bisset

Just when you thought all the PCB-oil capacitors had disappeared, Figure 1 raises its ugly head. Not only are the caps of the PCB-oil type, the back cap is leaking (notice the black goo at the base of the right terminal).

Encountering this problem reminds me that a new generation of engineers is now on the scene and may not know about PCB hazards. So, for those new to broadcast engineering, a brief history lesson:

About a decade ago, stations had to remove or mark transmitters that contained capacitors or transformers filled with PCB oil. The EPA has determined that PCB oil isn't good for living beings. Large capacitors must be disposed of properly through an EPA-licensed disposal company (read: big bucks). Because of the cost, some stations left the capacitors in place, and labeled the transmitter as containing PCB parts. Labels are available from NAB, along with a decent workbook describing the responsibilities of station engineers and owners.

A majority of broadcasters replaced the capacitors and got rid of the PCB-type capacitors. If you need replacement capacitors, contact Dan Churchill of Commercial Radio Supply in Vermont at (802) 226-7582.

As for our picture, it's important not to come in contact with the oil, and pray that a fire never occurs. When the PCB oil burns, it turns into an ugly vapor.

Dan Churchill has some **RW** reprints that discuss the hazards of PCBs. If you have older transmitters, give Dan a call; his company provides replacement parts for transmitters no longer manufactured.

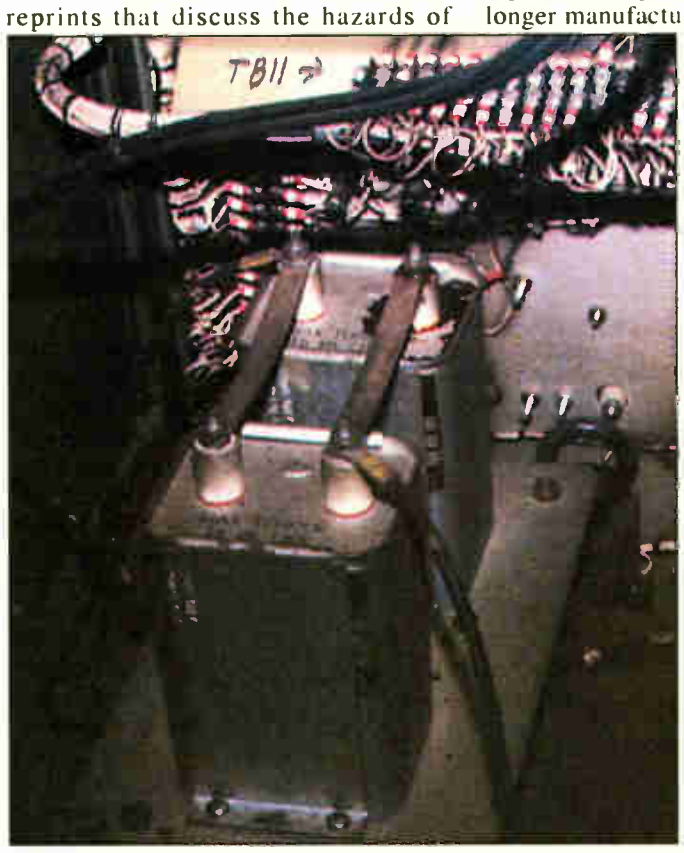


Figure 1: Careful inspection of older transmitters may disclose leaking PCB-oil caps.

★ ★ ★

Gil Houston of KHSL-TV in Chico, Calif., writes that the use of the chase nipple fitting in places where wiring passes through panels with sharp metal edges is a good practice, adding the fittings come in a variety of lengths. However, readers are cautioned always to use a plastic bushing "nut" on the threaded side. Otherwise, the value of using the chase nipple is defeated, because they tend to have rough inside edges.

★ ★ ★

Fred Krock of KQED-FM has attended both NAB transmitter workshops and offered some good ideas during our audience participation section. During this session, we discussed high-efficiency air filter use in transmitters. We ran out of time before more information on these filters could be discussed, so Fred sent the following information for use by *Workbench* readers.

The filter system Fred uses is a Space Guard #2400, costing less than $200. The #401 replacement filters cost $35, and last for a year. The filter output opening is 15-3/4 x 25 inches. Its material is pleated, so the air goes through about 28 square feet of filtering.

The filter is specified to remove 95 percent of particles as small as 0.1 micron, and 99 percent of 10 micron particles. Particulate matter in smoke is about 0.1 micron, to give you an idea of the efficiency. The smallest particles that are visible to the naked eye are about 10 microns. This means concrete dust is no problem!

Installation is easy for transmitters with the air intake fan on the top, like Continental models. Fred applied foam adhesive strips to the bottom of the filter, and set it on top of the transmitter. Other makes of transmitters may require some modifications to ensure that 100 percent of the cooling air goes through the filter before entering the transmitter.

One of the benefits of pleated air filtering is that the filter area is so large that it creates little air resistance. Fred noticed little change in temperatures with or without the filters. The only drawback to super-filtering is missing those all night cleaning and dusting parties, because there is little incentive to dust the transmitter.

What's wrong with that, you say? During those dusting parties, the engineer tends to find the broken wires, cracked insulators, leaky capacitors, or burned resistors — those unpleasant discoveries that take another couple of hours to fix!

★ ★ ★

Jon Hosford, assistant chief engineer for several stations in Jackson, Miss., uses the Tascam 112/122 series cassette players, mostly for aircheck machines in four studios. A great deal of sluggishness was encountered in the record mode.

The fix? Jon added a toggle switch; when turned on, the machine was put in the PLAY/PAUSE mode. This brings the tape up to the heads, ready to record or playback. The control was tied into the remote connector on the back of the player. In their case, the MIC tally triggers the REC mode. Putting the player in the PLAY/PAUSE mode should correct the sluggish start problem. Thanks, Jon, for helping out a fellow engineer!

★ ★ ★

RW Technical Adviser Tom McGinley of WPGC-FM/WARW(FM) in Washington, and his station assistant, Roger Dufault, picked up a neat door prize at last year's Chapter 37 SBE Holiday Party. It's called a Fox and Hound, and is manufactured by Triplet, the meter people.

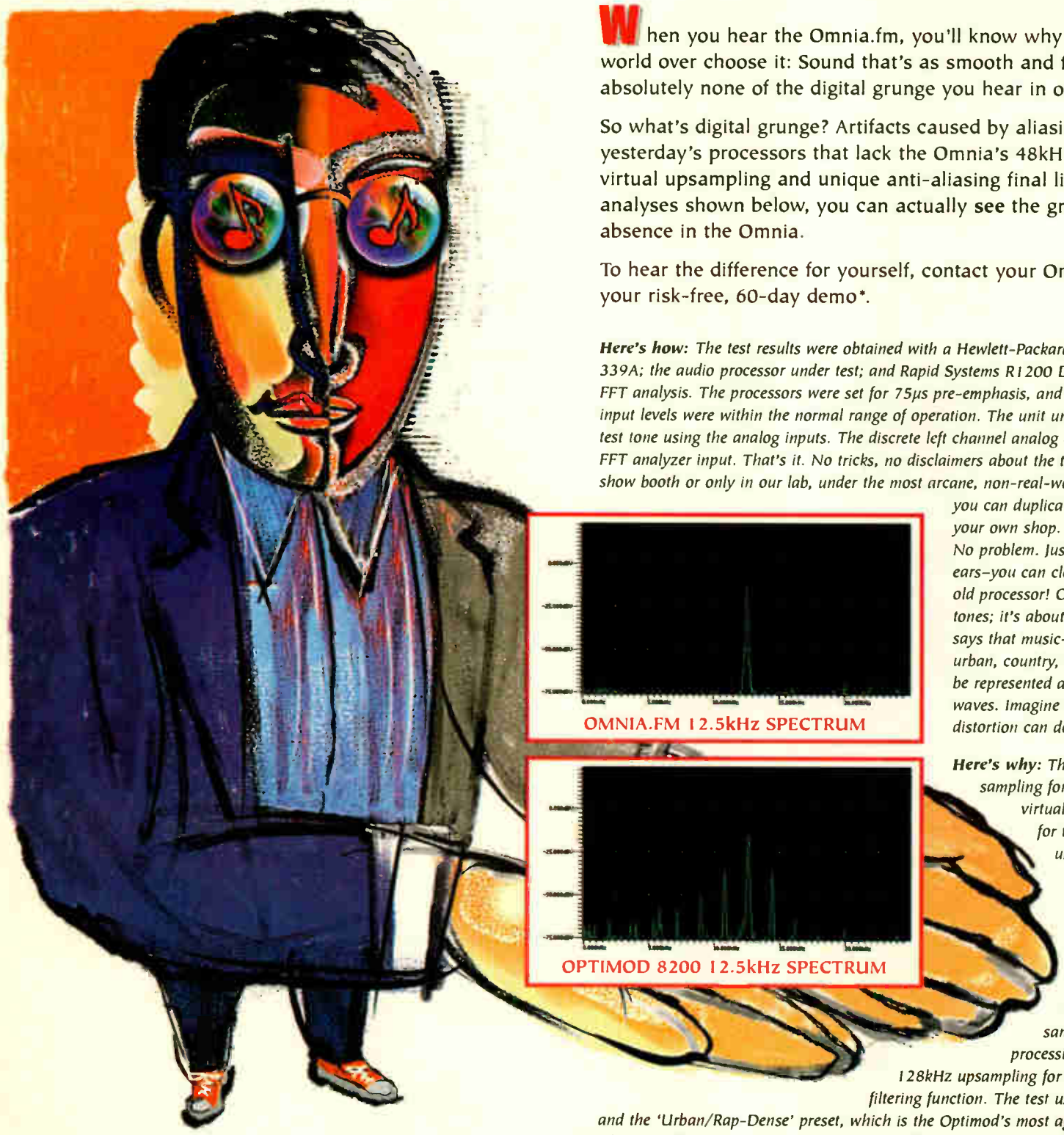
The Fox portion of this device is a tone generator, and the Hound is an amplified speaker. Tom said not a week goes by where they don't use this device for something. In fact, when I joked about how much he enjoyed this test device, he remarked that they use it more than their multimeters! Some endorsement!

So what can this product do, besides continuity checks? How about a continuity check three feet deep in the dirt? In Tom's case, they wanted to reuse a Heliax sampling cable which had been inadvertently sliced off by a backhoe.

See WORKBENCH, page 21 ▶

Large capacitors must be disposed of properly through an EPA-licensed disposal company.

LISTEN



When you hear the Omnia.fm, you'll know why broadcasters the world over choose it: Sound that's as smooth and fluid as analog, with absolutely none of the digital grunge you hear in other digital processors.

So what's digital grunge? Artifacts caused by aliasing distortion in yesterday's processors that lack the Omnia's 48kHz sampling, 192kHz virtual upsampling and unique anti-aliasing final limiter. In the FFT analyses shown below, you can actually see the grunge as well as its absence in the Omnia.

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OPTIMOD 8200 12.5kHz SPECTRUM

Here's how: *The test results were obtained with a Hewlett-Packard Audio Test Set, Model 339A; the audio processor under test; and Rapid Systems R1200 Data Acquisition System for FFT analysis. The processors were set for 75µs pre-emphasis, and were carefully adjusted so the input levels were within the normal range of operation. The unit under test was fed a 12.5kHz test tone using the analog inputs. The discrete left channel analog output was connected to the FFT analyzer input. That's it. No tricks, no disclaimers about the test working only in our trade show booth or only in our lab, under the most arcane, non-real-world test conditions. In fact, you can duplicate the test results yourself in your own shop. Don't have an FFT analyzer? No problem. Just use an oscillator and your ears–you can clearly hear the birdies in the old processor! Of course, this isn't about test tones; it's about music. And Fourier theory says that music–whether it's rap, oldies, urban, country, and yes, even grunge–can be represented as a combination of sine waves. Imagine what this kind of aliasing distortion can do to complex musical signals!*

Here's why: *The Omnia.fm utilizes 48kHz sampling for dynamics processing and virtual upsampling at 192kHz for the final limiter, which is a unique, anti-aliasing design. The test used version 1.02 software and the 'Cranked' preset, which is the Omnia's most aggressive stock setting. The Orban® Optimod® 8200 used for testing operates at 32kHz sampling for the dynamics processing and incorporates (4x) 128kHz upsampling for the clipping/low-pass filtering function. The test used version 3.0 software and the 'Urban/Rap-Dense' preset, which is the Optimod's most aggressive stock setting. Aliasing will occur with input signals above 5kHz in 32kHz FM broadcast audio processors unless mechanisms that cause aliasing are eliminated.*

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Circle (202) On Reader Service Card

The Hazardous Side of Radio

Howard L. Enstrom

In broadcasting, we hear many stories of people who have been embarrassed, injured or even killed by their own actions. It happens to intelligent crafters of art form and to uncommon engineers.

Some behaviorists claim that people with high intelligence have notoriously poor judgment. Do low-intelligence types, therefore, have notoriously *good* judgment? Of course not. But I think some mute, inglorious Miltons get their satisfaction in seeing other's mistakes.

In my 52 years in broadcasting, I have seen quite a few, and they offer us lessons about our own behavior.

In Montana, TV transmitter engineer Greg was concerned about high compartment temperature in the PA. He pondered why the manometer didn't control.

Another thing: he'd put up with that constant racket from that high-voltage transformer long enough. During his shift, he carved shims from a cedar shingle to pound into the laminations.

He wasn't chief, but he had the right stuff.

At the end of the broadcast day, Greg entered a full set of transmitter meter readings and cut all high-voltage DC, leaving only tube filaments and blowers energized for AC power during cool-down.

At dawn, the startup shift engineer was surprised to see Greg's car still there. What Hank saw inside was awful. Greg was dead. Immediately, he pulled main breakers and dialed 911.

Fatal error

An incomplete log in Greg's handwriting read: "2:15 a.m. — High PA temp caused by low air supply. Found flex boot off blower duct in floor trough because clamp too tight making duct collapse. Strengthened duct, resecured boot. PA air supply OK, manometer OK. Who put a clip lead across manometer?" The clip lead and a Spintite nut driver were found in his pocket.

Investigation findings were clear. Greg had re-accessed and wiggled himself part of the way into the transmitter. The door interlock was not defeated, the grounding stick was still hooked on a high-voltage point. The fatal energy was from the 240 VAC primary terminals of the PA filament transformer. Actually, the current path for 120 V was between Greg's hand and grounded waist.

He had been trapped, and he died alone.

Tragic losses

In the same city, Dr. Arthur Movius was a skilled physician who specialized in hand surgery. He was a friend of mine, a fellow radio ham who loved to build equipment. He loved his life, work, hobby, music, a little booze, the ladies.

Not all errors are fatal. But severe RF burns can maim.

Art personally remodeled his home and installed a church pipe organ. At day's end he sapped his sauce while singing and playing the organ. Twice, I was his only audience. The organ sound, I liked. But in his radio room, I kept my distance from his transmitter. It was a dangerous contraption, and I told him so.

One Saturday morning, in robe and slippers, he went down to his radio room for a scheduled QSQ that he never kept.

Art's fatal mistake was where he put his hand. Ironically, the hand that helped heal so many others was stilled.

At a 50 kW AM station in Chicago, humongous high-voltage plate, modulation transformers and filter chokes were mounted 25 feet from RF equipment, within a protection cage. Near the ceiling, rows of lines ran between insulators replaced with wire stripped of its insulation. But one piece of insulation hung, as if by a thread.

It bothered Walt, the on-duty engineer. So he moved a tall ladder and went up to yank the thing off. He must have lost his balance and raised his arms, right into the lines. His death was instantaneous.

Hard lessons

Not all errors are fatal. But severe RF burns are painful and can maim. Ed's mentality was obvious during our first meeting about business at a Chicago station, where I was with the engineering management. We discovered we were almost neighbors in the suburbs, hams who built our own equipment and shared important beliefs. A friendship grew between us and our families.

See HAZARDS, page 15 ▶

▶ HAZARDS, continued from page 14

Ed was an engineer for a well-known transformer manufacturer, and we acquired some otherwise-expensive components to build "cool kilowatt" AM transmitters.

Both used positive peak modulation, negative peak clipping and dual-section filters to suppress splatter. Talk about loudness factor. With tall, high-gain antennas, our signals packed authority in "kilowatt alley," on the 20-meter band.

My PA tank circuit used a variable vacuum capacitor and a silver-plated edge-wound roller inductor. His used plug-type inductors and an air-spaced variable capacitor.

One day, he wondered if his inductor was running hot, so he touched it and pulled a big white flame. He had forgotten to cut the 2,200V, though a blocking capacitor kept the inductor at zero volts DC.

What was left of Ed's finger was cauterized.

I had a close brush with electrocution when I was a field engineer for a well-known consultant.

From Minneapolis, I drove a few hours to the next station in northern Wisconsin. Its transmitter would not make licensed power. I had never been there, so my meeting with the owner was the first.

At midnight, when I met Paul in his downtown office, I got a feeling this man was hurting. He was a station owner, manager, everything.

"Wanna cold one?" he asked, opening the refrigerator next to his desk, and next to stacked cases of Mountain Dew. Empty cans of the stuff were everywhere. We went to the transmitter in my car, loaded with test gear and a cold six-pack of Mountain Dew.

I remarked about the nice block building.

"Trade-out. Shoulda seen what was here," he replied, and unlocked the door, flicked a light switch and disappeared into darkness.

Near thing

The inside was neat and clean, as was the old transmitter. Paul came in and fired up, using local control. I examined operating parameters and engineering documents on file. Then a look at the tower tuning unit, writing down the ammeter reading.

After some tuning, my conclusion was low emission in the final amplifier tube.

But no spare. Now what? Paul summoned courage to make a phone call and we drove 50 miles to meet halfway with a crusty guy at an all-night diner.

I paid for coffee, and the two of us headed for our cars. Paul would be right out, with one PA tube. The used type.

It must have been 4 a.m. when I switched bottles. From the back of the rig, I said, "Paul?" No reply; he had gone outside to relieve himself.

During such intermissions I noticed things. This time I saw another refrigerator, the sofa, lamp, reading material and verses stuck on the wall.

I thought, "This is not just a transmitter site. It's a place of refuge, maybe healing, in fighting a booze problem."

I neutralized the PA statically with high plate voltage off, but with drive from the IPA. Paul told me what was happening with grid current meter readings. Because I had defeated the transmitter door interlock safety feature, I had to be very careful when intruding the cabinet's interior with high voltage applied to components. For this, Paul toggled the front-panel breaker switch on my commands as I put my right arm in and out of the equipment to make small adjustments. (As always, my other hand was pocketed.)

I had a close brush with electrocution as a field engineer in Wisconsin.

All of a sudden, flames appeared at my right shoulder and hand. A war whoop, and the transmitter shut down.

Still conscious, I thought, so this is the moment I looked toward, the gift of death, and I'm with Him.

But I was alive. On the floor, against a wall. Paul was holding ice-cold cans of Mountain Dew on me. I believe that man prayed. I was shocked; all was bewilderment. But within a half hour, just some reddish spots.

We finished up; the transmitter delivered full power.

I realized later that I had so concentrated on keeping my left hand away and achieving results that I was unaware of a large high-voltage capacitor at shoulder level. To steady my hand while twisting an insulated rod, I had leaned it against grounded metal. The transmitter automatically shut down when the added current flow through my arm tripped its overload relay.

I don't care for Mountain Dew. But I do for the man who did.

■ ■ ■

Some names of people in this article have been changed.

Howard Enstrom is an engineering consultant based in Inverness, Fla.

Do you have your own hair-raising radio experiences to share? Send e-mail to radioworld@imaspub.com

FIRST PERSON

Mitch: No Calm After the Storm

An ABC Radio Reporter Rushes to Nicaragua to Cover the Aftermath of a Devastating Hurricane

Jim Ryan

Like most of my network assignments, this one came out of the blue. More accurately, in this case, it came out of the gale-force gray of the most powerful storm of the 1998 hurricane season.

While most of the major networks were concentrating on the midterm elections, Hurricane Mitch was crashing down on Central America. Once the last vote was counted, it was time to catch up with the storm.

A midday phone call from ABC News Radio on Friday, Nov. 6, informed me that I was to be in Nicaragua the following Monday morning for live coverage of the storm's aftermath and the region's recovery. That would require a Sunday morning departure from my home in Dallas.

I had about 42 hours to get ready. Not bad, considering most calls from the assignments desk in New York go something like this:

"We need you there. *Now*."

This time, I would need the extra hours to prepare.

Besides the assignment from ABC on that Friday came another from the editor of **Radio World**. My father, former radio and wire-service journalist Bill Ryan, had contributed to the publication. **RW** wondered if I might take some notes during my trip. This article is the result.

Down with disease

The first order of business was to contact my travel agent for a flight to Managua, a hotel room and rental of a 4-wheel-drive sport utility vehicle.

Friday afternoon found me at the Tarrant County, Texas, International Travel Clinic, rolling up my sleeves for two shots in each arm for protection against hepatitis A, typhoid, diphtheria and cholera. The anti-malarial drug is a bitter pill called "chloroquine." Unfortunately, most of this preventive medicine probably would be useless; it takes several days for the drugs to take effect.

Because of the remoteness of the hurricane-damaged area and under the presumption that communication had been knocked out, my bosses at ABC asked me to check into the rental of a satellite cellular phone. One brief phone call later, I was headed to a supplier in Dallas to pick up the unit. Looking back, the satphone might have given me more protection against the hazards of storm-ravaged Nicaragua than did all those shots. My carry-on gear is listed in the accompanying box (page 23).

Photo by Roger Miranda Rojas

Jim Ryan at Work in Israel, Nicaragua

The MZ-B3 MiniDisc machine is about a quarter of the size and weight of the Marantz deck. It provides excellent sound quality, instant queuing of cuts, a high-quality condenser mic and a built-in speaker. It has become the heart of my equipment pack.

The Sony R3, on the other hand, is more of a consumer-oriented MiniDisc model. It has no speaker or condenser mic, but has one extremely useful feature: Cuts may be rearranged on the disc, making the R3 a one-deck editing machine. In other words, I can conduct an interview at the "front" of the disc, then voice my script at the "end." Then, using electronic edit marks and the R3's thumb wheel, I can insert bites of the interview into my script.

If anyone knows of a MiniDisc unit that combines the R3 and B3 features — built-in speaker, condenser mic, editing capability — I'd love to hear about it.

With two MiniDisc machines, why carry the Marantz tape deck at all? First, it allows me to boost the audio from either of the MiniDisc players, each of which seems to yield woefully low levels. Second, it's a force of habit.

The Comrex HotLine codec, checked in my luggage, is a digital modem designed specifically for audio-broadcast purposes. Using a standard telephone line, the HotLine gives, in many cases, near-studio quality at a fraction of the cost of ISDN.

The HotLine is finicky when confronted with switchboard extension lines, e.g., the telephone in a hotel room. It also has trouble in some locations, as it did in Cancun, Mexico, while I awaited the arrival of Hurricane Mitch. The storm never made it that far north and the Comrex never meshed with its counterpart in New York. The solution, of course, was to disconnect the HotLine and pick up the telephone. I'd estimate that, for me, the Comrex HotLine has been flawless 80 percent of the time.

Up, up and away

My flight left Dallas/Fort Worth International Airport at 6:20 a.m. on Sunday, Nov. 8. A plane change at Miami meant one of the airline industry's longest gate-to-gate hikes.

During the two-hour, 46-minute flight from Miami to Managua, a man sitting across the aisle noticed my ABC News Radio baseball cap. He asked whether I was headed to cover the disaster, then told me he was a geologist from the State University of New York intent on studying the hurricane-induced mudslide at the Casitas volcano.

He agreed to be interviewed once we reached Nicaragua, as did another passenger who was helping to coordinate the distribution of relief supplies from a Texas-based religious group. Pretty rare to have tape in the can before arriving at the scene of a story.

At 12:51 p.m., the plane landed in Nicaragua. At 1:08, I learned that the big, plastic shipping case (bottled water, beef jerky, HotLine) was lost somewhere between Miami and Managua and wouldn't arrive for another day. Great.

Here and there, we saw the corpses of the victims, some incinerated by workers using flame throwers to prevent the spread of disease.

It looked as though it would be a matter of feeding ABC and my other employer, WBAP(AM) in Dallas/Fort Worth, by telephone instead of Comrex. Actually, I was more concerned about losing the water than the HotLine. The nurse at the travel clinic had issued a stern warning against drinking third-world water, especially after a disaster like Mitch. She also suggested I eat only what I bring. Luckily, the crackers and three bottles of water did make it to Managua on my flight.

My plan was to edit the tape with the geologist and the relief worker, both of whom were excellent interviews, on Sunday afternoon, feed a series of stories for overnight use, go live from Managua during Monday morning drive time, then head to the hard-hit northern region, near the Honduran border.

Wakeup came at 5 a.m. Monday at Managua's Hotel Intercontinental. My first live shot was with WBAP at 5:45; the next was with ABC Radio's Information Network at 6. Later calls went to WDBO(AM) in Orlando, Fla.,

See MITCH, page 17 ▶

▶ MITCH, continued from page 16

WBAL(AM) in Baltimore, KTRH(AM) in Houston and the ABC Entertainment Network.

A typical day on an out-of-town story like Mitch will mean approximately 20 reports fed throughout the day to various entities around the country.

About feeding tape: I normally carry a specially adapted telephone handset with a mini-jack installed at either end and a push-to-talk button under the thumb. The engineer who designed it and I have dubbed it the FeedPhone, and it works under most conditions. I did not carry it on this trip because it does take up space in my equipment bag and, like the Comrex, does not like some foreign telephone systems.

In the case of the FeedPhone, it's because the modular telephone handset jacks we're accustomed to seeing in the States can't be found elsewhere. It's only a minor point, though; I have found that using the tape deck to amp the audio from my MiniDisc machines and simply holding the phone up to the speaker of the Marantz provides perfectly usable and occasionally very good sound quality on the other end. Call it old-fashioned, call it small-market — by God, it works.

No trucks

Once Monday morning drivetime was on the books, I left for the Nicaraguan Air Force base adjacent to the Managua International Airport. Common sense told me that all the relief supplies I'd seen on the ramp as I deplaned the day before would be loaded onto trucks and taken to the storm-damaged areas to the north. I reasoned that I could follow those trucks directly to the affected region to see the devastation for myself.

My logic was flawed from the start. The cases of food, water and clothing on the ramp were to be loaded into helicopters, not trucks. I wouldn't be able to hitch a ride on a military helicopter until the following morning, if at all. I was told, though, that trucks were being dispatched from the Red Cross headquarters across town. I was given an address and started out.

Ever tried to drive in downtown Managua, Nicaragua? The roads are full of potholes; streets and addresses are entirely unmarked, and traffic laws seem not to exist. It's a blinding road race in which green means "go" and red means "slow down a little ... if you feel like it."

What's more, the 4-wheel-drive vehicle my travel agent tried to arrange turned out to be a 2-wheel-drive Nissan pickup truck with a standard transmission and 50,000 difficult miles behind it.

Somehow amid the chaos, I found the Red Cross office. Never in a million years will I know how. Another thing amazes me: Despite all the speeding and swerving, I didn't pass by a single car-crash scene.

Once at the Red Cross headquarters, I struck up a conversation with one of the agency's public information officers from Costa Rica. David ("dah-VEED") and his friend, Roger ("roh-HEHR") had arrived the day before and were, themselves, planning to go north. A short time later David, Roger and I were headed up the main highway to the city of Chinandega, which had been cut off since the storm.

It wouldn't be long before we began to see evidence of Mitch's power. Floodwater had rushed in from the east, washing away about a dozen bridges between Managua and Chinandega, population 80,000. An expected two-hour drive took three and a half hours to complete. We finally arrived at 8 p.m. and checked in with David's Red Cross colleagues.

While Roger and David ate supper in a small, family-run diner (I was keeping my promise to the nurse not to eat or drink anything but my own rations; too bad they were all in my hotel room at Managua or sitting on the ramp in Miami), I stepped outside to see if the satellite cell phone would really work. Sure enough, it did.

The Mitsubishi ST151 is remarkably easy to use. It is contained in a hard-plastic briefcase whose lid doubles as its antenna. Just find yourself on the map affixed to the phone, use the latitude/longitude grid and built-in compass to determine the correct lid/antenna angle and the best direction in which to lay the briefcase, wait for the phone to establish a strong, stable link with its satellite and you're ready to go.

A typical day on a story like Mitch means feeding about 20 reports daily to various entities around the country.

Stable link

Calling New York from Chinandega on the sat-phone was actually a tiny bit quicker than calling on a land line from Dallas, Texas, because you don't precede the area code with "1" or "0." The satellite phone does carry the inconvenience of a delay (about 3/4 of a second), which makes live reporting a bit difficult. I began by feeding several taped stories for later use by ABC.

After dinner (which was another bottle of water for me), we decided to move closer to the Honduran border, where relief efforts were just getting underway. Things in Chinandega seemed to be improving; the roads were now passable and the Red Cross

See MITCH, page 23 ▶

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Basics of Amplitude Modulation

Ed Montgomery

This is the second part in a series about the basics of amplitude modulation. The first part appeared in the Dec. 23 issue and is available online at www.rwonline.com

For continuing education credit, see the information at the end of the article.

Amplitude modulation is a simple, efficient method for transmitting information. The original idea for creating a radio signal goes back to James Clerk-Maxwell, an English physicist who theorized the existence of electro-magnetic energy in 1873. His theories were proven by Heinrich Hertz, who actually generated and received radio waves in his laboratory in 1888. Hertz did not follow up his work with any practical applications.

It was Guglielmo Marconi who found the practical application for the "wireless telegraph." Marconi implemented a system of radio communications between ships and coastal stations he had established on land. Most of these systems employed an alternator similar to the one in an automobile to create a radio signal.

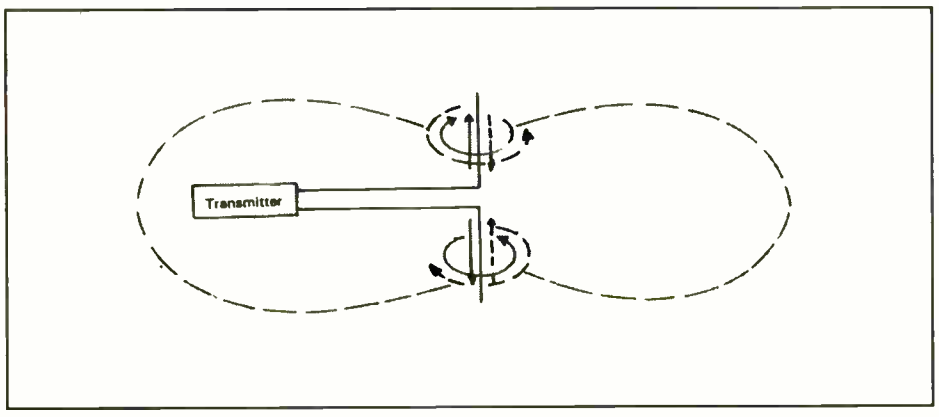

Figure 1: The magnetic lines of force (dashed lines) radiate away from the antenna at the speed of light.

The radio wave is the product of an electric current flowing through an unterminated wire or antenna. As the alternating current flows to the end of the wire and then back, a magnetic field is created perpendicular to the current flow. If the wire is spread apart as illustrated in Figure 1, the magnetic field will radiate away from the transmission line.

Spreading the wires apart creates an antenna. The radio wave is moving away from the antenna at the speed of light. Originally this magnetic field would be intercepted by the receiver antenna, and through electro-magnetic induction, produce a small current that would actuate a relay creating a clicking sound. Morse Code was sent this way.

But some people wanted to do more than just transmit code. One could say that the frequency that was transmitted with code was the carrier. To transmit voice, more than the carrier had to be sent.

It was discovered that if audio signals were converted to electric current variations, through a microphone, these signals could be added to the radio frequency and decoded in a receiver. Initially these audio signals were capacitively or inductively coupled to the radio frequency. Pioneers like Reginald Fessenden and Lee DeForest demonstrated audio transmissions around the United States and Europe.

However, it was another individual, more closely associated with FM, who improved amplitude modulation and made it practical for broadcasting. Edwin Howard Armstrong invented the principle of regeneration or oscillation. This allowed the alternator to be retired. The totally electronic transmitter was at hand. Armstrong also invented the superheterodyne receiver, making radio reception simple and reliable.

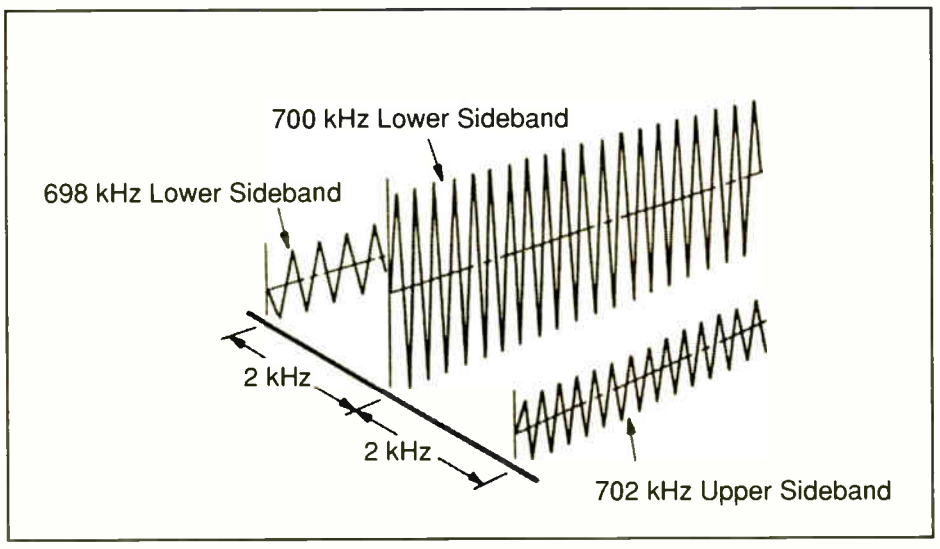

Figure 3: The Results of Combining a 2 kHz Audio Signal with a 700 kHz Radio Frequency Carrier

The carrier

Amplitude modulation operates on a specific frequency known as a carrier. This signal never changes in power. The operating power of a broadcasting station is the carrier power. The radio signal is generated in the form of a sine wave. Figure 2 depicts its wavelength and amplitude characteristics. The number of wavelengths occurring in one second is the wave's frequency, measured in cycles per second, or Hertz.

The audio signal is added to the carrier frequency creating modulation. For instance, if the carrier frequency is 700 kHz, the radio signal, or carrier, is creating magnetic fields that are radiating off the antenna at 700,000 times per second. If audio is applied to this carrier, the sum and difference frequencies also will be transmitted. If an audio tone of 2,000 cycles is applied to the carrier, the following frequencies will be present:

Audio Frequency: 2,000 Hz
Carrier Frequency: 700,000 Hz
Sum Frequency: 702,000 Hz
Difference Frequency: 698,000 Hz

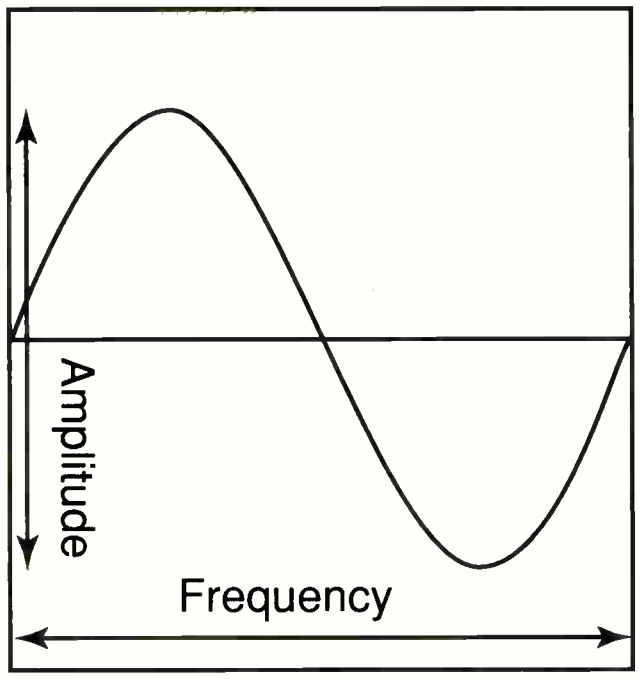

Figure 2: A Sine Wave

The antenna will accept the frequencies that are most closely related to the carrier: 698 kHz, 700 kHz and 702 kHz. The 698 kHz and 702 kHz are sidebands. The difference between the carrier and sideband frequencies is the audio frequency. It is duplicated above and below the carrier.

Figure 3 depicts the sidebands and the carrier. The amplitude of the sideband determines the loudness of the signal while varying frequencies in the sideband represent the audio information. For years, radios used a diode or envelope detector to extract the audio from the radio signal and amplify it.

Much of the problem with AM broadcast today is not within the transmission

See AM, page 21 ▶

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READER SERVICE NO. 116

AM Radio and the Noise Problem

▶ AM, continued from page 19

of the signal but in its reception. Most electro-magnetic noise, from lightning, motors, computers, etc., is an amplitude function. Because the AM receiver is detecting amplitude variations, it receives the desired signal along with any other electro-magnetic noise in the vicinity.

Remember the radio signal is very weak. Signals from computers, telephone systems, appliances, and so many other local sources are much stronger. The receiver picks up everything surrounding the carrier and amplifies it, often producing a lot of noise.

Over the past 30 years, receiver manufacturers have tried to reduce noise by narrowing the frequency bandwidth of the tuner.

AM transmits a frequency response that is very close to human hearing. It is flat out to 7,500 Hz and beyond. However, audio is varying constantly, allowing noise to get in where low levels of radio signal are present. The receiver manufactures decided to cut the audio bandwidth to 2,500 to 3,000 Hz. This reduces fidelity.

The receiver picks up everything around the carrier, often producing a lot of noise.

There are other methods available to reduce noise in AM while keeping audio fidelity high. One is to replace the envelope detector with a synchronous detector. That was once an expensive addition, but now simply requires a microprocessor. Receivers with AM stereo capability use them with good results. Many automobiles have them. They do not eliminate noise, but they reduce it.

Denon has made a receiver sold by the NAB that has a "smart filter" that will eliminate a lot of noise. However, few consumer stereo manufacturers have chosen to add this feature in their AM receivers. Even the ingenious Bose wave radio, which uses a synchronous-type of detection circuit, has no provision for decoding a stereo signal.

We will continue the discussion in our next part.

■■■

You can receive continuing education credit from Northern Virginia Community College as part of this series. The course fee is $30, payable to the college. For a faxed copy of the registration form, send e-mail to radioworld@imaspub.com *or call (703) 998-7600, ext. 117*

Ed Montgomery is the video technology and communications lab director at Thomas Jefferson High School for Science and Technology, Fairfax County, Va. He has worked as a broadcast engineer and college-level instructor. Reach him at emontgom@lan.tjhsst.edu

A Job for The Fox and Hound

▶ WORKBENCH, continued from page 12

somewhere within a 25-foot circle around an AM tower base. The problem was deciding where to begin digging.

This was clearly a job for the "turbo-charged" Fox and Hound. The Fox audio signal could never be picked up by the inductive-sensing Hound, at the other end of 300 feet of cable, not to mention three feet of dirt.

The solution was to amplify the signal and step up the source impedance of the Fox signal. Driving the line-level Fox output into a 100 W monitor amp, then using an old 5k plate to 8 ohm speaker transformer, hooked up backwards, the output voltage was augmented. This lit up the dead-ended Heliax with some real punch.

One side of the 5,000 ohm transformer winding fed the cable's outer and inner conductors, while the other side was connected to system ground. The amp's volume was set to a moderate level. The Hound could easily hear the buried signal propagating to almost one foot above ground, when directly above the buried cable. Tom and Roger walked the signal out to five feet from the base of the tower, where it stopped abruptly.

Two eager engineers digging carefully with spade shovels for 20 minutes found the end of the lost cable, almost exactly three feet below the first and only hole attempted!

Who says you can't teach an old "hound" new tricks?

■■■

John Bisset has worked as a chief engineer and contract engineer for more than 20 years. He is a district sales manager for Harris Corp. Reach him at (703) 323-8011.

Submissions for this column are encouraged, and qualify for SBE recertification credit. Fax your submission to (703) 323-8044, or via e-mail at jbisset@harris.com

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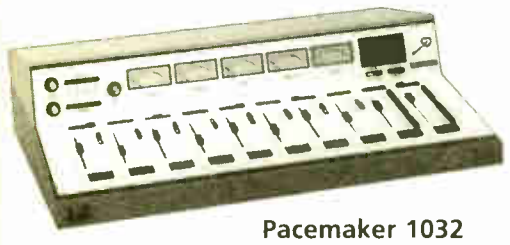

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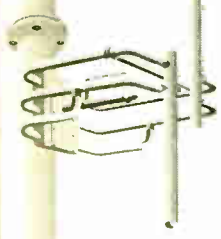

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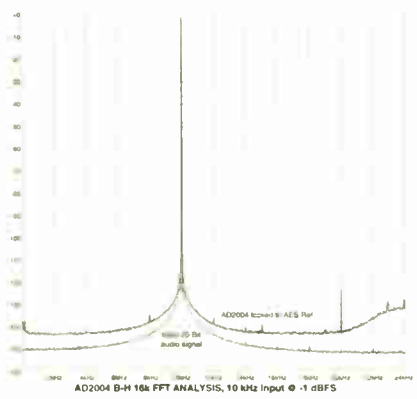

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READER SERVICE NO. 155

In the Wake of a Killer Storm

▶ MITCH, continued from page 17

office had told us of a tiny "pueblo," about an hour-and-a-half to the northeast, where supplies had just begun to get through. Lack of food and a long day were taking their toll, so I tossed Roger the keys.

As we dodged three-foot-wide potholes and drove off-road around sections of washed-out bridge, Roger, David and I talked of the dangers, human and non-human, that might lie ahead. Armed bandits are a constant threat, hurricane or no hurricane; what's more, the entire area around us had been flooded just days earlier, undoubtedly raising the reptile population. We finally had to stop: The bridge ahead had been obliterated by the rush of muddy water.

Roger began to back up and a flashlight beam filled the cab of the truck. The man who approached had a rifle slung over his shoulder. Was this one of the human dangers we'd discussed?

As he drew nearer, we could see the fatigues the stranger wore, and David recognized his Nicaraguan army insignia. The soldier informed us we'd missed the dirt road leading to the town we were searching for and he sent us on our way.

In the hillside village of Israel, the satellite cell phone earned its keep; even on the best day, the town is without telephone service or electricity. The unit I had rented in Dallas became my one means of communication with New York and Dallas.

As I powered up the phone, the digital signal indicator showed an immediate and strong link with the designated satellite and I was able to feed the network before turning in for the night in the back seat of the pickup truck. Cows and horses lumbered around outside eating grass and occasionally peering through the windows at the three strangers inside.

First sunlight came at 5:30 a.m., followed by a chorus of roosters. Great nat sound behind live reports back to the States. Soon the human population began to awake. The Nissan was the only motorized vehicle in town, and the people of Israel were eager to gather around for a look and to share their stories of hurricane survival.

The satellite cellular phone might have given me more protection against the hazards of Nicaragua than did all those shots.

The Red Cross had taken up residence in the tiny, once-a-week clinic that served the medical needs of the community. Before long, local men, women and children had lined up, buckets and jugs in hand, to collect water poured from a plastic, 55-gallon drum. East-coast drive time was over at 9 a.m., and Roger, David and I packed the truck for the drive back to Chinandega, with an eye toward visiting the site of the Casitas landslide. The morning sun bathed the towering San Cristobal volcano, white clouds of steam billowing from its crater.

No one may ever know how many people died at El Tolorar Uno, an agricultural community that sat near the base of Casitas, between Chinandega and Managua. The sugar-cane farmer who escorted us onto his property spoke of hearing screams for three days after the side of the mountain slid into the valley.

Here and there, we saw the corpses of the victims, some incinerated by workers using flame throwers to prevent the spread of disease. Others lay nearly intact, decomposing in the Central American sun 11 days after the disaster.

I interviewed the farmer and some French Red Cross workers we met, voiced a few pieces at the site and recorded the sound of the Blackhawk helicopter that swept down over the field. David, Roger and I then began the walk back to the truck.

It was during the half-mile hike in and half-mile hike back out that I learned of the sat-phone's biggest drawback. At 22 pounds, it can be a shoulder-breaker.

Returning to Managua, I dropped off Roger and David at the Red Cross headquarters and decided to head to the airport to retrieve the shipping case containing the Comrex HotLine, my water bottles and food rations.

Yes, I was told, the crate had arrived from Miami. No, I was told, I could not take it with me. The water, the food, the HotLine and the case were locked in the airline warehouse next to the airport and wouldn't be accessible until the next morning.

Back at the Hotel Intercontinental, I called the desk in New York for evening marching orders: two more live shots and some taped pieces for the following morning.

I sat down to write and, despite the warning from the nurse in Fort Worth, I called room service. The threat of contaminated food or water wasn't in Managua; it was in Israel and El Tolorar Uno, where daily poverty and disease were only compounded by Hurricane Mitch.

The plate of pasta and bowl of soup that came to my room on my last night in Nicaragua were the best I've ever tasted.

■■■

Jim Ryan is senior reporter for WBAP(AM), a 50 kW news/talk station in Ft. Worth owned by ABC Radio. He also works for ABC News Radio and its Information and Entertainment Networks. Send him e-mail at jimryantx@aol.com

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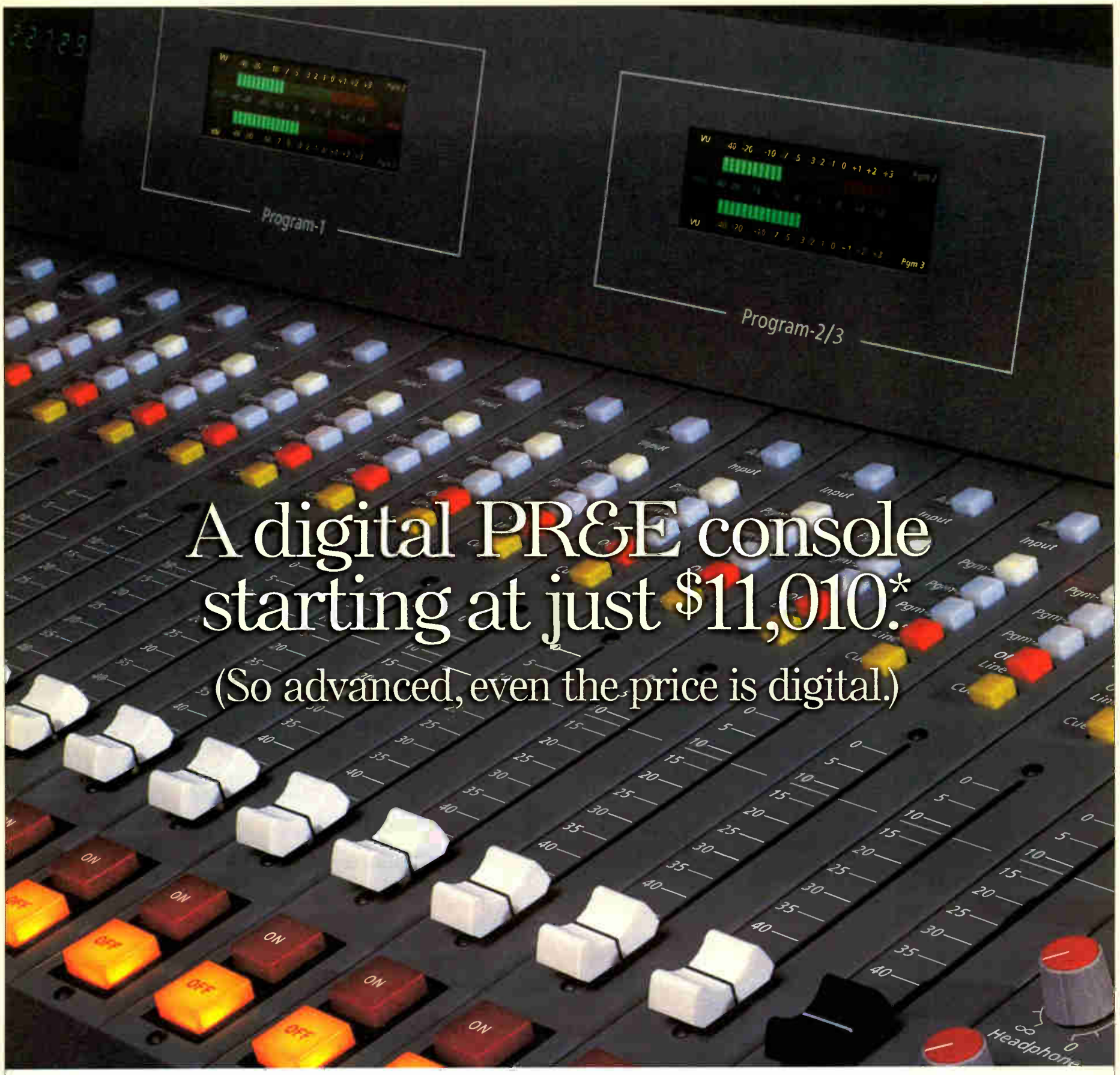
A/C power unit for the sat-phone

Photo by Jim Ryan

Mitsubishi Satellite Cell Phone



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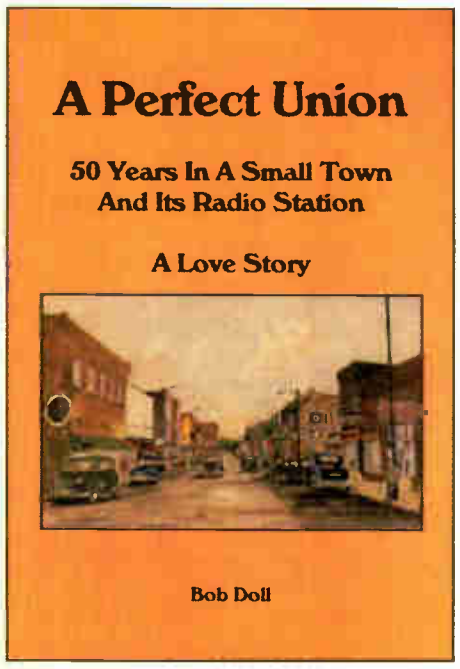
BOOK REVIEW

The Heart of Small-Town Radio

Barry Mishkind

Do the call letters WBCU(AM) mean anything to you as a radio professional? Maybe not, but if you have worked in small-town radio, you may find the new book, "A Perfect Union: 50 Years In A Small Town And Its Radio Station," by Bob Doll, interesting and familiar.

In early radio, it was natural for stations to be located in the larger cities where it was easier to attract "talent" to fill the air time. Suburban stations often moved to the city for this reason, one example being WOR(AM), which moved its studio from Newark, N.J., to New York City.



Stations in smaller towns often centered upon universities or other locations where technical knowledge in operating a station existed. While owners of these stations had different reasons for operating, they often had the same result: These stations quickly became the cornerstones of local pride in their communities.

Not all pioneer radio stations are well known. In the 1920s, it was hard for smaller town-based stations to survive financially. Some just perked along for years, basically known only to the local population. Many others were unable to survive the decade, especially after the stock market crashed.

But conditions were different in the post-World War II era — the country's economy was roaring, and communities looked ahead to the 1950s with optimism.

It was in this environment that it again became possible for local radio to take root; in just three years, the number of stations in the United States grew from 1,000 to 2,000. And then there was television, the "new kid on the block." As a result, while the number of radio stations exploded, the number of stations losing money rose from 5 percent to 30 percent.

One of the ways radio fought the war of survival was by reversing the dominance of network programs — more programs of local significance began to air. These stations are as much a history of small town America as they are of radio itself.

"A Perfect Union" is one such story of how small market radio adapted in post-war radio in the 1940s and 1950s to be both a successful business and a good community neighbor.

'A Perfect Union' is a story of how small-market radio adapted after the war.

As mentioned, making a "go" of these new stations was not guaranteed — not only were there fewer advertising dollars in the small towns, but the local newspaper was accustomed to having those advertising budgets to itself. Reacting, some newspapers put their own stations on the air while others had a policy of ignoring the competition.

To overcome this situation, the new stations, often owner-operated, worked hard to become an integral part of the community. Staff members would join as many local service groups as possible. Remote broadcasts, especially from high school sporting events, brought great visibility.

The stability of the staff was another asset. Many times, WBCU staffers would be there for 20 years or more. They knew their town, and spoke to their listeners as neighbors. It was not unknown for air personalities to open record stores or run for local governmental offices.

As Doll relates the story of WBCU, it is interesting to note how a station could

See BOOK, page 30 ▶

UNITY for Christian Radio

Christian Radio Consortium (CRC) has chosen the **Wegener Communications** Unity digital broadcasting platform for its satellite audio distribution.

Each of more than 1,000 Christian radio music and talk stations will use the DVB-compliant Unity4000 receiver in 1999. Additionally, each network will use Wegener's Compel, an advanced network control system. The total order is about $3 million.

When combined with the corresponding receiver feature-set in the Unity4000, Compel gives CRC control of the diverse broadcast needs of each represented organization.

"The end result is a system that allows a radio station to receive multiple satellite channels on a single receiver," said Phil Shappard, assistant to the vice president of Moody Broadcasting.

In addition to Moody Broadcasting and Focus on the Family Network, CRC includes the Salem Radio Network, Ambassador Advertising, Skylight and USA Radio Network.

For more information, contact Sally Campbell at Wegener Communications in Georgia at (770) 814-4000; e-mail info@wegener.com *or circle* ***Reader Service 8.***

NPR Chooses Dalet5 System

National Public Radio selected the Dalet5 from **Dalet Digital Media Systems** for news production. The new system allows NPR to provide CD-quality sound to 60 users at once.

With this purchase, NPR moves toward a digital system of more than 70 workstations linked by a 100 Mbps network to a "server farm," which will house news audio files. The producer and distributor of newsmagazines such as "Morning Edition" and "All Things Considered" began using digital editing techniques in

its newscasts in March 1998, employing a smaller Dalet network.

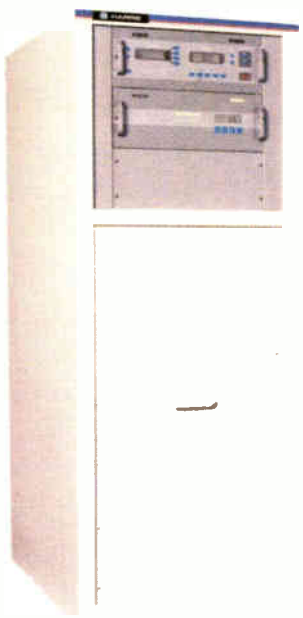
"Digital editing will enable NPR News to provide more and better content to our member stations and listeners," said Mike Starling, vice president of engineering. "(Dalet has) the ability to satisfy our customization needs for optimum workplace efficiencies."

For more information, contact Dalet Digital Media Services in New York at (212) 825-3322 or circle ***Reader Service 47.***

Harris Wins Emmis RF Project

Harris has been awarded a contract from **Emmis Communications** to provide Platinum Z-CD solid-state FM transmitters for several of its New York City radio properties.

The project concerns the consolidation of three stations, WQHT(FM), WRKS-FM and WQCD(FM), into one plant on the 85th floor of the Empire State



Building. Harris will supply Emmis with seven Z-10CD 10kW transmitters, featuring the company's Digit CD digital FM exciter.

"All three Emmis New York properties are market leaders," said Jim McGivern, one of the chief engineers for Emmis New York. "In a media-intensive market like New York, it is important to provide a high-quality, reliable product to our listeners and advertisers."

The new transmitter plant is the final phase of the consolidation project, which began two years ago with the construction of an all-digital studio facility for the three stations. Once the transmitters are installed, the facility will be complete.

For more information, contact Harris Broadcast Systems Division in Illinois at (217) 221-7577, visit the Web site at www.harris.com/communications *or circle* ***Reader Service 86.***

National Weather Service Selects Gentner

The **National Weather Service** is using Remote Facilities Management systems from **Gentner** for installation in its NOAA Weather Radio network.

The GSC3000 RFM systems from Gentner were specified by **Crown International**, which won the multiyear contract to expand NOAA and replace the network's old transmitters with its own. The new products were employed to meet Vice President Al Gore's decree for 95 percent weather radio coverage across the United States and the improvement of the existing network's performance.

Monitoring and controlling several transmitters from a single location, the GSC3000 can recognize problems, take corrective action and notify the engineer via phone, pager or data transfer of the events. It is can be custom-tailored and operates independently.

For more information, contact Gentner in Utah at (801) 975-7200; fax (801) 977-0087 or circle ***Reader Service 125.***

Continental Electronics Wins Lebanon Contract

Continental Electronics recently signed a contract valued at more than $7.7 million to supply high-power radio broadcast equipment to the **Ministry of Information** in Lebanon. Financing is being provided by the Export-Import Bank of the United States.

The solid-state equipment replaces a station constructed more than three decades ago. Featured in the installation are two medium-frequency transmitters operating at 1 megawatt and 100 kilowatts. The broadcast system includes antennas, transmission lines, tuning units, power generators and microwave systems.

"We'll have the complete station operational in Lebanon within 18 months," said Adil Mina, vice president of marketing for Continental Electronics. According to Mina, the transmission will reach throughout the Middle East, the Arabian Peninsula and Northern Africa.

For more information, contact Continental Electronics in Texas at (214) 381-7161; fax (214) 381-7161; fax (214) 381-3250 or circle ***Reader Service 27.***

"Who's Buying What" is printed as a service to our readers who are interested in how their peers choose equipment and services. Information is provided by suppliers.

Companies with news of unusual or prominent sales should send information and photos to: Radio World Managing Editor, P.O. Box 1214, Falls Church, VA 22041.

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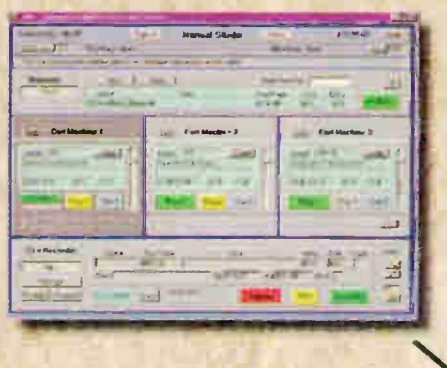
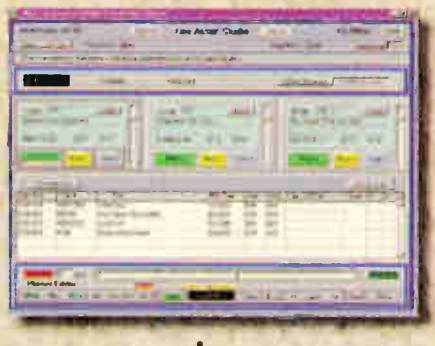
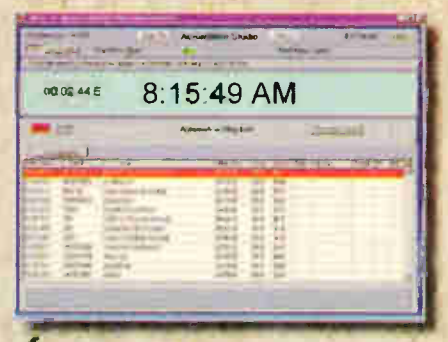


Live Assist $1,995



Hard Disk Automation
$2,995



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(includes Live Assist software)

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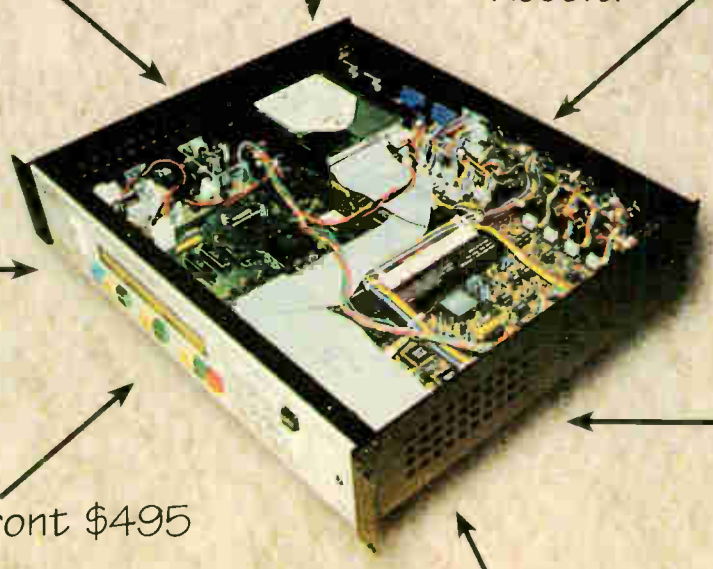

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Circle (196) On Reader Service Card

WBCU: A Town and Its Station

▶ BOOK, continued from page 25

become successful by interacting with the community, working to bring people together. Public service programs, including local radiothons, were specifically designed to help people and organizations in need.

Entertainment programs sought out the local talent, and the remote broadcasts underlined the immediacy of radio that newspapers couldn't match. Over the years, recognition of the station's efforts and industry awards increased. The ability of listeners to get instant feedback to its questions about local politics and other events further solidified WBCU as the "information center" of Union.

On the other hand, general news from outside the town was not seen to be of major importance: the news director was the chief engineer!

The story of WBCU traces the growth of the station during the good times, periods when the owners had opportunity to expand into a "chain" by purchasing other stations and how this affected its focus. Difficult times for the town were also discussed, including when the main source of local jobs drove unemployment to new highs. And then there was the time WBCU tried to change formats without asking the listeners.

While focused on the 50 years of WBCU's operation, the story of Union's station parallels innumerable other small-market stations of the time. It is unlikely that most of us have heard the names of the staff members of WBCU, but it is their stories that are familiar, the stories of small-town radio all over the country.

■■■

The retail price of the book is $20. For information, contact Winters Publishing in Indiana at (800) 457-3230.

Barry Mishkind has no basement out on the desert, but can be reached via telephone at (520) 296-3797 or via e-mail at barry@broadcast.net

The Early Days of WBCU

The following is from "A Perfect Union: 50 Years In A Small Town And Its Radio Station" by Bob Doll. The text refers to owner Everett Hughes. Manager Milton Scarboro and Chief Engineer Tommy Weathers.

Early in the last full week of August, 1949, Mr. Hughes sent by "Special Delivery" an advisory to the Federal Communications Commission in Washington that the WBCU construction was complete. The advisory was accompanied by the required engineering data that tests had been made that showed the station would operate under the terms of its license. The advisory concluded with, "We await your permission, by collect wire, to commence broadcasting."

In 1949, the Union telegraph office was run by "Mert" Parsons behind the front desk of Fairforest Hotel. The telegram arrived early

As soon as the 'test program' went on the air, the studio phone rang off the wall.

the evening of Aug. 26. There were local people in the hotel lobby who heard about the wire's contents.

Milton Scarboro was at the studios, making last-minute preparations for what was expected to be the station's first day on the air. Weathers was there too. When he received the wire, he told Weathers, "Since we have an O.K. let's go on now with a 'test program.'" Weathers went to the transmitter site at Lukeville to turn the transmitter on. At the same time, Scarboro moved into the control room to present the very first broadcast on "Union's Own Station."

Shortly, the phone rang at the WBCU studios, Weathers advising that everything was ready. The first voice on WBCU was Scarboro, telling anyone who happened to be listening. "This is W-B-C-U, Union, South Carolina, broadcasting a 'test program' ... "

As soon as the "test program" went on the air, the studio telephone rang "off the wall" with people who had heard that WBCU might come on that night. The callers enthusiastically told members of the new staff, "We're hearing you loud and clear. We're proud of you."

GM Journal

Radio World — Resource for Business, Programming & Sales — February 3, 1999

Leykis Gets Rowdy With Radio Fans

Westwood One Personality Seeks More Exposure in Top Radio Markets Through Unusual Methods

Bob Rusk

Here in Portland, Ore., several hundred rowdy radio fans packed themselves into a sports bar recently — but they didn't show up to watch an NFL game. They came to attend a live broadcast of the nationally syndicated Tom Leykis radio show.

The blue jeans and T-shirt crowd, a coed mix in Leykis' primary 25-54 demographic, greeted him with wild applause as the broadcast began.

"Thank you for tuning into 'The Tom Leykis Show,'" he screamed into his Sennheiser microphone at center stage. "This is where America gets together to talk about the issues you *really* care about. It's a different kind of a radio talk program. We're the radio talk show that is *not* hosted by a right-wing wacko or a convicted felon."

Fascinating games

Glancing from behind his trademark dark glasses, Leykis eyed his loyal legion while they drank beer and wolfed down onion rings. "We're in Portland, Ore., baby!" Leykis shouted, and the crowd roared its approval.

Tom Leykis

On this Friday afternoon, telephone lines were wide-open and Leykis proclaimed, "Anything's fair game, as long as you're absolutely ... " and before he could finish the sentence, the crowd yelled, "fascinating!"

"That's right," Leykis said. "You guys do know the show. This is so cool. Because if you don't think you can hold a nation spellbound — and more importantly, if you don't think you can hold a drunk and unruly crowd spellbound, a Mr. Michael J. Dooley will kick your ass the hell off the air. That's just the way it's gonna work."

A caller named Vin was the first to pass the test. He had no problem grabbing the attention of Leykis listeners with a story to tell about "that girl named Angel" who was at one of Leykis' previous gatherings.

The Portland broadcast was typical of the many remotes Leykis hosts with his affiliate stations throughout the country. These appearances provide an opportunity for listeners to attend a live radio show and meet Leykis, while also satisfying his desire to occasionally get out of the Los Angeles studio where he is based.

Party animal fans

"I feed off the audience for sure," Leykis, 42, said during a commercial break. "You see who the demographics are, you see what the audience looks like."

Dozens of people stood in line during each break, waiting to shake Leykis' hand and get an autographed photo. They were the lucky ones. So many people showed up at The Locker Room, the bar where Leykis appeared, that dozens had to stand outside and wait in the rain, hoping for a chance to get in during the four-hour broadcast.

In an effort to accommodate all of his fans, a second event — a three-hour listener party — was held at another venue after the broadcast.

One of Leykis' favorite activities at such gatherings is signing the bare breasts of female fans. Photos of him doing this during a party at Hennessey's Tavern in

KOTK HOT TALK 1080

Hermosa Beach, Calif., were posted on his Web site *(www.blowmeuptom.com)*.

Even more salacious is "Flash Friday," when Leykis goes on the air and encourages female listeners, while in their cars, to bare their breasts to passing male motorists.

During his stop in Portland, Leykis' sexual escapades were the topic on "Town Hall," a public affairs show on KATU-TV, the ABC affiliate. The station is owned by Fisher Broadcasting, which

See LEYKIS, page 40 ▶

Track Radio Listeners With EMUs

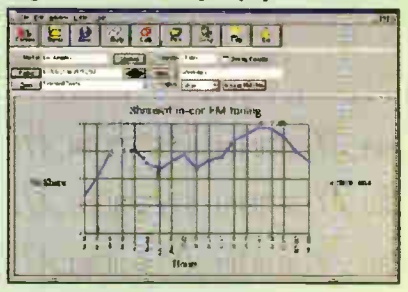
Dee McVicker

A unique electronic ratings system, designed to portray habits and trends in car radio listenership, is rolling out in more markets.

MobilTrak monitors car radio tuning by placing electronic measurement units along roadways in high traffic areas within a specific market. The EMUs register the station to which a passing car radio is tuned.

MobilTrak began putting its receiver tracking system on the map several years ago. The system appeared first in Toronto, then in Phoenix and, most recently, in Los Angeles.

With the success of tests in those regions, the company plans to roll



MobilTrak records in-car radio listening in real time.

out its frequency sampling system in a handful of markets in the first quarter of 1999.

Fast response

When radio people discuss measurements of listening habits, the usual source of those numbers is Arbitron. It, too, is testing an electronic method for sampling audience response, although its system works in a much different way than that of MobilTrak. For some time, Arbitron has been testing a Multimedia Personal Portable Meter for measuring television, radio, satellite and cable audiences. The tests are being performed in Manchester, England.

Will our familiar system of using diaries to track listening habits take a back seat to electronic rating methods someday? The answer is unclear. No one expects the diary to disappear anytime soon. But less-intrusive, more-immediate methods of measuring audience response could round out the information picture for broadcast clients.

"I believe, in the long term, this has perhaps some better mechanisms for more complete information," said Ron

See MOBIL, page 38 ▶

Why is Bob laughing?

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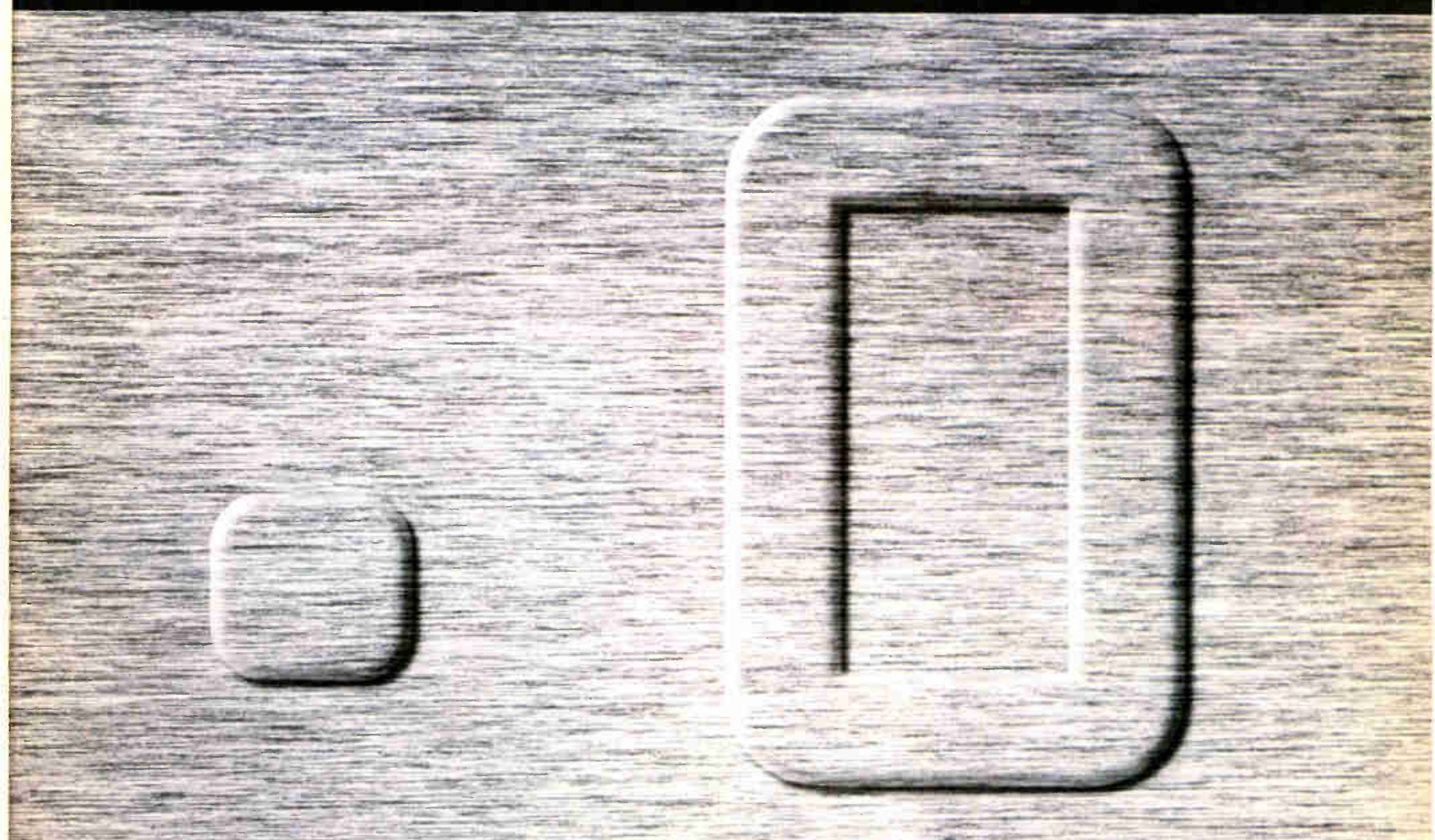

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BUSINESS ANALYSIS

1998 Yields Big Deals in Radio Stock

Lynn Meadows

The fourth quarter of 1998 marked another good one for the radio industry. National and local ad sales increased and radio group owners labored to complete new market clusters while radio stocks continued to rise.

Radio groups savored new opportunities in Q4. One example is Heftel Broadcasting Corp. (NASDAQ:HBC-

CA), which announced a long-term agreement with XM Satellite Radio to be the exclusive provider of Hispanic entertainment programming. XM, provider of five Spanish channels, plans to launch its satellite and begin providing up to 100 channels of digital audio next year.

Back on the ground, the most expensive deal of the quarter was the Clear Channel Inc. (NYSE:CCU) plan to purchase Jacor Communications (NASDAQ:JCOR) for $4.4 billion including the assumption of Jacor debt. Upon completion of the deal, which is expected to close in the third quarter of this year, Jacor will operate as a wholly owned subsidiary of Clear Channel.

Strategies to grow

Cumulus Media (NASDAQ:CMLS) and Citadel Communications Corp. (NASDAQ:CITC) were among the big buyers in the fourth quarter. Citadel announced it would pay $77 million to acquire Wicks Broadcast Group and its stations in Charleston, S.C., Binghamton, N.Y., and central Indiana. The company also announced plans to purchase six radio stations in Saginaw-Bay City, Mich., for $35 million.

Citadel also said that it will expand its presence in Pennsylvania by buying Carlisle stations WHL-AM-FM, from Zeve Broadcasting Co. Citadel already owns stations in York, Pa., and Harrisburg, Pa.

Cumulus Media rounded out its clusters in several cities in the fourth quarter and extended its reach into others. The group announced purchases in Muscle Shoals, Ala., Fayetteville, Ark., Savannah, Ga., Dubuque, Iowa, Green Bay, Wis., Bangor, Maine and Topeka, Kan.

New groups have moved into the top 10 spots among radio group owners as a result of the Jacor sale last quarter and the Capstar sale in the third quarter. Steve Pruett, senior vice president of the New York-based investment bankers Communications Equity Associates, said he was waiting for the top 15 to 50 groups to begin making consolidation moves. If someone put four or five of the groups in that tier together, he said, they would find themselves in the top 10.

Withstanding few exceptions, Pruett said the top 12 radio group owners have all exhibited a specific consolidation strategy. Likewise, with few exceptions, the groups ranked below 13 or 14 have not exhibited specific growth strategies. Pruett said we might see that change in 1999.

Stock holds its own

November 1998 marked the 75th consecutive month of sales growth for the radio industry, according to the Radio Advertising Bureau. Compared to the same period of time in 1997, local ad revenues were up 10 percent and national sales climbed 12 percent.

Radio stocks fared well in the fourth quarter as the market realized the radio industry was posting good third-quarter revenues and holding its own, despite a third-quarter stock market shakeup. By the end of the quarter, price per share of every one of the top 10 groups had increased.

Clear Channel

"Clearly all the radio stocks are back on a rebound," said Bishop Cheen, media analyst at First Union Capital Markets. He said radio stocks had come close but were not quite back to the peak they saw in mid-July. The market meltdown that began in August and lasted until the end of October was a result of non-industry forces like the Asian meltdown and the impeachment process, he said.

Cheen said while the market flopped, the fundamentals of radio remained extremely strong, with double-digit top-line growth. He said the stock price fall came about when money managers had to scramble to cover their other losses and sold their liquid stocks like radio more and more cheaply. As stocks tumbled to the point where they were cheap again, people started to buy.

"There is nothing wrong with this industry," Cheen said.

Other Wall Street watchers became interested in radio in the last quarter. Prudential, Wheat First Union and Paine Webber all initiated coverage of several of the top 10 radio group stocks. In December, Prudential began covering Chancellor Media, giving the group a "strong buy" recommendation. Paine Webber and Wheat First each gave Clear Channel "buy" status recommendations. Cox Radio garnered an "outperform" status from Wheat First in October but then changed its recommendation to "hold" by quarters' end.

Infinity Broadcasting (NYSE:INF), a subsidiary of CBS Corp., made its huge initial public offering on Dec. 10, selling 140 million shares at $20.50 each. The Infinity stock finished the quarter near $28 per share.

Emmis Communications exceeded Wall Street expectations in its third quarter (fiscal period ending Nov. 30) and posted a 6 cents earnings per share, according to analysts at Zacks Investment Research firm. Zacks gave Emmis a "strong buy" recommendation early in the quarter. Upon the announcement of the broadcaster's earnings, Emmis stock rose another 5.2 percent.

A Good Fourth Quarter

Top radio stocks were up in the fourth quarter of 1998

Group	Sept. 30	Dec. 31
1. Chancellor Media	33 3/8	47 7/8
2. CBS/Infinity	24 1/4	27 3/8
3. Clear Channel	47 1/2	54 1/2
4. ABC Radio	25 3/8	30
5. Cox Radio	35 1/8	42 1/4
6. Entercom	Not publicly traded	
7. Heftel Broadcasting	37 3/4	49 1/4
8. Emmis	37 3/4	43 3/8
9. Citadel	20 7/16	25 7/8
10. Susquehanna Radio	Not publicly traded	

Stock prices provided by BIA Research.

Optimizing groups

The Department of Justice continued to cast its watchful eye on the industry in the fourth quarter. It reached a settlement with Chancellor on two of its outdoor advertising purchases. To complete the $930 million acquisition of Whiteco Industries Inc., Chancellor agreed to sell billboard assets in seven counties located in Kansas, Pennsylvania, Connecticut and Texas. Chancellor must also divest $5 million worth of assets in Arizona in order to consummate the $39.5 million buy of the Kunz & Company outdoor advertising business.

One familiar face that chartered his company through the lifting of the ownership rules left radio during the quarter. Michael Jordan, chairman and CEO of CBS, retired at the end of the year. His successor is CBS President and COO Mel Karmazin.

New positions opened up during the quarter as groups realized their needs following the consolidation activity. Citadel Communications named D. Robert Proffitt to the new position of president and COO of its Citadel Broadcasting subsidiary. Chancellor named Ken Benson, former vice president of music programming at MTV, to be programming and operations specialist. Benson works with Chancellor's chief programming officer to optimize each station's ratings performance in its target demographic.

A similar position was created by Atlantic Star, a division of Capstar Broadcasting (NYSE:CRB), when the company promoted Brian Check to its new position of regional programmer for its six markets.

Emmis took advantage of the consolidation publicity to unveil its new world headquarters in December. The seven-story 142,000-square-foot building houses five radio stations, Emmis Publishing, Indianapolis Monthly magazine, Network Indiana and AgriAmerica radio networks and the Emmis Corporate offices.

An interest in operations will be the hallmark in 1999 in the radio industry, Pruett predicted. He said the industry will continue to see properties swapped and bought, but the headlines in 1999 will be made by operating successes.

■■■

Lynn Meadows is a regular contributor to ***Radio World****. Reach her via e-mail at* meadows@pinn.net

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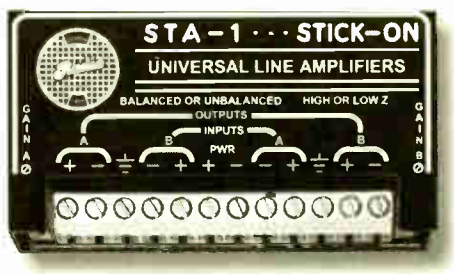

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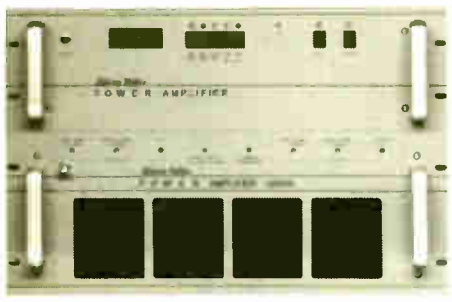

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READER SERVICE NO. 153

Radio Service and the Ad Council

John Montone

When you think of how radio performs public service, perhaps The Advertising Council springs to mind.

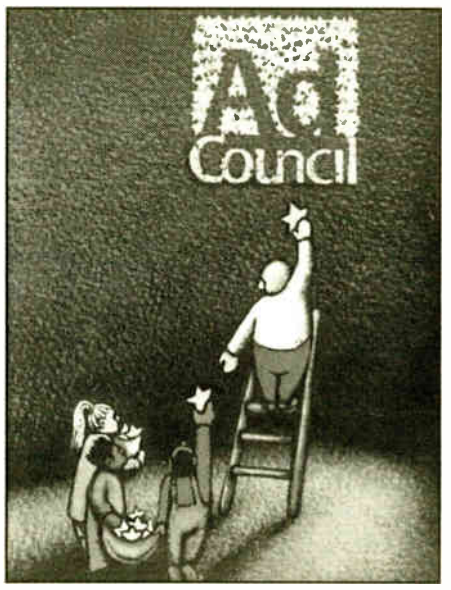
There's a good reason for that. Radio and the Ad Council are quite a team.

For example, radio took center stage at the Ad Council's recent 45th Annual Public Service Awards Dinner in New York. With representatives from media companies, ad agencies and major advertisers on hand, the Ad Council presented a video called "Tribute to Radio."

The video tribute was a six-minute drive across the country with Ad Council staffers stopping off at stations in several cities. Along the way, public service announcements can be heard on the car radio: an anti-drug message in Chicago; a PSA on preventing domestic violence in St. Louis; a plea not to let friends drive drunk in Dallas; and environmental messages in Tucson, Ariz., and Las Vegas. The video ends in Malibu Beach, Calif.

The big message is: Radio and the Ad Council are everywhere.

Ad Council President and CEO Ruth Wooden told **RW** that the salute "was in honor of radio being the No. 1 medium for us." Wooden said radio now provides the Ad Council with about half a billion dollars in donated airtime.



Wooden believes radio is the Ad Council's primary medium.

"Public service is inherently a part of radio. That's where people go to hear about everything from tornado warnings to where to vote," she said. "There are 9,000 radio stations on the air 24 hours a day, so stations are constantly looking to be of service to their listeners."

In the Ad Council's annual State of the Organization address, Wooden said the organization's mission is to use the power of advertising and media to affect kids in a positive manner.

"Ninety percent of our messages are about helping kids in some way," she said.

Ad Council awards

The Advertising Council's 1998 Distinguished Public Service Award, presented annually to a business leader who demonstrates an outstanding commitment to community service and volunteerism, was granted to Proctor & Gamble Chairman of the Board and CEO John E. Pepper.

In addressing the assembled advertising executives, Pepper said, "Collectively, we have more influence on what children and the family see and hear than any other group in this country. We can be an incalculable force for good in influencing the lives of children if we focus on it. Let us make the coming year one of significant progress."

Wooden said Pepper's dedication to education deserves applause. "We at the Ad Council believe a truly successful business leader contributes equally to his company's bottom line and to the future of his community."

John Pepper is a trustee of The Yale Corp., and co-chairman of the Governor's Education Council of the State of Ohio and of the Cincinnati Youth Collaborative. He supported the creation of the Every Child Succeeds initiative, an early childhood intervention program that places family support workers in the homes of at-risk, expectant mothers.

In his acceptance speech, Pepper announced the creation of an awards program to recognize achievements in the development and broadcasting of family programming by networks, studios and advertisers.

Pepper challenged those in attendance to influence their companies to include at least one hour of quality family programming over the next year.

"If every person in this room delivered that one hour," he said, "we'd generate nearly three hours of family programming for every day of the year. What a difference that would make in the lives of our children."

See AD COUNCIL, page 38 ▶

The Ad Council produces campaigns each year on issues like education, preventive health, community well-being, environmental preservation and strengthening families. Among its familiar faces and voices are Smokey Bear and McGruff the Crime Dog. Campaigns must be "non-commercial, non-denominational, non-political and significant to all Americans."

A private, non-profit organization, it was founded in 1942 to support the war effort. The Council created PSA campaigns that raised $35 billion in War Bonds, encouraged the planting of Victory Gardens and recruited 2 million women into the work force through the symbol Rosie the Riveter.

Operating expenses are funded by donations from corporations, foundations and constituent organizations. Ad agencies do creative work for free; the media donate millions of dollars in time and space for its messages.

For more information, call (212) 922-1500 or visit the Web site at *www.adcouncil.org*

Radio Billboard Sitter Comes Down at Last

After 65 days perched on a billboard, KEX(AM) Promotion Coordinator Marty Anderson finally came down, to the open arms of his wife.

Anderson moved onto the billboard in November to protest the NBA lockout (**RW**, Jan. 6) and vowed to stay put until the dispute between owners and players was settled, or the basketball season was canceled. Immediately following the 11th-hour settlement on Jan. 6, Anderson ended his vigil.

"I wish I could say this is something I would do again, but there's probably no way. I'd at least think long and hard about it," said Anderson, 25, who was lowered to the ground by a Portland Fire Bureau hook and ladder unit. "I am really thankful for all the support I've received from NBA fans here in Portland who care just as much as I do about having our NBA basketball."

Anderson, who had not showered during his sit-in, slipped out of his pants, coat and shirt, which were put into a "hazardous materials" bag and turned over to the Fire Bureau to be "decontaminated." He was then given the standard issue "HazMat" jumpsuit, and was greeted by a cheering crowd and the media.

"Marty is a trooper," said KEX General Manager Clint Sly. "He's a rare breed of radio nut that makes the business fun."

The billboard stunt was a publicity coup for the Jacor station, which received national attention on the ESPN Web site and coverage on local TV and in the Portland Oregonian newspaper.

"The staff created ways to keep the promotion fun for the news people, Marty and the listeners," Sly said. "Day 1, Marty was out there in a tent. Day 2, we handed him plywood and the tools needed so he could build his house. Later the fire department came out and installed a smoke detector, and a barber came to give Marty a haircut. A chiropractor even visited him. There was always something going on."

Marty Anderson during his billboard protest.

During Anderson's more than two months in a 4-by-8-foot lean-to on the billboard, a giant banner proclaimed, "Save Our Season." Before coming down, Anderson added a "D" so it would read "Saved Our Season."

KEX showed its appreciation to Anderson and his wife by whisking them off for a limousine ride to the airport and a week-long vacation to Hawaii, courtesy of a local travel agency.

— Bob Rusk

Measuring Real-Time Listening

▶ MOBIL, continued from page 31

Kolessar, the director of technologies for Arbitron. Its portable meter system relies on inaudible code information embedded into the audio portion of a given signal.

Survey participants carry a pager-like decoder that senses the codes when the respondent is exposed to encoded sound waves. Thus Arbitron can record listening and viewing habits.

Electronic sampling of listenership could turn radio measurement as we know it on its ear.

"We don't have to model. We're measuring actual instant," said Lucius Stone, marketing agent with MobilTrak, a division of Tapscan of Birmingham, Ala. The new system detects the frequencies of FM receivers in moving vehicles. As cars pass, MobilTrak detection units or EMUs placed at major traffic sites detect the signals from the local oscillators of FM receivers, record the frequencies and send the data to a centralized computer via cellular phone for compilation.

Sample sizes

The system yields sample sizes of more than 100,000 a day. Listenership habits play out in real time, revealing, for example, at what point listeners tune in or tune out.

"I can see what I did the day before if there's a special feature that I ran, and gauge whether it was successful or not as far as in-car listening goes," said Shellie Hart, program director for KEDJ(FM) in Phoenix, which pipes in MobilTrak data over the Internet to its computers daily. "All those cars can't be wrong," she said.

Hart followed listening patterns over a three-month period to find out what worked and what didn't — even cutting a few "sacred cows" such as long-winded artist interviews, which listeners quickly tuned out, according to MobilTrak data.

In the next Arbitron book, KEDJ moved up the market ranks and tied with another station for the top spot among listeners aged 18 to 34, Hart said.

The new electronic measuring systems might answer the question: Can you buy an audience?

When Los Angeles radio station KIIS-FM launched a million-dollar giveaway with a television commercial, MobilTrak reported that the radio station's listenership increased the very next day. A similar reaction was recorded in Phoenix when KMLE(FM) ran a giveaway promotion, according to Stone. As prize money increased, MobilTrak data recorded an increase in listenership for both radio stations.

It's not enough to know if listeners are listening; broadcasters want to know why they're tuning in and where they're listening. Stone cited a Los Angeles Hispanic station as a good example of how surveying listenership by regional zone, instead of market, changes market dynamics.

"They only have a 1.8 share in the market as a whole, but do a 13 share in South Central (Los Angeles)," he said.

MobilTrak divides markets by zone according to traffic data, and places EMUs at intersections with the most traffic to reach what Stone calls a "critical mass" in research for oversampling. The electronic measuring units allow for continuous collection of data 24 hours a day, seven days a week, and deliver the results the next day.

Temporary limits

But MobilTrak, as it now is set up, is not a replacement for Arbitron data.

"The only downside of it is that you don't get exact demographics," Hart said. The system cannot tell a radio manager about the nature of the person behind the wheel. Also, in-car listening is only one of several kinds of radio listening.

Further, MobilTrak doesn't track AM because the system's sensitivity bias is skewed in favor of older AM receivers. MobilTrak units can readily pick up the bounce-back signal of older AM receivers than it can pick up on the newer ones. That limitation could go by the wayside soon; the company completed tests on a new antenna that will overcome this problem, although it means having to retrofit existing units.

"Although they technically got it solved in the lab, there's a lot of work that has to be done," Stone said. "I would guess it will be 9 to 12 months down the road before we're able to put that in the marketplace."

Arbitron's solution, by comparison, provides information about each user, who has agreed to be monitored and who must take part in the mechanics of getting the information back to Arbitron.

For its system to work in the United States, program material would have to be encoded, which would require additional hardware at radio stations. Who would bear the cost of this hardware installation?

"(We) haven't determined that," Kolessar stated.

As both Arbitron and MobilTrak technicians press on with development of their electronic ratings systems, they are likely to create as many questions as they will answers.

■■■

Dee McVicker is a regular contributor to ***Radio World****.*

Leveraged Media Buys

▶ AD COUNCIL, continued from page 37

The Ad Council also honored Mindy Rosengarten, senior group creative director from Avrett, Free and Ginsburg as winner of its annual Crain Award for volunteering time to the creation of a PSA. Rosengarten wrote and produced a campaign on prejudice, race and discrimination for the White House.

Through participation in the joint effort of the Office of National Drug Control Policy and the Ad Council, radio stations can become a part of the youth anti-drug campaign while benefiting from government-subsidized initiatives to buy airtime for public service announcements. An initiative to encourage participation in the campaign calls for leveraged media buys in which the media must match each dollar the government buys with public service. Advertising time is required to meet most of the terms; but radio stations also can fulfill the match with non-advertising efforts including family programming and in-school programs. Any public service donation that broadcasters have committed to prior to the campaign is not included in the leveraged buy. Qualified messages should address healthy environments and encourage kids to steer clear of behavior patterns that are likely to lead them to drugs. Issues such as

Louis V. Gerstne, left, presents the 1998 award to John E. Pepper.

parental involvement, underage drinking and mentoring to after-school programs are acceptable.

■■■

John Montone is a radio reporter for 1010 WINS(AM), New York.

Products & Services Showcase

For more information on the products shown below, circle the appropriate Reader Service No.(s) on the enclosed Subscription/Reader Service card or contact the advertiser directly.

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Leykis Walks the Talk

▶ LEYKIS, continued from page 31

also owns KOTK(AM), Leykis' local radio affiliate.

Defending his actions on the telecast, Leykis said, "I don't put a gun to anybody's head and tell them to do crazy things. Many of the things people do, they're doing on their own and then they call in to report what they've done. (It) has nothing to do with what I've told them to do. The biggest thing they do is they flash," he said. "Now really, how harmful is that?"

A female in the studio audience was quick to reply. "We're not talking just about the actions that they're doing but what they're thinking after they hear these messages," she said. "You're telling young boys to look at women as possessions. This is teaching young boys to disrespect women."

A male in the audience thought there should be a counter to the Leykis show that could give listeners a "realistic idea of life."

Leykis responded. "How many all-religion stations are on in this market? You add on to that all the conservative talk shows (and) the Dr. Laura show and tell me there's no counter to this. I am the counter to everything else that's on the air. I am the one person doing this, and everything else is a bunch of conservative and religious claptrap. That's what's mostly on talk radio."

The sexual content of his show has done nothing to spoil the ratings at his flagship affiliate, KLSX(FM) in Los Angeles. In fact, ratings have increased.

"The Tom Leykis Show," which the station has been running for just over a year, now ranks as the No. 1 afternoon-drive talk program among listeners 25-54, according to KLSX General Manager Bob Moore. In the Summer '98 Arbitron book, Moore said, Leykis scored a 2.8 share and a 209,000 cume (25-54).

On Leykis' attitude toward women, Moore said, "Tom has a tremendous amount of female followers. The women that show up at these events are like frenzied fans. Obviously, none of them are forced to be there."

Moore said, "In an era of forced political correctness, people know that's not the way society really is and Tom slaps that in the face." Moore pointed out that even though "the show is labeled as kind of 'sexy,' a lot of news also gets covered."

I am the one person doing this, and everything else is a bunch of conservative and religious claptrap.

— Tom Leykis

The show, syndicated by Westwood One, airs on about 155 stations and is heard by approximately 2.1 million listeners a week, according to Jennifer Bennett, the network's affiliate relations manager.

While those numbers may be impressive, Leykis has a long way to go before he comes close to the success of Rush Limbaugh or Dr. Laura Schlessinger, the most popular hosts on the air. Limbaugh and Schlessinger each attract about 20 million listeners a week.

Leykis will likely be unable to reach that stratosphere until he is picked up in more major cities. KLSX is his only top 10 market affiliate. (CBS manages Westwood One and owns KLSX, but Moore said that was not a factor in the decision to put Leykis on the station.)

"With an emergence of different types of talk stations," Moore said he expects Leykis to gain affiliates. As soon as the hectic pace of consolidation cools down, Moore thinks Leykis will be on in "every one of the top 10 markets."

"There's been a lot of changes going on with group ownership, station ownership (and) management changes," Moore said. "I think you'll see all these things straighten themselves out in the next couple of months."

Affiliate relations manager Bennett said negotiations are underway. "We're talking with a lot of (major market) stations right now," she said. "A couple of them we're very close with."

"The Tom Leykis Show" picked up five affiliates in smaller markets in late October 1998, Bennett said. In July, the show began on Shamrock station KJFK(FM) in Austin, Texas.

Mark Kiester, KJFK general manager, said while it is too soon to tell how well Leykis will do in Austin, "We're expecting some pretty good ratings from him in the long run."

Commenting on the content of the Leykis show, Kiester said, "I doubt if (it) would ever bother us." The station airs someone even more controversial — shock jock Howard Stern during morning drive

Adult Marketing

An adult video chain and a talk radio station may not seem like a good marriage for an afternoon-drive promotional campaign, but it worked for KOTK(AM).

The station decided to give away tickets to the Portland, Ore., broadcast of "The Tom Leykis Show." The free tickets were handed out at sponsor locations, including Fantasy for Adults Only, which rents X-rated movies.

Rich Franklin, KOTK local sales manager, said matching Fantasy with Leykis "was a good combination of the right program and the right audience. And it was exactly what that advertiser was looking for."

In another novel move, KOTK T-shirts were sold for $10 each at the remote. The proceeds of T-shirt sales helped defray the costs of the broadcast, including the ISDN lines.

"It was a great way to generate non-traditional revenue," Franklin said. Following on the heels of the remote, the station announced that Leykis earned a 2.4 share (25-54), in the Summer '98 Arbitron ratings.

Replaying its spring book success in Portland, "The Tom Leykis Show" was the highest-rated afternoon-drive talk show in that demographic. Leykis also had the highest time spent listening among talk stations (25-54) in his time slot, with a total of four hours per week.

— Bob Rusk

Tom Leykis wasn't afraid to take on suggestive sponsors when he brought his radio show to Portland, Ore., for a remote broadcast.

Studio Sessions

Special Focus On Microphones And Monitors

Radio World — Resource for Radio Production and Recording — February 3, 1999

Microphones: A Look Back, Ahead

Alan R. Peterson

The charged plate is a contender, but where radio is concerned, the coil is still king.

Emphasis in modern microphone manufacture is showing a shift away from classic dynamic design and more toward condenser technology. Well-known companies are concentrating on getting affordable large-capsule condenser units into the hands of users. Newer companies are coming up with completely original designs in small-diaphragm electret-style transducers.

One company is shipping a digital-ready mic that outputs an AES/EBU stream, while another company bends light to its will inside an experimental unit.

And yet through it all, the overwhelming favorite microphones for radio continue to be dynamic units: the same technology we have known for over a hundred years.

Interest in tube condenser microphones was renewed a few years ago as audio engineers began seeking ways to "warm" digital voice tracks. This led to the design and manufacture of new tube-based condenser mics from emerging and established companies.

From Europe, the Striking Microtech Gefell UM900 Microphone

In some cases, users began to notice how noisy tube mics actually were — a fact well-concealed in the past by tape and vinyl noise. Still, the tube sound they craved was evident and tube mics were in vogue.

Tube condenser mics generally are expensive and fragile, limiting their use as everyday studio microphones. It is more likely to encounter a large-condenser tube mic in a production house or high-end studio than a typical broadcast facility, although syndicated personality Howard Stern can be seen cradling a Neumann condenser mic in his hand on his E! Network cable television show.

Heavy, expensive and carrying dangerous voltages, tube circuits gave way to a greater interest in FET circuits driving the mic capsules. Like tubes, FET circuits can handle the high impedance of the mic capsule and, according to some, softly clip the signal in a similar manner. These newer mics are less expensive than tube units, somewhat more resilient to studio use and can be driven from a console's phantom power supply.

For Cliff Castle, vice president of sales for Audix, the time was right to get into condenser mics.

"We had been concentrating on dynamic mics for a long time," he said. "We had requests from our users to begin developing a large-diaphragm microphone and the trend recently has been for companies to develop lower-cost, affordable microphones."

Two such microphones, the Audix CX101 and CX111, are priced at less than $600. Castle said National Public Radio recently ordered an assortment of each.

"Broadcast is an area of concentration we want to get into," said Castle. "This means mini-condensers, hanging mics, podium mics, for both radio and TV."

Karl Winkler, brand manager for Neumann USA, echoed the affordability factor.

"The focus lately has been toward affordable, high-quality units," said Winkler. "Manufacturing methods have improved. This is what has made our under-$1,000 TLM 103 mic possible."

The tube noise issue also was addressed by Neumann in the form of extensive research and development

See MICS, page 44 ▶

One of radio's favorite mics continues to be the Electro-Voice RE20, shown with air personality Lisa Novak at WFLS(FM), Fredericksburg, Va.

PRODUCT EVALUATION

Audio-Technica Wireless UHF Mic System Excels

W.C. Alexander

For many years, Audio-Technica has been a producer of excellent wireless microphone equipment. You can find its products in many churches, theaters and radio station remote kits.

Audio-Technica 7000 Series Wireless

With the introduction of the 7000 Series professional-grade UHF wireless microphone system, the company has made the jump to the next level in versatility and adaptability.

When operating from a fixed location, a wireless microphone system using a carefully-chosen, fixed frequency usually works well and is free of interference. On the road, however, other wireless mic signals, radio and television signals and RF garbage can render a fixed-frequency system unusable.

It is bad enough when such interference is detected at the time of the sound check. Then, at least, the remote crew can go to Plan B. Worse is when interference appears during the remote. Then, it might just be too late for Plan B.

Audio-Technica has addressed the

See A-T, page 43 ▶

Monitors for Radio: Anything Goes

Alan R. Peterson

Where most radio station personnel swear by their RE20 microphones or their DSE 7000 workstations, the votes are extremely mixed on what kind of studio monitor is the de facto standard. Nearfields, midfields, precision studio monitors or hobby computer speakers all can be found in use.

KRK Monitors, Coming On Strong

Main studios can be equipped with anything from a powered monitor system such as the E-V Sentry 100, a passive speaker set such as the JBL Control One or Control Five, or even a set of small, self-powered units designed primarily for project rooms and personal music recording.

These smaller speakers solve several problems at once. They are small so they fit anywhere. They are self-powered, so an external amplifier and extensive cabling is not needed. Most can be tuned to a room's characteristics with rear-panel controls.

Of course, a station might also trade out a set of consumer hi-fi cabinets from the local electronics emporium or Radio Shack.

In a living room or dormitory, this would be appropriate, but according to Brian Anderson, president of Quested U.S.A., this is counterproductive to the ultimate goal of the radio station: a high-quality sound.

"People are spending serious money now on monitors and no longer treating them as afterthoughts," he said. "In the last one-and-a-half years, a tremendous number of people began looking for accuracy. They want a couple of monitors that translate well when they play a mix somewhere else."

In spite of the current interest in powered monitors — especially popular with desktop audio producers — Anderson sees interest developing in larger systems, even for radio.

"I am seeing the demand for big systems and soffit (flush wallmount) systems happening," he said. "Nearfields aren't the big, hip thing anymore. Demand for big systems has gone up about 300 to 400 percent for us."

Quested has manufactured large speaker systems for 12 years, and Anderson noted the difference from a manufacturing point of view. "It's a lot easier to build a small system than a large one. Other companies, such as KRK, have their eyes open, with some large-format systems."

Maybe nearfields are considered unhip for the moment, but that does not stop them from being big movers. David A. Kimm, director, recording and broadcast for JBL, spoke of the popularity of smaller, self-powered speakers.

"We sell lots of the JBL 4400s," Kimm

JBL LSR 12P Monitor

said, "but out bi-amped LSRs are pretty popular." The JBL 4400 line consists of the 4408, 4410 and 4412 passive studio monitors."

"Radio likes using powered nearfields because of the convenience. They can move them around, there is no separate amplifier; just plug, patch and you're set," he said.

Kimm gives major credit to computer users and television production for the general popularity of self-powered monitors.

"These speakers have made things a lot easier for someone using a workstation," he said. "But 5.1-channel surround sound for television is what made these speakers take off. Someone would need five amplifiers — 10, if you are bi-amping — and the speakers, the cabling, all of that. It becomes simpler with powered speakers: it's just one decoder, the speakers and you're done."

This does not mean the entire industry is shifting exclusively to small, powered speakers. Kimm reports some brisk business still for the 4400 and the Control Series.

"There are a lot of Crown D75 amplifiers out there, looking for speakers to get hooked up to," he said.

Dave Burns, studio products manager for Harris Corp., rattled off the names of the biggest movers.

"JBL is tops, there's KRK, the passive speakers from E-V, then there is Mackie and Hafler. Hafler is especially big in production rooms. These manufacturers have really come into their own over the past few years."

What are buyers of monitors looking for when they shop? Kimm said, "Frequency response, dynamic range and smooth response without distortion or the 'fatigue factor.'"

Kimm also said users want a consistent stereo image, especially when they

See MONITORS, page 44 ▶

Earthworks Presents The SR71 Condenser

Tom Vernon

Earthworks is a company that has set out to reinvent analog sound technology. So far, the company appears to have succeeded.

The "World Cafe" recently was a test site for its new Lab 102 mic preamp. When used with a pair of Z30X microphones, the results were astounding. This combo defined new standards for transparency of sound reproduction, and proved that analog technology is not only far from dead, it is in no way inferior to digital technology.

Recently the folks in Milton, N.H., added a new mic to the Earthworks family, designated SR71. I was anxious to give it the "World Cafe" treatment.

In a touch of marketing humor, the SR71 is shipped in a clear acrylic cylinder.

The accompanying literature explains that Earthworks now makes a "tube" mic, with the tube on the outside where it belongs. A mic clip and windscreen are packed in a separate tube. Both are durable enough to be used for storage if you take the SR71 on the road.

The SR71 is a rugged cardioid condenser mic targeted to the live sound and home recording markets. The on-axis response at 6 inches is a smooth ±2 dB from 50 Hz to 20 kHz, ensuring high gain before feedback. The maximum acoustic input is 145 dB SPL with a 5 kohm load.

But never mind the specs — this mic just looks great with its sleek black epoxy finish.

In addition to vocal applications, Earthworks recommends the SR71 for stringed instruments, brass, wood winds, and all manner of percussion.

Earthworks already has amassed a number of musicians who are devotees of these mics. Among those who have used the company's microphones for album projects are the Indigo Girls, 10,000 Maniacs, Duran Duran, Pearl Jam and Medeski, Martin and Wood. Many of the musicians visiting the "World Cafe" had heard of Earthworks, and were anxious to give the mic a try.

See EARTH, page 43 ▶

Going Wireless With A-T 7000

▶ A-T, continued from page 41

interference issue in a compact, easy-to-operate package. The 7000 Series offers 100 UHF frequencies from which to choose. Both receiver and transmitters are PLL-synthesized. The system operates in the 728 to 740 MHz band, which corresponds to television channels 57 to 59. Channel spacing is 125 kHz. Included with the unit are recommended frequencies to use with multi-channel wireless systems and with local television signals present on channel 57, 58 or 59. The user is not left to figure out how to coordinate frequencies on his or her own.

7000 Series Specs

Frequency: UHF, 728.125 - 740.500 MHz

Channels: 100

Frequency Stability: ±0.005%, Phase Lock Loop frequency control

Modulation Mode: FM

Normal Deviation: ±10 kHz

Range: 300 feet typical

Frequency Response: 100 Hz to 15 kHz

Seamless switching

The receiver features diversity reception, complete with two antennas, two RF sections and logic-controlled voter circuitry to select the RF section with the better signal automatically. Switching is seamless and silent, completely undetectable. Front-panel indicators show which RF section has been selected by the voter circuitry.

On the receiver, the operating channel is selected with two rotary switches, one of which selects the "tens" digit and the other of which selects the "ones." For example, to select channel 58, the tens knob is turned to 5 and the ones knob to 8. To implement the frequency change, the user simply selects the desired channel and presses the channel set button. A two-digit LED indicator reflects the selected channel number. Frequency change is instantaneous.

Both balanced mic-level and unbalanced line-level outputs are provided. A front-panel AF level control adjusts the output level of each output simultaneously. LED bargraph displays show the modulation level, independent of AF level adjustment, and the RF signal strength.

Pick one

There are two transmitters available in the 7000 Series, the UniPak belt-pack and the hand-held transmitter. Both transmitters operate using a 9 V alkaline battery, which provides eight to 10 hours of operating time at 50 mA current draw. Both transmitters produce about 50 mW RF output power. Operation is by means of an "on-stand-by-off" switch with an LED battery indicator.

The UniPak transmitter can accept any of 11 microphones, including several lavalier types and head-worn microphones. It also can accept a high-impedance musical instrument output, such as a guitar pickup. Individual audio level adjustments are provided in the UniPak for both mic and instrument feeds. The unit is lightweight and made of molded plastic. It does not appear to be as rugged as older Audio-Technica belt pack transmitters.

Kid gloves

The hand-held transmitter features a dynamic unidirectional element. It is fairly rugged, although it looks as if a few drops onto a hard surface could do some serious damage. The diameter also is larger than most wired hand-held mics, but not so large as to present a significant problem to users with small hands. It will not, however, fit into a conventional mic clip; but a stand clamp is included with the transmitter.

Frequency selection is made by means of two small screwdriver-operated rotary switches. Operation is the same as with the transmitter, without the channel set push-button and readout. Simply select the two-digit channel number you want, and you're there.

The sound quality of the 7000 Series is excellent, more than adequate for remote broadcast and public address applications. Operating range was typically about 300 feet, so a system located in the press box of a sports venue should cover all of the playing field and sidelines and most all of the stands.

■ ■ ■

Thanks to Bradley Broadcast Sales for arranging the demonstration unit for this evaluation. Call the supplier at (800) 732-7665 for more information.

Product Capsule: Audio-Technica 7000 Series Multi-Channel UHF Microphone System

Thumbs Up

- ✓ Frequency agility
- ✓ Front panel control operation
- ✓ Simplicity of operation
- ✓ Well-written instruction manual
- ✓ Battery Life
- ✓ Range

Thumbs Down

- ✓ Plastic belt pack transmitter case
- ✓ Large diameter hand-held transmitter

For more information contact Audio-Technica at (330)-686-2600, visit Web site www.audio-technica.com or circle **Reader Service 119.**

▶ EARTH, continued from page 42

Our studio evaluation included applications as an overhead drum mic, percussion and ambient room mic. The transparent, open sound that is the Earthworks signature was apparent in all of our recording situations.

The flat, smooth response of this mic makes EQ ill-advised during recording sessions. Our rule-of-thumb was if something sounded bad, it indicated a problem with mic placement, which we fixed by repositioning the SR71. We noticed that this microphone's 90-degree response is better than the on-axis performance of some other cardioids.

The extended frequency range and fast response of Earthworks mics demands that the rest of your system be up to the challenge. The preamplifiers in our Yamaha O2R do very well, but some older equipment may actually sound bad with these mics.

For example, while recording percussion instruments, Earthworks mics easily can put out 10 volts at 10 Hz. This may overload vintage transistor preamps with transformer inputs. Transformer inputs are not recommended, as they tend to interpret very low frequency signals as DC. Active balanced inputs are preferred. If an application involves recording extreme percussion, a pad should be inserted between mic and preamp.

Also, the transient response of these mics is faster than some peak-reading circuits and most definitely too fast for VU meters. You are likely to erroneously set levels too high. Before blaming the mics for a bad sound, make sure the rest of your gear is up to snuff.

The obvious question is how the $399 SR71 compares with the similar $750 Z30X. While these two cardioid condenser mics look and sound alike, there are differences between them.

The Z30X is made of stainless steel and intended for recording studio environments. In addition to the wide response, it offers unparalleled ability to capture detail in the sound.

By comparison, the SR71 is made of brass and designed for live sound and home recording uses. While it sounds good, it lacks the ability to capture some subtle sonic details that the Z30X can. On the other hand, the SR71 can withstand the rough handling of broadcast and live sound situations. In fact, Earthworks engineers tested an SR71 by dropping it tip-first eight feet onto a hard surface. It survived unscathed.

After redefining the sonics of high-end mics and associated preamps, one wonders what Earthworks will roll out next. Although no specifics are available at this time, word is that they are in the process of designing some impressive time-aligned loudspeakers with the same wide response as their microphones.

Special thanks to "World Cafe" producer Joe Taylor Jr. for his assistance with this review.

■ ■ ■

For information, contact the company in New Hampshire at (603) 654-6427; visit the Web site www.earthwks.com *or circle* ***Reader Service 129.***

Tom Vernon is a multimedia consultant working in Philadelphia.

Microphones: What's Next?

▶ MICS, continued from page 41

on its new microphones.

"People romanticize the sound of tubes," said Winkler. "They forget the noise floor and tube reliability. That is why we poured serious R&D into the Neumann 149. The noise floor is about what you would get from a solid-state unit."

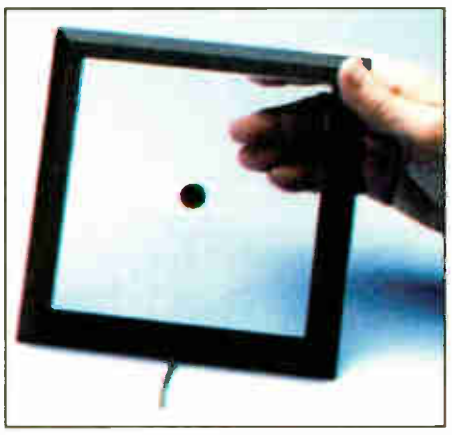
Meanwhile, across the hall at Sennheiser (the companies are co-owned), there is an experimental optical microphone just waiting for an application to come along. The yet-unnamed microphone was first exhibited at the 1998 AES show in San Francisco (**RW**, Nov. 11, 1998).

It operates by modulating light from an LED source with a reflective mic diaphragm. The light beam is captured by a photodiode. The result is a mic unaffected by AC fields, humidity, or proximity to computer monitors. Despite several industry awards and continued interest by the audio community, the experimental mic remains a solution in search of a need.

The warmth of mics in general is irrelevant to Eric Blackmere, designer of the distinctive, precise and slender machined-metal Earthworks microphones. He believes that microphones should be accurate and offer no coloration to audio being aired or recorded.

"There is the general pattern that a mic has to have a personality, a warmth, a presence," said Blackmere. "To me, coloration equals distortion. You can always do it better further down the line, but when you do it at the mic, it is a permanent imprint and cannot be taken out."

Blackmere maintained microphone



Waiting for a Job: Sennheiser Optical Mic

manufacturers may be too much in love with the past. "They have a retro way of looking at things," he said. "People still move toward warmth in microphones. But remember, people were trying to get the best they could out of the limits of the equipment of the day. Vinyl records had only 50 dB of signal-to-noise."

Blackmere's top-of-the-line microphone is the Earthworks QTC-1, with a measured response of up to 40 kHz and a $2,000 price tag for a matched pair.

"Radio people are slow to change," said Blackmere, which may explain the continued success of dynamic mics such as the Electro-Voice RE20 and the Shure SM7.

Called a "best-seller" and a "career-maker" in the Bradley Broadcast equipment catalog, the RE20 is a fixture at thousands of radio stations, networks and production houses domestically and abroad. It has a serious heft and jocks love the sound of their voices through it.

Dave Burns, studio products manager for Harris Corp., acknowledged the continued popularity of dynamic mics. "The RE20 is No. 1 with a bullet," he said. "It remains our biggest and best seller. Smaller stations will still scrape up enough to buy one."

Burns also noted the Shure SM7 and the Sennheiser 421 as popular movers, but the RE20 is the front-runner.

"Some stations have latched onto inexpensive condensers such as the Neumann 103, but the dynamic mics are still the favorites."

New MZS421 Shockmount Bracket For the Venerable Sennheiser 421

Ironically, EV rolled out the RE27N/D dynamic cardioid mic a few years ago, meant to be a superior microphone with switchable EQ and a neodymium magnetic element. The less-fancy RE20 continues to outsell its sibling.

A digital future

Microphones can be made digital-ready by applying the input to an A/D converter. This process is employed in many mic preamps and in every digital broadcast console made today.

The next logical step in microphone technology for broadcast would be the elimination of the off-mic converter and the creation of the self-contained all-digital microphone — a product already brought to reality by beyerdynamic.

The MCD-100 microphone combines a mic and an internal converter, powered by an external power supply. The output is a standard 16-bit AES/EBU stream.

Introduction of the MCD-100 was delayed in the United States, due to patent concerns; the developer of an unrelated digital telephone had to be sure the beyerdynamic process did not employ any technology used in the telephone. Once the issue was resolved, the mic was released.

The beyerdynamic MCD-100 microphone remains a notable standout in a branch of technology that is nearly 100 years old: the transmission of the human voice across space.

Studio Monitors

▶ MONITORS, continued from page 42

move off-axis. "They tell us they want to be able to move to the end of the console, or even stand where the 'hangers-on' are, and still be able to hear a good image," he said.

Event 20/20 Direct Field Monitor

Engineers have their own reasons when it comes to buying monitors for radio stations: budgetary considerations, brand familiarity, the need to get a new multiple-station facility built on deadline with the utmost simplicity, or sometimes "just because."

Russ Mundschenk, chief engineer of WBEB(FM), Philadelphia, said, "I know what I like. In production, we have those little active Genelec monitors. In all our other rooms, we are using Platinums."

Platinum Audio Ltd. of Manchester, N.H., is a manufacturer of monitors intended for recording studio use, yet Mundschenk prefers the Platinum Session One speakers for WBEB.

"They are little and not too efficient, but they sound big," he said. "So what if they are not 'radio' monitors? Who cares? A lot of people are stuck on a specific speaker. The point is, you don't need big heavy monitors anymore.

One Washington-area engineer considers a monitor's personality — or lack of it — his highest priority. "I want a speaker to be honest in its reproduction, to not color the sound in any way," he said.

Reliability also is an issue. "These speakers are being used in a brute-force commercial application. The 'Harry Homeowner' speakers cannot cut it," he said. "Remember how many tweeters used to get blown out from tape rewind? Will I be able to get replacement drivers in 2006?"

The way this particular engineer sees it, cost should not be a fundamental factor, especially when thinking long-term.

"A monitor is a piece of gear that is expected to be in service 10 to 15 years."

Electro-Voice RE27N/D

The **Electro-Voice** RE27N/D microphone is a dynamic cardioid mic for broadcast production and live on-air use.

The steel case is similar to the popular EV RE20 broadcast microphone. Internal construction includes a neodymium alloy magnet and a hum-canceling coil. A pair of bass rolloff switches offer sharp or gentle low-frequency cut at 200 Hz. A third switch reduces high-frequency boost.

The RE27N/D has an essentially flat response from 80 Hz to 2 kHz, with a 6 dB lift from 2 to 16 kHz. Internal shock, pop and wind protection covers each acoustic opening on the mic body.

Optional accessories include the 309A shockmount stand adapter for use with a boom or stand.

For information contact Electro-Voice in Michigan at (616) 695-6831 or circle ***Reader Service 120.***

Samson UHF and VHF Wireless Mics

From **Samson Technologies** comes the VHF, VHF TD and Series One UHF line of wireless microphones. Designed primarily for vocalists, public speakers and television applications, the mics are applicable for live remote radio broadcast and public appearances.

The VHF series features handheld transmitters with a choice of mic capsules or beltpack transmitters for use with any type of mic. The VHF TD is a true diversity system with a high-speed microprocessor in the receiver, scanning incoming signals 200,000 times per second for best possible wireless reception.

The UHF Series One includes the UM1 Micro Diversity receiver, the UT1L Beltpack Transmitter and the UH1 handheld mic transmitter. All operate in the 800 MHz band with reception up to 300 feet and typical battery life of 12 hours.

For multiple mic use, Samson also has the UHF Synth Six, a high-performance synthesized UHF mic system that lets you run up to 96 simultaneous channels. The line consists of the UR6D dual receiver, the DA6 distribution amplifier and a pair of powered receiver antennas for reliable reception of the wireless transmitter units.

For information contact Samson in New York at (516) 364-2244 or circle ***Reader Service 10.***

Shure KSM32 Cardioid Condenser

Shure introduced the KSM32 side-fire cardioid condenser microphone at the 1998 AES show in San Francisco.

The mic features Class A transformerless preamp circuitry, a 2.5-micrometer gold-layered Mylar diaphragm and internal shock mounting and pop protection. Frequency response is 20 Hz to 20 kHz.

The mic is available in a "champagne color" finish, and in a non-reflective gray coating when less microphone visibility is preferred. Accessories included with the mic are a swivel adapter, elastic shockmount and aluminum carrying case.

For information contact Shure Brothers in Illinois at (847) 866-2200 or circle ***Reader Service 53.***

Neumann TLM 103 Microphone

Radio continues to embrace the Neumann TLM 103, a cost-effective condenser microphone that delivers a classic Neumann tone.

The $995 microphone comes with a swivel mount and wooden case. The frequency range is 20 Hz to 20 kHz, self-noise is 7 dB-A and maximum SPL is 138 dB, yielding a 131 dB range.

The capsule is a 1.25-inch, single-diaphragm, DC-polarized condenser, based on designs of the K67 and K87 capsules found in Neumann U67 and U87 mics. The capsule is coupled to a single FET preamplifier and a transformerless output circuit.

For information contact Neumann USA in Connecticut at (860) 434-5220 or circle ***Reader Service 222.***

Nady Wireless Mics

Among the wireless products in the **Nady Systems** line are the Link/551VR converter, ENG-12 UHF converter and the low-cost UHF 760.

The Link converter is a VHF transmitter that connects to a conventional mic's XLR connector (or comes hard-wired to the Nady SP-4 dynamic microphone) for wireless operation. The Link operates between 170 and 216 MHz and has a 1,000-foot line-of-sight range.

The ENG-12, while similar to the Link, operates in the 477 to 951 MHz UHF range. It too can be used with the Nady SP-4 mic.

The newest addition to the Nady line is the UHF 760, a half-rack, user-switchable receiver that functions between 686 and 950 MHz. Transmitter options include either handheld models or metal-housed belt-packs. The 760 lists for less than $1,000.

*For information, contact Nady in California at (510) 652-2411 or circle **Reader Service 90.***

CAD Equitek E-350

CAD Professional Microphones recently added the new E-350 to its Equitek Series of microphones.

The E-350 is a high-performance studio recording and live reproduction mic, with a 1.10-inch Optima Series mic capsule and extended low-end frequency response. The mic is capable of high SPL levels before distorting.

Switches on the mic body are for power on/off, a 20 dB pad, an 80 Hz rolloff filter and pattern select. The E-350 can be used in Omni, Cardioid and Figure-8 patterns.

The CAD Equitek E-350 includes an elastic ZM-1G shockmount bracket that supports the mic at the threaded stand socket and at the neck between the capsule and mic body.

For information contact CTI Audio in Ohio at (440) 943-0110 or circle Reader Service 154.

Rode NT-1 Condenser Mic

The **Rode** NT-1 is a large-capsule, high-performance professional condenser microphone.

The NT-1 capsule features a full 1-inch gold-sputtered diaphragm and is mounted in a proprietary internal shock-mounting system. The electronic components are mounted on a sub-assembly that assures structural integrity.

The microphone head is made of two layers of stainless steel. The outer layer is an extremely heavy open weave to provide strength, while a finer internal layer provides an effective pop shield and acoustic transparency.

The frequency response of the Rode NT-1 is 20 Hz to 20kHz, with a maximum SPL of 135 dB. The output connector is gold plated and the mic comes with a stand mount and custom high-impact carrying case.

*For information contact Event Electronics in California at (805) 566-7777 or circle **Reader Service 132.***

Audio-Technica AT3525

Part of the **Audio-Technica** 30 Series of condenser microphones is the AT3525 cardioid studio microphone.

The AT3525 is a fixed-charge backplate, permanently polarized condenser mic with a response of 30 Hz to 20 kHz. With the -10 dB pad switch engaged, the AT3525 can handle a maximum 156 dB SPL, 1 kHz at 1 percent THD.

A low rolloff switch engages an 80 Hz, 12 dB/octave filter to eliminate rumble. The microphone requires 48 V phantom power. The multi-position shockmount bracket is included with the microphone, and can be attached to any standard 5/8-inch-27 threaded boom or stand.

The AT3525 is joined in the series by the cylindrical AT3527 omnidirectional condenser mic, and the AT3528 cardioid unit.

For information contact Audio-Technica in Ohio at (330) 686-2600 or circle ***Reader Service 161.***

Coles Reporting Mic

The British-made **Coles** 4115 Broadcaster Ribbon Mic is distributed domestically by Independent Audio of Portland, Maine. The 4115 is used for close indoor voice situations where good-quality broadcast audio in high-background noise environments is required.

The 4115 microphone is optimized for speech only, with a response of 80 Hz to 8 kHz. The corrugated aluminum ribbon element is acoustically dampened to be free of resonance and provide immunity from handling noise and mechanical shock. A fine woven nylon gauze layer protects the ribbon from plosives. A built-in "lip bar" above the microphone maintains a proper speaking distance from the ribbon element.

A similar microphone, the Coles 4104 Commentator Mic, has a wider response (60 Hz to 12 kHz) and a replaceable, washable lip bar. Both mics have a decidedly 1950s-era European look, with brown enamel paint, satin chrome finish and brown PVC jacketing.

For information, contact Independent Audio in Maine at (207) 773-2424 or circle ***Reader Service 114.***

Mackie HR Series Monitor

Mackie Designs offers the HR824 high-resolution active studio reference monitor for pro studios, video and audio applications and project recording rooms.

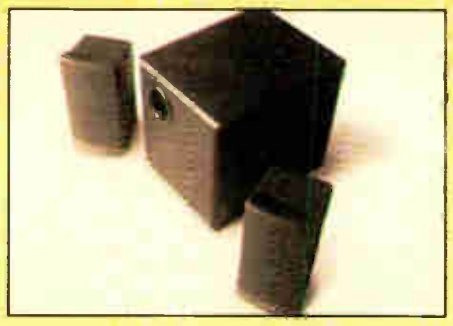
The active bi-amplified monitor is compact (15-3/4 by 10 by 12 inches) and has a free field response of 39 Hz to 22 kHz. The 8-3/4-inch woofer is rated at 150 W. and the 1-inch aluminum tweeter can handle 100 W. Maximum peak sound pressure level at 1 meter is greater than 121 dB.

Inputs are on both balanced XLR and quarter-inch jacks. An AC power switch is located on the front of the cabinet. An acoustic space switch allows Full, Half-Space or Quarter-Space response.

For information contact Mackie Designs in Washington state at (425) 487-4333; Web site www.mackie.com *or circle* ***Reader Service 117.***

Fostex Personal Studio Monitors

Fostex has the PS-3 personal studio powered monitoring system, consisting of three powered enclosures sized to fit in compact studio spaces.



A ported bass reflex subwoofer contains a 15 W amplifier to drive the bass speaker and two 5 W amplifiers for the satellite treble enclosures. All speaker connections are on reliable binding posts, with inputs provided on two RCA jacks. Response of the combined system is 70 Hz to 20 kHz.

Separate volume and bass controls are on the back of the subwoofer. Distortion is listed at less than 0.1 percent.

For information contact Fostex in California at (562) 921-1112 or circle ***Reader Service 185.***

Hafler TRM8 Monitors

The **Hafler** TRM8 monitor is a powered monitor speaker based on Hafler Trans-Nova amplifier technology. The monitors are intended for use in mastering facilities, music recording studios, broadcast and post-production houses.

The TRM8 monitor is a bi-amped, two-way system with a frequency response of 45 Hz to 21 kHz. The internal Trans-Nova amplifiers provide 75 W for the 6-ohm high-frequency driver and 150 W for the 6-ohm woofer. The amplifier has a signal-to-noise ratio greater than 100 dB. A pair of clip indicator lights monitor the performance of the high and low frequency drivers.

A bass level control offers selectable levels of -4 to +4 dB from 40 to 200 Hz. A similar control for treble allows -4 to +4 dB from 3 to 20 kHz.

Hafler TRM8 monitor speakers are $2,400 per pair.

For information contact Hafler in Arizona at (888) 423-5371 or circle ***Reader Service 78.***

Alesis M1 Active Monitor

Alesis Corp. recently entered the active monitor marketplace with the M1 Active Bi-amplified Reference Monitor.

The M1 Active features a 6.5-inch woofer driven by a 75 W amplifier and a 1-inch silk dome high-frequency driver powered by a 25 W amplifier. Frequency response is 38 Hz to 23.5 kHz.

Special time-alignment circuitry added to the tweeter portion of the crossover network allows the high and low drivers to move in synchronization, avoiding time smear. The magnetically shielded cabinet allows the placement of the M1 Active monitor in close proximity with computer screens.

The back panel features a power on/off switch, an input level pot and a combination XLR/quarter-inch input jack. The M1 Active is 15 inches high and weighs 19.5 pounds. It is available for $649 per pair.

For information contact Alesis in California at (800) 5-ALESIS or circle ***Reader Service 173.***

Yamaha MSP5 Monitors

Yamaha adds to its line of nearfield monitors with the MSP5, a bi-amplified unit with flat response and well-articulated stereo imaging.

Designed for use in studios likely to contain computerized audio equipment, the MPS5 features magnetic shielding for close proximity use to video and PC monitors. Both +4 dB XLR and -10 dB phone jacks are provided for connection to professional or semi-pro audio equipment.

The MPS5 has trim switches to allow custom tailoring of low- and high-frequency response to suit different acoustic spaces. Internal amplification provides 40 W to the 5-inch woofer and 27 W to the 1-inch titanium tweeters.

MSRP for the Yamaha MSP5 monitor is $299.99 each.

For information contact Yamaha Corp. of America in California at (714) 522-9011 or circle ***Reader Service 151.***

HHB Circle 5 Studio Monitors

HHB Circle 5 studio monitors are compact, competitively priced monitor speakers, available in powered and passive versions.

An 8-inch bass driver, injected-molded in HHB trademark purple, is mated to an aluminum voice coil operating in a field-canceling magnet. This allows the Circle 5 to function in close proximity to computer and video monitors. Fluid-cooled soft-dome tweeters are individually tested and matched to ensure consistent response from unit to unit.

The active version of the Circle 5 is powered by a two-channel amplifier pack delivering 120 W to the bass driver and 60 W to the tweeter. An extra-large toroidal transformer delivers a low hum field and enough power to provide sufficient headroom.

Both versions feature a solid-state polyswitch to protect the tweeter from excessive input. Unlike other protection circuits that ride gain on the tweeter, the polyswitch cuts all power to the tweeter and illuminates a red warning light on the Circle 5 monitor.

HHB Circle 5 monitors are priced at $1,399 for the active version and $749 for the passive version.

For information, contact HHB Communications in California at (310) 319-1111 or circle ***Reader Service 36.***

Quested Monitoring Systems

The **Quested** VS2205 is a self-powered two-way, high-resolution monitor, described in company literature as "brutally honest."

Response of the VS2205 is 75 Hz to 19 kHz. The two 5-inch low-frequency drivers are driven by a 100 W amplifier, while a 1-1/8-inch tweeter is fed with 50 W RMS. Maximum SPL is 108 dB.

Rear panel controls include LF and HF contour switches, and a +4/-10 input selector. The front panel includes LED indicators for Power On, Overload and Thermal Protection. Full magnetic shielding is available for use in locations where the VS2205 will be adjacent to video or computer monitors.

The Quested VS2205 has a retail price of $1,749 each.

For information contact Q.usa, the U.S. distributor of Quested monitors, in Wisconsin at (608) 251-2500 or circle ***Reader Service 207.***

Audix PH15 Powerhouse Monitor

The Audix PH15VS Powerhouse series speaker is a powered monitor for desktop audio production and nearfield monitoring at a digital workstation.

The "VS" in the model number indicates it is a vented and shielded enclosure, for enhanced bass response and close placement near computer monitor screens. The discrete amplifier circuitry offers complimentary symmetry and extremely low distortion rate of 0.01 percent THD in the mid-bands.

The PH15VS self-powered monitor is designed as a two-way integrated system, employing a woofer for bass and mid-range and a tweeter for highs. Audix utilizes high-quality crossovers in each Powerhouse model, providing well-defined sound. The amplifier circuit and volume control are mounted in the "A" speaker, with a passive "B" speaker connected via a quarter-inch cable.

The amplifier circuit has a frequency response of 20 Hz to 20 kHz, with an input impedance of 10 kohms. The response of the PH15VS speaker is 50 Hz to 20 kHz.

For information, contact Audix Corp. in Oregon at (503) 682-6933 or circle ***Reader Service 158.***

Tannoy System 1000 Monitor

The **Tannoy** System 1000 nearfield monitor is part of the latest range of studio loudspeakers from Tannoy and is suitable for broadcast production, project rooms and desktop audio creation.

The speaker cabinet is constructed of medium-density fiberboard and high-density particle board. The System 1000 stands 13 inches high by 21-1/4 inches wide and weighs 41.9 pounds.

The system incorporates a high-performance tweeter positioned immediately behind the center of the bass cone. This design produces all the frequencies from a single point. The speaker is capable of high volume levels without compression and delivers excellent transient response.

Frequency response is 45 Hz to 20 kHz when used with a recommended amplifier power of 60 to 200 W RMS. The driver is a 10-inch Tannoy dual-concentric unit, loaded into a bass-reflex cabinet.

For information, contact Tannoy/TGI North America in Ontario, Canada, at (519) 745-1158 or circle ***Reader Service 29.***

Hayes Hemp Monitors

The Hayes Spatial One, distributed by **LPB**, is intended as a consumer/pro audio monitor, designed with the mass market in mind.

The cabinet consists of 100 percent processed hemp, compressed to a material similar to high-density fiberboard. The cabinet is left in a natural green finish or treated with a matte black spray.

The Spatial One has a frequency range of 49 Hz to 20 kHz. The bass driver is 6.5 inches, with a 1 inch tweeter element coupled to the Hayes FSS system, above the woofer.

The monitor is 16 inches high and can handle 25 to 150 W. The Spatial One is priced at $695 per pair. Also available is the F80Pro, with an outboard crossover for bi-amplified operation.

For information, contact LPB in Pennsylvania at (610) 644-1123 or circle ***Reader Service 62.***

JBL LSR28P Monitor

The **JBL** LSR28P Linear Spatial Reference Studio Monitor combines an 8-inch woofer, a 1-inch high-frequency driver, and two high-power amplifiers in a 16-inch-high medium-density fiber cabinet.

Frequency response of the LSR28P is 50 Hz to 20 kHz, with 250 W of continuous low-frequency power and 120 W for the high-frequency driver. Input is on a hybrid XLR/quarter-inch TRS jack and a trimpot attenuates the incoming signal 0 to 13 dB.

Eight DIP switches are used to adjust the upper and lower frequency response of the LSR28P. An AC On/Off switch on the back panel is accompanied by a 115/230 VAC selector slide switch and a fuse socket.

Linear Spatial Response design philosophy allows more relaxed studio placement rules and minimal off-axis coloration. The woofer element contains three voice coils: two to provide differential drive of the transducer and a third as a dynamic brake to limit speaker cone excursion.

For information contact JBL in California at (818) 894-8850 or circle ***Reader Service 39.***

Roland MA-9 Powered Monitors

The **Roland** MA-9 is a self-contained stereo micro-monitor with built-in echo for small studio use and desktop computer audio production.

The MA-9 has a 4-inch woofer, a 1.5-inch tweeter and two 8 W amplifiers to drive the elements. There are two stereo line inputs and a mic input with an echo channel control. Other front panel controls include volume, tone and a separate mic input control.

A headphone jack bypasses the speakers to drive a set of phones. Frequency response is 80 Hz to 18 kHz. A second model, the Boss MA-12V, features a built-in 10 W amplifier driving a single 4-inch full-range speaker. The sealed enclosure provides 70 Hz to 17 kHz response.

For information contact Roland Corporation U.S. in California at (323) 685-5141 or circle ***Reader Service 176.***

Radio World

Broadcast Equipment Exchange

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ACOUSTICS

Want to Sell

Circle (234) On Reader Service Cord

AMPLIFIERS

Want to Sell

Altec-Lansing A323B custom built power amp, push-pull 6L6 output tubes, BO. M Crosby, 408-363-1646.

Peavy CS-600-ASIS power amp, $200; Levin power amp. $200; Triton Sa-501, $350. A Stewart, 732-845-9362.

Anchor AN1000 powered monitor speaker, 50 W w/manual & cables, new cond, $550/pr; Melcor AB-49 100 W SS power amp, 4, 8, 16 ohm, 3.5" RM, gd cond, $100; Sound Design/3M SP-60 60 W PA amp input for 2 mics & music output of 8 ohm. 25/70V w/manual, new cond, $100. L Zieglmeier, 201-501-0088.

ANTENNAS/ TOWERS/CABLES

Want to Sell

Cablewave 1-5/8", 375', hardline, 2 yrs old, gd cond, $1000. P Wolf, 941-458-3777.

ERI 10 bay CP, high pwr at 98.3, 5 yrs old, avail 3/1/99, $2500/BO. D Harder, 316-276-2366.

Hughey & Phillips K-114 300mm code beacon, used in gd cond, $500; Puregas 1500 dry air pump, 1500'/day, $900. E Black, 405-524-3770.

Microwave Filter 3 cavity notch filter on 98.5, 2 yrs old, gd cond, $1000. P Wolf, 941-458-3777.

ERI 1105 7-bay FM CP antenna, tuned to 92.7, $3000/BO; Comark/Cablewave CFM-LP 3-bay FM CP antenna w/radomes, tuned to 94.3, used as backup, $1500/BO. L Fuss/K Harnack, 601-846-0929.

ERI 3 bay ring stub FM antenna w/mounting hardware, $1600; ERI 8 bay ring stub FM antenna w/mounting hardware, $3600, both on ground, pick up or pay shpg. M Casey, 803-275-4444.

AUDIO PRODUCTION

Want to Sell

Circle (232) On Reader Service Card

360 System Instant Replay, 4 hr memory, $2150; Digicart II HD-200 w/Bernoulli Drive D-Net upgrade, PB remote, full remote rack shelf & Bernoulli disks, $3850; Short Cut Editor w/gig bag, $2850 or $8000 takes all. Email: BMB5828@AOL.COM

Audio books: Creative recording (FX & processors); Making money making music; Jingles (how to write, produce, sell comm jingles), like new, $35/all. W Dougherty Jr, 573-998-2681.

Audisk DS1000 w/2 control points, on air & production, audio, 9 GIG hard drive. J Wilkinson, 801-524-2600.

Biamp MR140 reverb, $250; PR&E Multimax tri band compressor, $650. A Stewart, 732-845-9362.

Sony PCM-501-ES digital audio processor, record PCM 16 bit digital music on std VHS tape w/manual. $500. B Meuse, 650-969-2433.

Altec 1567A tube type mixer, 4 mic, 1 line inputs, w/plug in transformers, in wood case, $1200. E Duellman, 920-468-4100.

Lang PEQ-2, excel cond. A Polhemus, 212-302-9010.

ANTEX AUDIO CARDS, will not be undersold. A.S.C. (619) 523-1575.

Sansui PCM converter, $500; Burwen DNF1201 noise filter, $200; Shure AMS8000 mic mixed, 8 chnl, $1500/trade for studio gear. M Hughes, 301-962-6823.

AUTOMATION EQUIPMENT

Want to Sell

Arrakis Digilink CD interface, $400. A Stewart, 732-845-9362.

Cartworks Digital Audio System w/switcher, $2750/BO; Mueller TS-25/35 tone decoder, like new, $175. L Fuss/K Harnack, 601-846-0929.

ANTEX DIGITAL AUDIO CARDS, new condition, call for price, Shurla at Compusound, 626-859-0213.

BUSINESS OPPORTUNITIES

CART MACHINES

Want to Sell

Spotmaster triple deck cart machine; Tapecaster mono cart recorder, $200. A Stewart, 732-845-9362.

Spotmaster TP-1B cartridge tape winders w/o timer, $50; TP1B tape timers, $175; STL alignment carts C0031-FI (IEC); C0234-2-FI (stereo IEC); X1235-1-FI (3150 Hz flutter). M Crosby, 408-363-1646.

Harris cart machines (3), mono, $50 ea. L Fuss/K Harnack, 601-846-0929.

COMPLETE FACILITY

CONSOLES

Want to Sell

Ampex AM10 6x2 mixer, excel cond, $295; Altec tube mixer, 4 mic, 1 line, excel cond, $595. J Price, 214-321-6576.

Ramsa WR-8210A, 10x4x2 mixer, ea chnl has 3 selectable inputs, 3 band sweepable EQ, 2 pre- or post-fader aux sends, insert in/out, direct out, $1300/BO; Quantum QM8P vintage 8x4, some stereo chnls, 3 band EQ, +4, $1500 or trade for rcdrg gear. M Hughes, 301-962-6823.

Samick System 84 8 chnl w/phantom power, $250. A Stewart, 732-845-9362.

MCI/Sony 618, 24x24, $6.5K; Quantum 24x24, $4.5K; Soundcraft 600, 32x16, $5.5K, like new; Model 30, $295; 512, $950; 520, $1450. W Gunn, POB 2902, Palm Springs CA 92263. 760-320-0728.

Circle (233) On Reader Service Card

RCA 10 chnl console, great for parts or restoration, $450; Cetec Sparta A-15B 5 chnl mono console w/pwr supply, $200. L Fuss/K Harnack, 601-846-0929.

Want to Buy

Schematic for Collins Mark 8 stereo console. M Young, 314-487-4160.

Soundworkshop 40 for parts, modules or console. A Polhemus, 212-302-9010.

DISCO-PRO SOUND EQUIP

Want to Sell

Conn trombone, mouthpiece, HDS case, $75. W Dougherty Jr, 573-998-2681.

EV SX-500 2-way pro loudspeakers (pair), 15" woofer & titanium horn driver, lightweight molded cabinet w/handles, 400 W, excel cond, $498 ea. B Fisher, 701-523-3883.

JBL 2482 2" drivers (2), $560; (2) JBL 2328 throat adapter for 2" to large radials, $60/pr; (2) JBL 2350, 90x40 degree bi-radial horn, $275/pr or trade for studio gear. M Hughes, 301-962-6823.

LIMITERS

Want to Sell

Orban 414A stereo compressor, $500 or trade for studio gear. M Hughes, 301-962-6823.

Want to Buy

Tube limiter for studio. M Hughes, 301-962-6823.

Teletronix LA-2A's, UREI LA-3A's & LA-4's, Fairchild 660's & 670's, any Pultec EQ's & any other old tube compressor/limiters, call after 3PM CST, 972-271-7625.

MICROPHONES

Want to Sell

Sennheisser MD431 vocal mic, new demo, $325; Sony ECM16 guitar lavalier 125, ECM16T electret condenser lavalier mic, $125; F99LT one point stereo dynamic mic, mini jack new/demo, $99: ECM33P w/windscreen, condenser, $170; Shure Prologue 10HLC (3), $39 ea; Prologue 12HLC, $59 ea; TEAC ME15 electret condenser w/box, $75; Teledyne 341 condenser (4), $75 ea; Phillips 8200 lavalier condenser mic 200 ohms (2) one new, one new demo, $75 ea; Knight 100; EV PL9, $90; PL95, $100 CO85 condenser lavalier minus element, $100; Crown CM300 differoid, $200. M Hughes, 301-962-6823.

MICROPHONES cont....

Prof mic shock mount w/extra elastic bands fits hand-held sized mics, new, $20. W Dougherty Jr, 573-998-2681.

Neumann U47, $3900; U67, $3300; U87, $1800; KM83 or 84 pairs, $1400; KM88s, $950 ea; RCA 77DX, $1200; BK5, $700; BK1A, $300. W Gunn, POB 2902, Palm Springs CA 92263. 760-320-0728.

Want to Buy

Tube or ribbon mic for studio. M Hughes, 301-962-6823.

RCA 77-DX's & 44-BX's, any other RCA ribbon mics, on-air lights, call after 3PM CST, 972-271-7625.

RCA 77-DX's, 44-BX's, WE KU-3A's On-Air lights, recording lights. Top price paid. Fast response. Bill Bryant Mgmt, 2601 Hillsboro Rd, G12, Nashville TN 37212. 615-269-6131, FAX: 615-292-3434.

MISCELLANEOUS

Want to Sell

KLH 21 FM receiving system, $50. C Collins, 414-363-9205.

SCA subcarrier avail for Boston metro area. Email: mail@whrb.org, for more info.

Orban 245F stereo synthesizer, $100; Marti SCG-10 subcarrier gen, 92 kHz, 10 kHz audio bandwidth w/companding option, plus companion Marti SCD-10 subcarrier demodulator, like new, $1750/both; BE SCA gen, 67 kHz, $150. L Fuss/K Hamack, 601-846-0929.

ADC TT (Bantam) Patchbays, $149; TT or 1/4" cords, $10; new short MRL test tapes, $229 for 2", 1/4", $79; Gates dual stereo tube limiter, $1200; Gates top level, $595; Allen & Heath GL2 rack mixer, mint, 14x4, $795; CBS Labs Audimax, $400 ea; tube preamps, $300-400; MX10 mixers, $795. W Gunn, POB 2902, Palm Springs CA 92263. 760-320-0728.

Gentner G2500 Super Hybrid, $950. Gentner Tele-Switch $350, both items like new. S Kirsch, 516-763-1776.

Want to Buy

McIntosh L-12 cabinet for McIntosh C-28 & MA-230. JP Robillard, 504-834-5010.

UTC transformers, WE 111C repeat coils, Triad R6A pwr transformers; MXR effects rack modules, UREI compressor, tube echo unit, panning device. M Hughes, 301-962-6823.

Jazz record collections, 10" LP/12" LP be-bop, swing, dixie, highest prices paid. B Rose, Program Recdgs, 228 East 10th, NYNY 10003. 212-674-3060.

MONITORS

Want to Sell

Belar FMM-1 mod mon tuned to 103.5 & Belar FMS-1 stereo monitor, $850/BO; Belar RFA-1 FM RF amp tuned to 103.5, $250/BO or all for $1000. L Fuss/K Harnack, 601-846-0929.

Belar FMM-1 mod mon tuned to 92.7 & Belar FMS-1 stereo monitor, $850/BO; Belar RFA-1 FM RF amp tuned to 92.7, cracked meter but otherwise OK, $225/BO or all for $975. L Fuss/K Harnack, 601-846-0929.

Belar RFA-2 AM RF amp tuned to 1450 kHz, $250. L Fuss/K Harnack, 601-846-0929.

Used Mod Monitors, McMartin & Belar. Many to choose from, tuned & calibrated on your frequency, full guaranteed. Goodrich Ent. 402-493-1886.

RECEIVERS & TRANSCEIVERS

Want to Sell

Marti Subcarrier Generators (2), SCG-10s, one 67.7 kHz and one 92.7 kHz, $400 each; (15) Dayton Industrial subcarrier receivers, $120 each, $2250 takes all. Email: BMB5828 @AOL.COM

Comrex 2-line freq extender, xmtr & rcvr, $1995 for both ends. Steve Kirsch, 90 S Long Beach Rd, Rockville Centre NY 11570. 516-763-1776.

RECORDERS

Want to Sell

Akai M7 cross-field head recorder, $150; Roberts portable recorder, mono, tube type, $200. M Crosby, 408-363-1646.

Ampex 350 power supply chassis, BO: Ampex 601 tube-type mono recorder, case & very clean, $250; Ampex AL-500-2 recorder, $100. M Crosby, 408-363-1646.

Ampex ATR-700 r-r (2), $325. A Stewart, 732-845-9362.

Ampex tube recorder 1/2" stereo w/440 transport, $2995; MCI JH110A stereo in console, excel cond, $495; MCI JH110B stereo in big console in excel cond, $795; MCI JH110C 1" 8 trk recorder AL-3 in excel cond, $2500; Otari MTR10-2 stereo recorder, excel cond, $1750; Ampex 8 trk erase/rec/play heads (set), $750; Ampex 16 trk 2" heads, new, $350 ea; MCI-110 electronics stereo set, $200. J Price, 214-321-6576.

Dokorder 9200 4 trk 1/4" r-r, excel cond, $100. A Santorine, 740-859-2195.

MCI JH110B 4 trk in console, excel cond, $1250; Ampex 351 transport, BO; Ampex 354-2 tube recorder in console, excel cond, $1000; Ampex 440 stereo in console w/Ampex mixer, excel cond, $750; Ampex 440C servo motor 4 speed in console, excel cond, $995. J Price, 214-321-6576.

Sharp stereo cassette deck, rec metal & high bias tape, tape counter, FL meters, works gd, $50; Marantz SD155 stereo dbl cassette deck w/high speed dubbing, $140. W Dougherty Jr, 573-998-2681.

Tascam 32 2 trk r-r 700, tweaked, aligned, great cond, $800/trade for studio gear; Fostex 80 8 trk, in box, low hrs, $1000/trade for studio gear. M Hughes, 301-962-6823.

Ampex 4 trk tube deck, $2500; stereo 351 (recond), $1800; Akai Adam, new, digital 12 trk, $3500; MM1000-16 w/new heads, $4500; Otari MTR10-4, $3500; Ampex ATR102s, search to cue, $495; Ampex locator for ATR or 1200, $895; MCI 110C-8, $3.5K; Tascam 85-16 recond w/dbx, rc & loc, $3K. W Gunn, POB 2902, Palm Springs CA 92263. 760-320-0728.

Want to Buy

Ampex 351-354, MR70 electronics. J Price, 214-321-6576.

Ampex ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

CONSULTANTS

RECORDERS continued...

Ampex PR10 tape recorders. W Gunn, POB 2902, Palm Springs CA 92263. 760-320-0728.

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TFT 7700B composite STL xmtr & companion rcvr, 950.0 MHz, type-accepted, $3000; TFT 770B composite STL xmtr & companion rcvr, 944.5 MHz, type-accepted, $3000. L Fuss/K Harnack, 601-846-0929.

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Potomac Instruments FIM-71 Field Intensity meter in excellent condition with Oak carrying case. $6,750.00. B Bingham (518) 793-7748.

Want to Buy

Sencore Cricket TF30. J Price, 214-321-6576.

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Continental 316 10 kW on 1260 kHz, needs plate transformer & tubes. $2500. L Lanser, 616-394-1260.

Energy-Onix 1 kW Legend 1000 w/freq adjustable 30 W exciter, $8000/both. A Stewart, 732-845-9362.

Gates FM3H 3 kW FM xmtr w/CSI EX-20F exciter, currently on air at 101.9, exciter is freq agile, operates on 3-phase pwr, $6000, buyer picks up. L Fuss/K Harnack, 601-846-0929.

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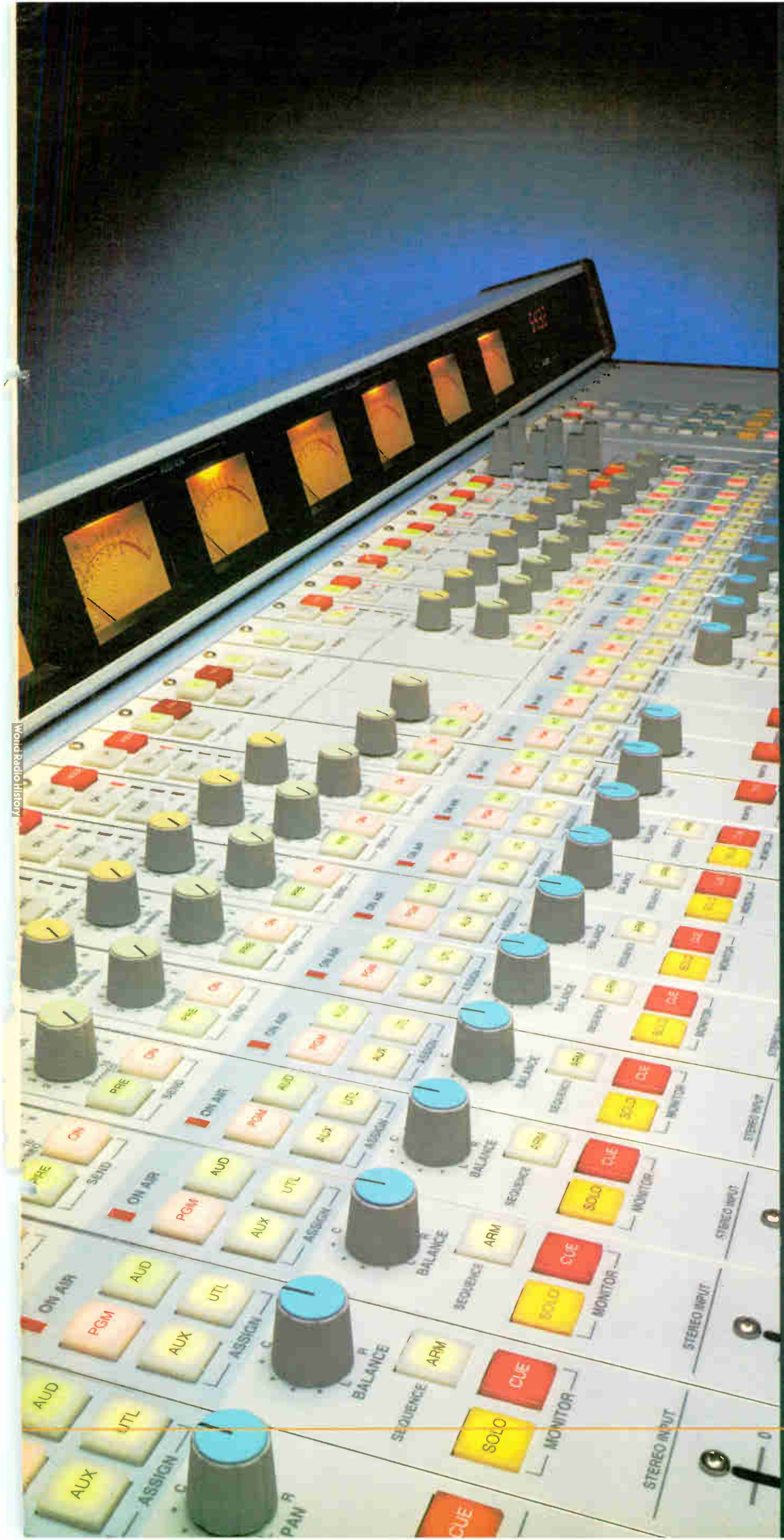

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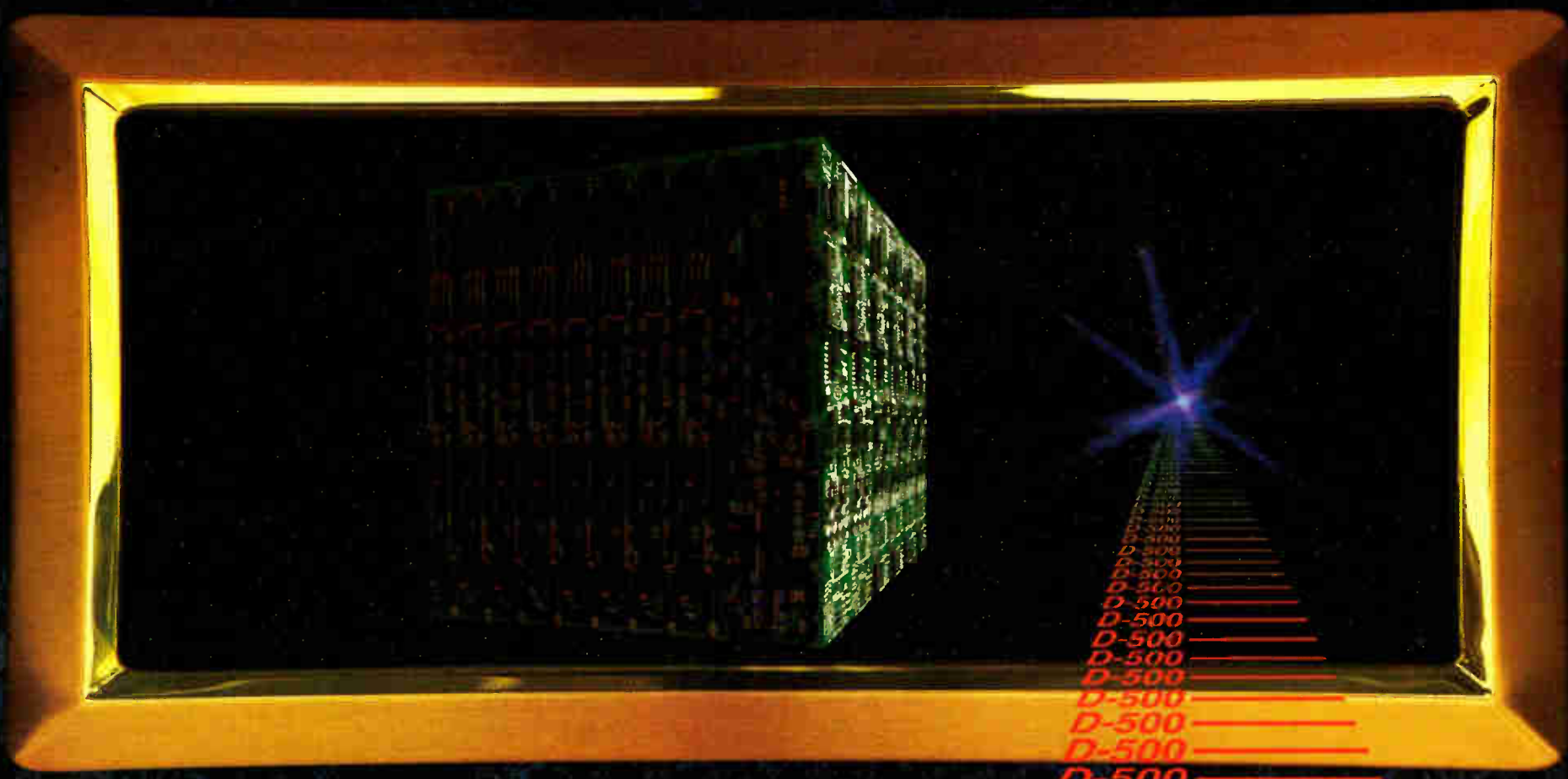

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