



Buyer's Guide:
Mics & Headphones
Page 60

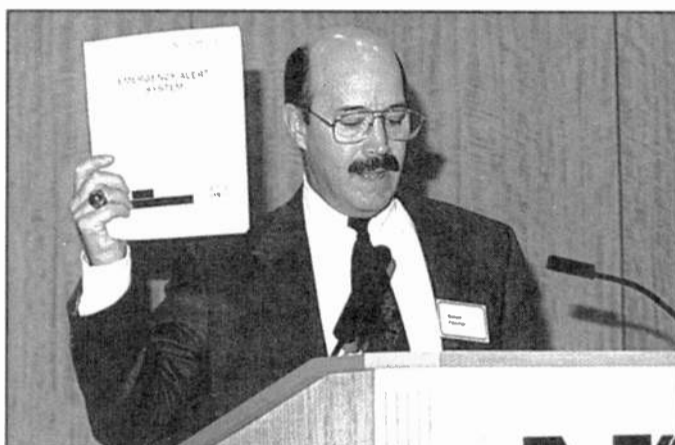
EAS Group Sets 1998 Agenda

by Leslie Stimson

WASHINGTON As the "shakeout" year for the Emergency Alert System drew to a close and a new year began, broadcasters, federal agencies and state emergency planners affected by the system that replaced EBS met here last month to discuss what is working, what is not working and what can be done to implement EAS more smoothly.

The group is named the EAS National Advisory Committee. The approximately 15 members are appointed by the FCC. Some form of this committee has existed since the 1950s. It was known most recently as the National Industry Advisory Committee.

When members convened in late January, it was the first time in more than six years the committee had met.



Robert Fletcher, FEMA

William Browning of the Heartland Partnership, a holding company consisting of non-profits, for-profits and

foundations, was elected president. He said he was the first person in charge of the former Emergency Broadcast System for the FCC.

Three subcommittees were formed: training and education, planning and technical. Richard Rudman of CBS Radio Engineering was elected head of the first subcommittee. Don Root of the California Office of

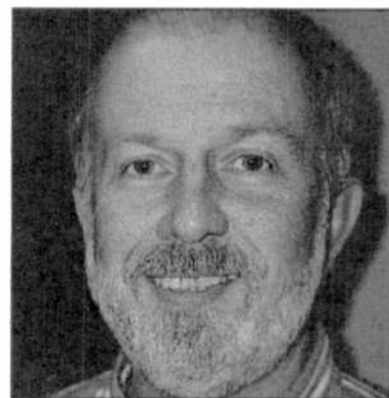
Emergency Services was elected head of the second. Steve Johnson of Time

See EAS, page 6 ▶

NEWS MAKER

Freinwald: A Model Engineer

Clay Freinwald is chief engineer for Entercom-Seattle. His career in broadcasting, now approaching four decades, earned him honors as the SBE Engineer of the Year for 1996



Clay Freinwald

and the Washington State Association of Broadcasters Broadcaster of the Year for 1997.

He is co-chair of the Washington State SECC (EAS Committee) and has been active in amateur frequency coordination for 23 years; his call sign is K7CR.

Freinwald, 55, was born in southern California. He moved to the

See FREINWALD, page 22 ▶

A New Player Enters IBOC Effort

by Bob Rusk

SAN JOSE, Calif. A new company has emerged in the effort to develop technology for in-band, on-channel digital audio broadcasting. Digital Radio Express Inc. has designed an FM IBOC system and is moving to inform the radio industry about it.

DRE President Norman Miller said the system "is viable and will demonstrate performance



vastly superior to that demonstrated by the IBOC systems tested by the Electronic Industries Association and National Radio Systems Committee in 1995."

Inspection process

In the past year, most of the attention surrounding IBOC DAB research has focused on USA Digital Radio, or USADR, the partnership effort of Westinghouse and Gannett which entered into a joint development relationship with Lucent Technologies/Bell Labs in 1997. Now Digital Radio Express, which has been working on IBOC DAB for about two years, is making its system known.

A working prototype was inspected by John Marino, NAB vice president of science and technology.

"NAB fully supports IBOC DAB technology," Marino said. "We're interested if someone should come along with a new IBOC technology. We certainly support what USADR is doing and are

looking at anybody else that wants to develop an IBOC technology."

DRE subsequently hosted a laboratory demonstration here, which was attended by NRSC DAB Subcommittee member Milford Smith, who is vice president of radio engineering at Greater Media, as

well as engineers from National Public Radio, Susquehanna Radio Corp. and Heritage Media Corp.

"I came out of the demonstration very enthusiastic," said Andy Laird, vice president of engineering, Heritage Media.

See IBOC, page 21 ▶

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And More!

Fees, Free Time Back in the News

by Leslie Stimson

WASHINGTON NAB has been seeking a more equitable regulatory fee structure for broadcasters, and hopes to propose a solution to the FCC soon. Last year the commission changed the system, hoping to do just that. But a lot of stations saw their fees rise, and complained.

In the past, regulatory fees were based on station class. For example, a Class C FM in Omaha would pay the same fee as a Class C in New York City, though the number of people they serve differ dramatically.

NAB recommended a system last year to the FCC that combined station class and populations, using protected contours. A number of suburban stations felt their new fees were too high.

NAB is likely to suggest a smaller contour, to make the fee schedule more equitable. NAB sources expect to see a notice of proposed rule making soon, and a final rule by June. (The FCC must give Congress 90 days' notice of the new fee schedule. The fees are due at the end of September.)

The NAB Radio Board also recently directed NAB staff to suggest that the FCC collect unpaid regulatory fees. "Some stations did not pay the fees, and whether they are exempt is in question," said one source.

The FCC has set March 2 as the deadline for stations to document their non-profit status, making them exempt from the fees.

Lawmakers return

As the second session of the 105th Congress got underway in late January, the chairs of the committees that govern radio set out their legislative priorities. Senate Commerce Committee Chairman John McCain, R-Ariz., outlined several goals, including ensuring equitable satellite TV rates for consumers and a mechanism to allow consumers to purchase local and long-distance telephone service from competitive, "one-stop" providers.

McCain also intends to introduce legislation to provide a process to solve tower siting disputes.

FCC Chairman William Kennard addressed tower siting concerns in a speech at the annual convention for the National Association of Television Program Executives. "Broadcasters need to build towers, and build them quickly, if they are going to roll out DTV (digital television) quickly. On the other hand, local governments argue — legitimately — that they need to protect their communities ... by deciding where these new towers will be built."

Kennard further said he believed federal pre-emption of local government should be considered only as a last resort, and urged broadcasters to work with local governments. There is an open rule making at the commission that would give the FCC the right to pre-empt local and state governments in tower-siting disputes.

Campaign finance reform is an issue again this session. In his State of the Union address on Jan. 27, President Bill Clinton said he would formally request that the FCC act to provide a mechanism for free airtime for candidates who agree to certain spending limits.

In response, Kennard said within two months, he wants the commission to develop a proposal that would include both radio and TV, and affect federal and state candidates.

"I want the FCC to be part of the solution," said Kennard.

Tauzin and McCain oppose the FCC operating independently of Congress on this issue.

So does NAB, which released this statement by President/CEO Eddie Fritts: "The FCC has no authority to mandate free airtime for political candidates. This

is solely and completely within the purview of Congress."

In response, Kennard said the commission "has always had a role in ensuring political candidates have access to the airwaves."

The Senate plans to act on its main campaign finance reform bill, sponsored by Sens. McCain and Russ Feingold, D-Wis., by March 6. A provision mandating free or discounted airtime for candidates who agree to certain spending limits was removed from the bill last year to make it more palatable to opponents. Those opponents, which include NAB, fear a free-time provision could be tacked onto an unrelated bill as an amendment.

The problems with the current political airtime rules for lowest-unit-rates, said Kennard, is that the rules are too complex. Whatever solution the FCC develops, he wants it to be easy for candidates and stations to work with and "self enforcing."

He said the commission staff has begun drafting a proposal.

No discussion of campaign finance reform would be complete without

mentioning First Amendment rights. That is a subject dear to Kennard. He told NATPE attendees that the Watergate hearings inspired him to become an investigative journalist. But he was sidetracked, he said — by radio.

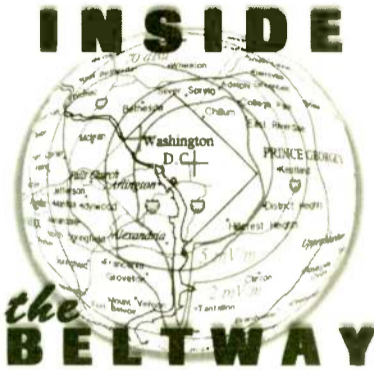
"I went to Stanford University and majored in Communications, but most of my time was spent at the student radio station. Every college with a radio station has a group of students who spend more time at the radio station than in the library. I was one of them," he said.

Kennard had what he called "a hard-hitting" public affairs show.

Media ownership

Since becoming FCC chairman, Kennard repeatedly has expressed concern about the concentration of ownership of broadcast stations since passage of the Telecommunications Act and the effects of consolidation on minority station ownership. Kennard has said that, as the FCC reviews its ownership rules as mandated by Congress, finding ways to preserve or increase station ownership by minorities is a priority.

"Obviously, in this transition there will be alliances. That's a natural part of competition," said a spokesman for Rep. Billy Tauzin, R-La., chair of the House Telcom Subcommittee. "Nothing we've seen to date suggests there's a lack of diversity in programming, news or ownership. If his intent is to crack down or limit ownership (beyond what's in the Act), he'll have a fight in Congress," the spokesman stated.



NEWSWATCH

► **NEWSWATCH**, continued from page 2
a surface-mount version of its miniature power jacks. The business will continue to operate under the Switchcraft name; Keith Bandolik will continue to serve as president. The Cortec Group is a private equity investment firm that makes controlling investments in middle-market manufacturing and distribution businesses.

Orion Reinstated

WASHINGTON The FCC issued an order reinstating North Carolina broadcaster Zebulon Lee's Orion Communications as the operator of WZLS(FM) in Biltmore Forest. The commission was carrying out the order of the United States Court of Appeals for the District of Columbia Circuit. The latest decision overturned an earlier FCC decision that forced Orion off the air in favor of Biltmore Forest Radio, a consortium.

Woodward Advances at IBB

WASHINGTON George Woodward has been appointed director of the International Broadcasting Bureau's engineering and technical operations division. Woodward will oversee the satellite and relay station network used by the Voice of America, WORLDNET Television and Film Service, Radio and TV Marti, Radio Free Europe/Radio Liberty and Radio Free Asia.

Woodward will head the planning, development and operation of the engineering and technical systems needed to maintain these networks. He has been the senior engineering/technical advisor to the director of the IBB and oversaw the IBB's digital broadcasting project. He also served as vice president for the engineering and technical services division of Radio Free Europe/Radio Liberty where he directed a \$77 million modernization program.

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Seasonal Deals, Revenue and Nor'easters

WASHINGTON Pre-NAB convention time is almost its own season of the year. Since I've been at the helm of *RW*, I've noticed that come February and March every year, activity heats up in a variety of segments of the business.

Of course, my own special little ritual seems to be mopping up my third floor office, which every year, around this time, adopts sieve-like qualities under the punishing winds of one of the mid-Atlantic's famed "Nor'easters."

So here I am again, ready to tell you about some of the recent buying activity in the business, and my office is sopping wet.

Texas Eagle

ENCO just received an order for 34 DAD_{pro32} digital audio delivery systems from Equicom Inc., dba Texas Eagle Radio Networks. Texas Eagle, which is referred to as TexRock Radio. TexRock Radio is one of the newest groups on the radio broadcast scene, and its recent purchases in Texas include: KHLR(FM), KTAM(AM)-KORA-FM, in Bryan, KKYN-AM-FM, KVOP-AM-FM in Plainview, KUVA(FM), KVOU(AM), KYUF(FM) in Uvalde, KLTG(FM), KOUL(FM), KRAD(FM) in Coprus Christi, KHLB-FM, KHLF(FM), in Marble Falls, KEPS(AM)-KINL(FM) in Eagle Pass, KKOS(FM) in Bay City, KBAL-AM-FM in San Saba and KGRW(FM), KQXF(FM) in Amarillo.

Dain Schult, founder and CEO of Texas Eagle and *RW* contributor stated in a release announcing the purchase: "We have been speaking to ENCO for the past several years, long before the creation of Texas Eagle, and the satellite-based store-forward capabilities of their DAD system were integral in the formation of our business plan and financial justification."

The group plans to uplink five formats via DAD from its Bryan headquarters, and use DAD systems at each of its downlinking sites, to transmit both live origination in the morning hours and automated local insertion into the master feeds at other times.



Giesler Broadcasting Supply, the Texas dealer for ENCO, finalized the deal.

EVI Audio

In other deals, Telex Communications and EVI International (parent to EVI Audio, which used to be Electro-Voice) said they were going to merge in late January. Both Telex and EVI are controlled by affiliates of Greenwich Street Capital Partners, the New York-based private equity investment fund.

Both Telex and EVI hope to benefit "substantially" from the merger, as both companies can utilize their combined worldwide distribution network, manufacturing, research and development efficiencies and expertise.

Radio-Mercury Awards

For those of you with a hand in the creative process, it is time once again to nominate radio's best commercials for the Radio-Mercury Awards. The annual gala, this year to be held at the Marriott Marquis in New York, is the seventh awards show.

"The competition and awards gala, sponsored by the Radio Creative Fund, is the richest awards program in advertising," said Gordon Hastings, president of the Radio Creative Fund. "\$225,000 in cash prizes is presented to winning creators of the year's best radio commercials, which is unprecedented in the advertising world."

Ten cash prizes — five \$20,000 Radio-Mercury Gold and five \$5,000 Radio-Mercury Silver — totaling

\$125,000 will be awarded in each of five categories: humor, music and sound design, radio station-produced, Hispanic and non-humorous.

The \$100,000 Radio-Mercury Grand Prize Award is presented for the best overall commercial entry. In 1997, "Instant Death," an advertisement for Ortho Antstop Fire Ant Killer produced by April Winchell and Mick Kuisel of Radio Savant in Los Angeles won the top honors.

The Radio Creative Fund will also honor the best Public Service Announcement of 1997 and announce the

pursue a career in writing and producing radio commercials.

Please note that all entries to the 1998 awards program must be submitted by March 8, and must have aired for the first time during the 1997 calendar year on a commercially licensed U.S. radio station.

For more detailed information and entry forms, call (212) 681-7207.

Radio revenue

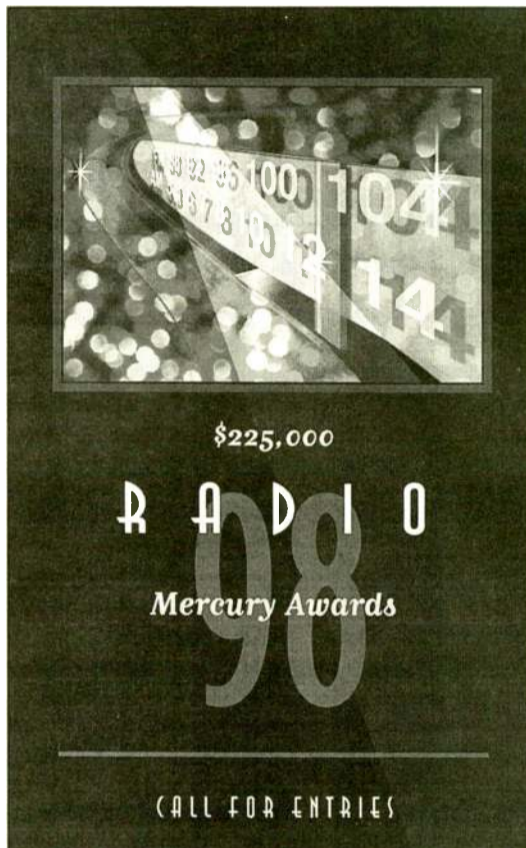
The Radio Advertising Bureau reports that 1997 was another record-setting (breaking) year for our industry. For the first time ever, radio revenue topped the \$13 billion mark, arriving there on the crest of a 10 percent increase in earnings for the year (\$13.646 billion, to be exact). Local advertising rose 9 percent to \$10.741 billion and national revenue totaled \$2.407 billion. For those of you keeping tabs, that was a 15 percent increase for the national advertising segment.

Radio Advertising Bureau President and CEO Gary Fries dubbed 1997 a "banner" year for radio.

"Perhaps even more impressive than the revenue figures themselves is that they represent an unprecedented level of confidence on the part of the business community in the value of radio and our ability to deliver exceptional advertising results."

December 1997 figures demonstrate the 64th consecutive month of gains in radio revenue, with a 10 percent increase in combined local and national sales numbers. Local numbers were up 8 percent compared to December 1996 and national dollars were up 15 percent for December 1997 versus December 1996.

As you know, the RAB numbers are compiled based on its revenue index of more than 100 markets and radio network revenue is compiled by Miller Kaplan Arase & Co.



Nominate your favorite radio commercial by March 8.

recipient of the Dick Clark Summer Fellowship. This educational opportunity, administered in conjunction with the IRTS Foundation, is granted to an outstanding college student who plans to

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IBOC Delivers

The following is in response to the letter "Emperor's Clothes," which appeared here Feb. 4. In that letter, engineer Mike Worrall asked why radio stations that seek "compression-free" air chains would consider a digital audio broadcast system that uses "perceptual coding."

I do not see a major dichotomy in delivering the best available quality to the most narrow link in our broadcast chain, the RF path — it is just good engineering practice.

Audio processing is our way of dealing with limitations in the channel. Audio processors make their best decisions on clean signals with full-frequency response and dynamic range.

The best quality that the FM channel

can deliver falls short of that possible with 16-bit PCM linear. Typical FM receivers deliver 7.5 kHz less frequency response and 30 dB worse dynamic range than the that of uncompressed CD quality.

IBOC uses perceptual audio coding processes to deliver CD quality. In the case of USADR's FM system, the 1.5 Mbps PCM linear data stream is compressed to 96 kbps. This compression is necessary to fit digital CD quality within the broadcast channel. The audio codec accomplishes this compression by removing portions of the signal that fall below human threshold of audibility. These deleted elements are inaudible because louder nearby passages are of sufficient amplitude to mask the audibility these signals. Double blind listening tests have demonstrated that trained listeners cannot identify which source is the CD and which is IBOC.

Listeners are growing accustomed to CD quality, making IBOC essential to the survival of over-the-air broadcasting. Broadcasters are aware that the digital revolution is underway; television is going digital, cell phones are going digital and we will soon have over-the-air CD quality broadcasts from satellites competing for our audiences.

IBOC delivers on quality — quality that is perceptually identical to that of a CD. Codecs, just like the audio processor, make their best decisions when processing clean audio.

Glynn Walden
Director, Engineering
CBS Radio

Glynn Walden is involved actively in the development of an in-band, on-channel DAB system with USADR.

RFE/RL Uses AudioVAULT

Dear RW,

I read with interest your recent article describing the broadcasting efficiency gains realized by Radio Free Europe/Radio Liberty in Prague, Czech Republic (RW, Jan. 21). Unfortunately you missed an important part of the equipment side of this story.

We here at Broadcast Electronics were intimately involved during the planning stages of the new facility in Prague, and take some pride in the results, given that our AudioVAULT digital storage and control system was selected and implemented as the primary medium to manage the vast RFE/RL audio library. With more than 120 audio workstations, this system represents one of the larger ones that we have deployed, and may be one of the largest networked systems deployed in the world.

RFE/RL should serve as a model as to what can be accomplished when an organization deploys enabling digital technology in a process re-engineering environment. The result is a more productive broadcaster providing high-quality programs within RFE/RL's noble mission. As a supplier of mission-critical equipment, Broadcast Electronics feels fortunate to have in some way contributed to their effort. As a U.S. taxpayer, I

DAB Heats Up

Radio broadcasters must start paying closer attention to efforts to develop a terrestrial digital audio broadcast system. DAB is in the news for several reasons: *A new proponent.* For the past year, most of the talk about DAB in the United States has focused on USA Digital Radio. Now Digital Radio Express has emerged with its own proposed in-band, on-channel FM system, with an AM system promised later. RW welcomes this development. It means more choices for radio, and it supports our

view that IBOC is the only realistic DAB solution in the United States.

Progress at USADR. Enthused about their year-old relationship with Lucent Technologies/Bell Labs, engineers at USADR hope to conduct over-the-air field tests of their DAB systems by autumn. They'd like to see transmitter and receiver manufacturers begin the rollout process in 1999, followed by 10 to 15 years in which stations would broadcast a hybrid IBOC system, compatible with both analog and new digital receivers.

A renewed industry forum. The National Radio Systems Committee has reactivated its Digital Audio Broadcasting Subcommittee. The Electronic Industries Association and the National Association of Broadcasters, which sponsor the NRSC, feel that IBOC research is sufficiently advanced to merit reopening its investigation.

The threat from DARS. More than one DAB proponent has argued that potential competition from the upcoming new digital radio satellite services has lit a fire under leaders of the U.S. terrestrial radio business, or at least opened their minds to the immediate advantages of DAB.

The NAB show. The most important trade show of the year for broadcasters takes place in six weeks in Las Vegas. IBOC advocates want to be able to show real progress when they meet their peers at the show.

Progress abroad. Broadcasters in Canada, Europe and elsewhere are moving past the test process to offer regular DAB services, using the Eureka-147 system. Consumer receivers for those markets are expected to roll out this year.

In short, DAB is not some far-off possibility. U.S. radio managers may be confronted soon with some serious decisions. It's time to pay attention. Get familiar with the terms. Read about the players in RW. Visit USA Digital Radio and Digital Radio Express at NAB'98, to hear about their systems for yourself.

— RW

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Next Issue of Radio World
March 4, 1998

congratulate the people at RFE/RL that made this new organization happen!

Ray Miklius
Director, Studio Systems
Broadcast Electronics Inc.

Licensing low power

Dear RW,

This is in response to an article in the Nov. 26, 1997, edition of RW ("Yo-Ho-Ho, A Pirate's Life for Me").

I think all of the fuss over low-power (pirate) radio stations is nothing more than jealousy and greed over the FM broadcast band. Other countries license low-power FM stations, why don't we?

good FM processing and, of course, common sense, there will be no interference with the commercial stations. They license 10 W radio stations for schools, so what is the difference?

"We the People" created this country, including the government (FCC), and we can't access our own radio waves? Hmm, something is wrong here. There will be pirate radio stations on the air until radio ceases to exist. The FCC will close down some, but for every one shut down, thousands more will go on the air. So why not make affordable low-power licensing available for these small communities?

Doug Pringle
Oblong, Ill.

Managing mistakes

Dear RW,

I have to tell you that I thoroughly enjoy Radio World. Your publication is number one on my reading list.

I was pleasantly surprised by Lucia Cobo's willingness to admit to a mistake (RW, Jan. 7) that was printed in a previous issue. Making mistakes comes with being human, and I have to commend her for admitting that in print. For me, making mistakes is embarrassing and sometimes funny, as was the case in the "Page Four" column. But trying to bury or deny them, in my opinion, is dishonest. It encourages me to meet "real" people like Lucia Cobo, who is willing admit them and even share them with her readers. Thanks, Lucia, for that chuckle! Keep up the great work you do for RW.

Please keep those *Running Radio* articles coming. Managers and salespeople always need ideas to keep their stations profitable.

Steve Tuzeneu
Station Manager
WVNE(AM)
Worcester, Mass.

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I am one of those examples of a poor person with a dream. I would love to own a radio station. It is not fair for our government to say, "If you are poor, you have no right to own and manage a radio station."

When you consider low-power radio, you can actually fit more micro-stations in an area than high-power stations. What about the distance? Well, it takes thousands of watts of power to send a stereo signal just 40 or 50 miles. A 10 W signal will travel about five or six miles. That's it! Beyond that distance it is sporadic. If you use a clean commercial FM exciter,

National EAS Planners Meet

► EAS, continued from page 1

Warner and Leonard Charles of the Society of Broadcast Engineers EAS Committee agreed to share chairmanship of the third subcommittee.

Making the grade

Frank Lucia, director, Emergency Communications, FCC Compliance & Information Bureau, urged broadcasters to file their EAS activation reports with the commission. He said seven reports were received for six stations so far this year, and 387 reports were received in 1997, most of those for tornado or flood warnings. Lucia said he suspected that the real number of EAS activations was higher than the paperwork submitted.

Lucia said the FCC is pleased with the progress of state and local plans submitted. Forty-six state and 60 local area plans have been submitted. Most of them have been approved, Lucia said.

State plans

The EAS state broadcast chairs for several states reported on the progress and problems of implementation. Consolidation of station ownership, some said, has caused them headaches. Constant turnover of employees complicates efforts to train staff to operate EAS equipment. Changes in management were cited, too.

"Just when you get a plan done, someone new comes in and doesn't see it as a public service obligation," said one state EAS chair.

Another state chair said he was trying to keep LPI and LP2 local primary source stations "from being owned by the same owner in the same building."

Still another state EAS chair said he has had a station refuse to participate as a primary station in the system.

In that case, Lucia said, "We don't have the force of law to say he has to do it. It is really a public interest obligation."

Others cited coordination problems with state or National Weather Service personnel. One state EAS chairman said National Weather Service activations were improving in his state. "The first time, they locked up the audio on our stations for 15 minutes," said Richard Archut, EAS state chair for New Jersey.

The state EAS chair for Pennsylvania said some automated stations were only running tornado warnings, and not thunderstorm warnings. He said the EAS system was overloaded by numer-

ous thunderstorm warnings and some of those alerts were getting erased.

Lawrence Krudwig of the National Weather Service said the NWS is considering raising the criteria for severe thunderstorm warnings and increasing the number of codes, to more effectively narrow alerts for the counties most affected.

Participants also discussed software problems with EAS encoders and decoders. The committee asked Lucia to draft a letter to all seven EAS encoder manufacturers asking them to remove any

time limitations for the Required Monthly Tests in their encoders.

In a petition filed with the FCC, the SBE asked that the relay window for the RMTs be extended from the current 15 minutes to one hour, to minimize disruptions in station programming (RW, Jan. 21).

In referring to that petition, Lucia said the commission plans to combine the suggested changes to Part 11 of the FCC rules with suggestions submitted by the NWS (including the ones discussed above), plus more non-weather-related emergency event codes, into one Notice of Proposed Rule Making. Lucia said the NPRM may be issued by the spring NAB convention.

AP Updates Radio Services to Compete

ARLINGTON, Va. The Associated Press, in an effort to broaden its image as a print-focused news organization and increase its attractiveness to broadcasters, has repackaged its news wires and added two newsroom software products.

AP conducted a survey of the approximately 3,000 commercial radio stations it serves. Member stations, it found, felt AP served news-intensive formats well but did not offer as much for other formats.

Because more than 80 percent of the radio stations AP serves have music-intensive formats, AP realized it had to offer more radio services to remain competitive.

AP has repackaged its radio news wires, called AP NewsPower, so they are now offered by three daypart options: mornings, drive times and 24-hours. In addition to news copy, the morning package includes a prep service; the drive-time package includes both a morning and afternoon prep service.

AP also is providing members two software packages to manage their news wires: NewsDesk and SoundDesk. AP NewsDesk is a PC-based desktop application for reading news wires, writing copy and managing contact lists. AP SoundDesk manages multiple audio files and features a point-



Terry Anderson, former AP chief Middle East correspondent, left, presented a rosary to AP President/CEO Louis Boccardi to be included in AP's 150th anniversary exhibit at the Newseum in Arlington, Va. Anderson made the rosary during the six-and-a-half years he was held hostage in Lebanon.

and-click editor, along with cart rack and cart playback machine.

— Leslie Stimson

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Courtesy of WEKS-The Bear

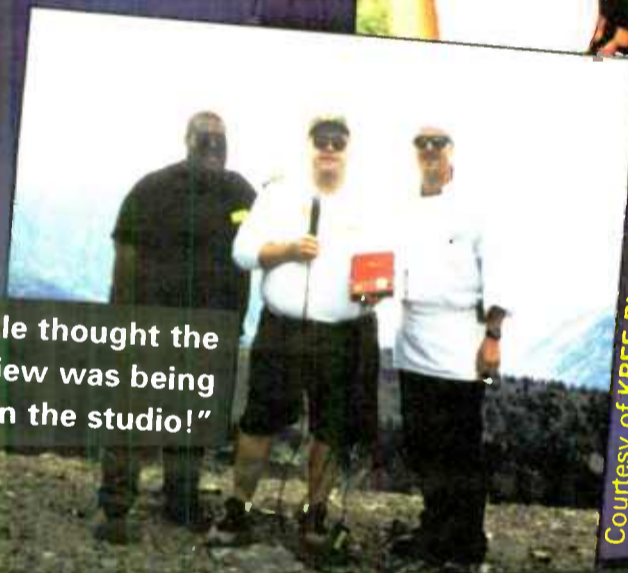


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Circle (131) On Reader Service Card
World Radio History

John Cheney of Comrex Remembered

by Sharon Rae

ACTON, Mass. Those who worked closely with John Cheney remember him as a "remarkable man."

Cheney, president of equipment manufacturer Comrex, died Jan. 19 of a heart attack. He was 70.

"It seemed like he never got old," said Kris Bobo, Comrex vice president of marketing. "He always had something valuable to add. He was extremely well-loved and radio was his whole life."

Cheney got his start in radio as a teenager. Despite his parents' wishes that he take up farming, he won his first broadcasting job at WJNO(AM) in West Palm

Beach, Fla. as a morning announcer.

Tom Hartnett, Comrex vice president of engineering, remembered Cheney as a man committed to his company and the industry.

"He stuck with it from the time he formed Comrex in 1961, past retirement age," he said. "He remained active in every aspect of the company."

Grand beginnings

Cheney moved to Massachusetts in the early 1960s and founded Comrex. The company was set up to design and market a wireless microphone system.

"It got its first use on 'The Mike Douglas Show' in July 1961, and after that they became very popular with TV talk show

types as well as stage productions on Broadway," said Hartnett.

According to Hartnett, the next big milestone came in 1972, when Cheney designed and introduced the first wireless mic to work on the UHF band. The high power and excellent range combined to make a popular electronic news gathering tool.

In the mid-1970s, Cheney took a different track with his designs. He introduced a concept



John Cheney in the 1940s

that would make Comrex an industry leader. Frequency extension was a process to enhance the quality of audio fed over telephone lines for broadcast transmission. With satellite delivery becoming more common at radio networks, it soon made its way into the business as a new alternative to backhauling.

"He introduced his two-line frequency extender in 1986, which rivaled the quality of the audio loops which were disappearing and becoming more expensive," said Hartnett.

In the 1990s, Cheney stepped into more of a leadership role, overseeing the transition of Comrex technology from analog to digital.

"His interest in history added wisdom to his presence," Hartnett said. "He could speak to things in a way no one else could."

Jim Loupas, president of James Loupas Associates Inc., recounted Cheney's sense of humor and his vision.

"Cheney created the first usable technology to improve dial-up phone line quality for broadcasters," he said. "He was the vision that directed Comrex through many years of successful development ... He was known for producing superior products and discovering and mentoring outstanding technical designers."

Cheney is survived by his wife, Comrex Vice President Lynn Distler, who takes over as president of the company.

Cheney also is survived by two sons, a brother and two grandchildren. Donations can be sent to the Deaconess Nashoba Hospital John Cheney Memorial Fund, 200 Groton St., Ayer, MA 01432.

FCC Move Delayed

by Leslie Stimson

WASHINGTON The FCC has told the government's leasing agent, the General Services Administration, that security is not up to snuff in the building commission employees are supposed to move into.

In a letter to GSA, FCC managing director Andrew Fishel wrote that the FCC "will not finally accept the space assignment" unless security concerns were addressed.

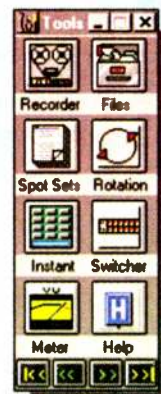
A commission spokeswoman said public access through the lobby is too easy and that overall, the building doesn't meet security requirements set up after the Oklahoma City bombing.

Congressional inquiries have delayed the move as well. Letters have gone back and forth between the offices of Rep. Billy Tauzin, R-La., Sen. John McCain, R-Ariz., the commission and the General Services Administration, the leasing agent in the deal. Tauzin and McCain have questioned details of the lease, including the cost, which they say is \$10 more per foot than comparable office space elsewhere in town. Staff for both say they have not received a response from GSA to their letters of inquiry and have not decided what their next step would be.

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On The Air



Time	Cart	Title	Artist	Length	Intro	End	Type
16:33:43	TRIP	TRIP 2		00:05			JIN
16:33:48	DALIVE			03:00			COM
16:36:48	J007	Longer Sets		00:11			JIN
16:36:59	M12	Armageddon it	Def Leppard	04:54	:22	F	MUS
16:41:53	V001	Voice Track 1		00:05			VTK
16:41:58	M17	Party Town	Glenn Fry	02:48	:06	C	MUS
16:44:40	J001	Today's Best Music		00:08			JIN
16:44:54	M09	Listen To Heart	Tom Petty	02:48	:11	C	MUS
16:47:42	DALIVE			03:00			COM
16:50:42	J005	TRM/F ast		00:06			JIN
16:50:48	M04	Dance The Night	Van Halen	02:47	:13	F	MUS
16:53:35	V005	Voice Track 5		00:05			VTK

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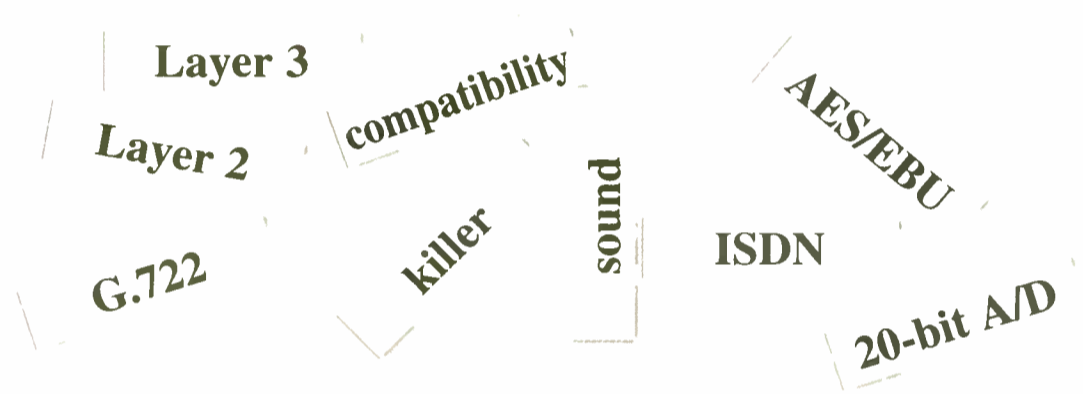
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Circle (183) On Reader Service Card

World Radio History

NRSC Reactivates DAB Committee

by Bob Rusk

LAS VEGAS The National Radio Systems Committee has reactivated its Digital Audio Broadcasting Subcommittee. The decision was made at the NRSC meeting held during the Consumer Electronics Show here in January.

The action was taken after the NRSC sponsoring organizations concluded that development of in-band, on-channel DAB has advanced, and that the subcommittee should continue its investigation of the technology. The NRSC is sponsored jointly by the Electronic Industries Association and the NAB.

"Discussion of the potential reactivation

was an agenda item," said NRSC co-chairman Charles Morgan, vice president of engineering, Susquehanna Radio Corp. "There was a general discussion concerning reactivation and a number of members spoke in favor of it. No one had any negative comments and there was a consensus that favored reactivation."

USADR progress

USA Digital Radio, a major player in developing IBOC, has made revisions in its AM and FM IBOC systems. The revisions address problems found in previous tests. Technical papers on the systems were presented at the 1997 NAB Broadcast Engineering Conference and

the 1997 NAB Radio Show, and have been excerpted in recent issues of RW.

In addition, at the 1997 Radio Show, USADR and development partner Lucent Technologies presented a demonstration of new audio codecs, giving a comparison of audio quality between digital and analog AM and FM signals.

More demonstrations are planned for the Special Technology Exhibit at NAB'98, and technical papers will be presented at the 1998 Broadcast Engineering Conference there.

USADR faces new competition from Digital Radio Express Inc. (see story on page 1), which requested the re-establishment of the DAB Subcommittee.

In a letter to the NRSC, Digital Radio Express President Norman Miller asked the subcommittee to "become involved in the process with us."

A new proponent

"It is clear to us that in order for DRE's IBOC technology to come to fruition it requires close cooperation with the industry it is meant to serve," he wrote. "Specifically, the NRSC has the opportunity to study and evaluate in great detail our FM and AM IBOC systems, participate in their testing, and determine the suitability of these systems as the method of choice for IBOC DAB."

The latest is a major step forward since September of 1996, when the DAB Subcommittee was deactivated.

"That was after the EIA/NRSC DAB lab tests had finished and after the IBOC proponents had withdrawn from the field testing," David Layer, senior engineer, NAB Science and Technology, said. "The subcommittee was deactivated because it was decided that at that time there were no IBOC systems ready for consideration as a deployable DAB system."

The previous activity of the subcommittee was exclusively IBOC-related; however, the testing on IBOC was coordinated with the EIA committee that was investigating all non-IBOC proposals.

This time around, Morgan said, "The activity will be only the NRSC and we will deal only with IBOC systems. We are not going to be comparing apples and oranges. The only thing that will be considered is on-band, on-channel."

WCLV Sells Facility, Tower Firm

CHICAGO Cleveland's 35-year-old classical music station, WCLV(FM), has sold its land, tower, buildings and tower business to OmniAmerica, Inc. OmniAmerica principals are Carl Hirsch and Anthony Ocepek, in collaboration with Dallas investment firm Hicks, Muse, Tate & Furst.

WCLV will continue to be a tenant in the building. By selling its assets, WCLV will use the funds to retire its bank debt and other long-term financial obligations and finance technical improvements.

"By being essentially debt-free, we will be in a better position to travel the rocky landscape of radio consolidation that faces today's independent broadcaster," said WCLV President Robert Conrad.

OmniAmerica intends to use the 510-foot tower and land to expand its wireless communications infrastructures. The site as developed by WCLV accommodates two FM stations (WCLV and WZJM), studio-transmitter links for two television channels and multiple wireless facilities encompassing paging companies, personal communication services, cellular and other wireless carriers.

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The Otari DX-5050 is a low cost digital audio recorder/player utilizing MO disks as the storage media. Designed as a replacement for 1/4" analog tape machines, the DX-5050 is ideal for radio production, broadcast and portable recording applications. Basic editing features and non-compressed PC standard (.WAV) file format provides compatibility with many popular workstations.

DX-5050 Highlights

Compact, portable and lightweight, the DX-5050 is ideal for portable applications. Battery power available as factory installed option. Accurate cut & splice editing is provided with the aid of a convenient Jog/Shuttle wheel. Digital I/O via AES/EBU and SPDIF. Serial and parallel control interface. Inexpensive 3.5" MO disks offer stereo recording times of up to 60 minutes. Quick play, program play, fader start and varispeed functions. SCSI port for direct connection to workstations. Optional sample rate converter and rack mounting kit.



MR-30

MR-30 Professional MiniDisk Recorder

The MR-30 is the newest in Otari's line of digital recording devices. Using readily available MiniDisk media the MR-30 delivers 74 minutes of stereo recording time and 148 minutes mono. The "auto-cue" function which locates to signal start points and detailed editing functions makes the MR-30 useful in all phases of Broadcast Production. The MR-30 is also perfect for production of jingles and playback of sound effects. The MR-30 provides instant playback of up to 20 tracks per disk for on-air applications.

MR-30 Highlights

Auto-record function starts recording upon detection of input. Automatic track numbering. Up to 5 cue points per track can be written and edited after recording. Programmable playback of up to 25 tracks in fail-safe memory. Selectable SCMS. Adjustable end of track notification. Controllable via PC keyboard. Serial and parallel control interface. Optional sample rate converter.

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HE **DARED** TO GO THERE.



A Monitor Radio Comeback Ahead?

by S.D. Yana Davis

BOSTON The Christian Science Publishing Society, the nonprofit publishing arm of the Christian Science Church and publisher of the daily newspaper "The Christian Science Monitor," may return to radio or television. Company executives are thinking about their broadcast options, as well as a possible foray onto the Internet.

But the guessing game will continue a little longer as CSPS broadcasting executives play their cards close to the vest.

The latest foray into broadcasting by CSPS ended last summer when Monitor

Radio executives announced that their daily radio news service would leave the air June 30, 1997. About 200 public radio stations carried the service, as did two CSPS-owned international shortwave stations.

Approximately 70 newspeople, producers and reporters, based in Boston, Washington, D.C. and abroad, lost their jobs.

Money problems caused the cancellation of Monitor Radio, said Sue Schardt, CSPS director of strategic development/Monitor Broadcasting.

"At the end, it was costing about \$9 million a year to broadcast Monitor Radio. Underwriting sponsorships and (station) carriage fees were bringing in

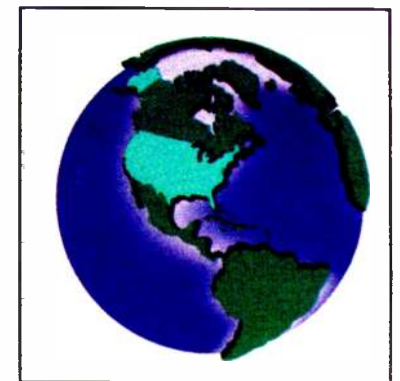
less than \$1 million a year. We did provide a valuable service, we feel, but that service was not financially sustainable."

Making money

"'Financially self-sustaining' is the mandate from CSPS for any new broadcast venture, which could include radio, television and the Internet, or a combination of those," Schardt said. "We are committed to some form of broadcasting, but want to do it right this time." But, she said, it was "unlikely" that CSPS would resume providing programs to noncommercial radio stations.

Schardt said CSPS hoped to announce

M O N I T O R



R A D I O

broadcasting plans soon.

Despite previous setbacks, Schardt seemed optimistic for the future. "This has been a rare opportunity, following the end of Monitor Radio, for us to sit back and say, 'Let's clear the deck and take a fresh look at things. Let's stop, pause and take time to carefully look at (broadcasting options).'"

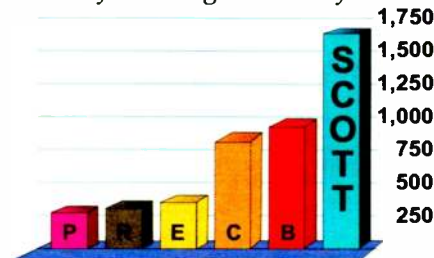
Monitor Radio was broadcast by many public stations to complement NPR's news magazines "Morning Edition" and "All Things Considered." The service was an hour-long roll-over news magazine service weekdays from 5 a.m. to 10 a.m. EST (broadcast as "Monitor Radio Early Edition") and again from noon to 8 p.m. EST (broadcast as "Monitor Radio Midday Edition").

We did provide a valuable service, we feel, but that service was not financially sustainable.

— Sue Schardt

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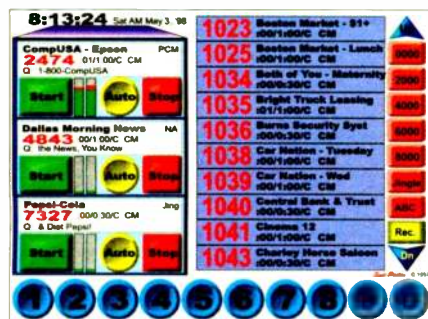
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8:15:38A Air 3:57 How Do I Live Leann Rimes :11/4:05/F HIT HM0105 8:15:47 #1 for 3 Weeks in Oct '97	Shotgun Jingle :03 4	Fast Jingle :06 4	Medium Jingle :12 4	Slow Jingle :14 4	Long Jingle :17 4
Start 3 Something About the Way Elton John :17/4:13/F HIT HM2608 8:18:40	Legal ID :11 4	Morning :09 4	Oldie Jingle :08 4	PSA Bed :30 4	Promo Bed :31 4
Start 3 Contest Promo Bed Instrumental :00/0:30/F PRO TO2214 8:22:42	Weather Open :40 4	Weather Close :04 4	Slide Whistle :02 4	Sports Bed :60 4	News Bed :12 4
Start 3 Short Jingle Q-102 :00/0:06/F JIN TO2215 8:23:02	Gong SFX :03 4	Drum Roll :10 4	Rim Shot :01 4	Traffic Bed :31 4	Weather Bed :13 4
Start 3 Help! Beatles :00/2:45/C 101 DA1234 8:23:08	Rooster Crows :04 4	Bugle Reveille :16 4	Woman Yawns :02 4	Contest Bed :59 4	Winner Bed :59 4
Start 3 McDonald's 2 for \$2 Q: ...may vary. :00/0:30/F COM DA4315 8:25:53	Don't Go There :02 4	Gong SFX :03 4	Happy Birthday :32 4	Applause :08 4	Wow! :01 4

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World Radio History

Flash Comm Turns to RDS Network

by Bob Rusk

MELBOURNE, Fla. Flash Comm is using RDS to build a nationwide network, using the 57 kHz subcarrier of FM radio stations to transmit out-bound messages, which will be an integral part of its two-way tracking and messaging system.

Targeted primarily at the transportation and public service industries, the network will allow real-time tracking of buses, trucks, trailers and railcars, as well as two-way messaging "at a fraction of the cost of any currently existing system," said Jim Rootsey, Flash Comm chief technical officer.

Flash Comm executives are contacting

FM stations throughout the country, looking to sign RDS subcarrier leases in almost every market; the company needs only one RDS lead in each market. All



stations that sign up will receive RDS encoders.

"We're starting our rollout in the southwest," said Bill Marriott, Flash Comm director of FM subcarrier operations. "We hope to be contacting stations

nationwide in large numbers within the next six months." Flash Comm has contracts with stations in Florida, Georgia, North and South Carolina, and Alabama he said.

"If stations already have RDS, we will upgrade their system," said Marriott. "Once the subcarrier is in place, we utilize its data capacity to send our data to trucks on the highway.

"We are using Universal Encoder Protocol and top-quality RDS equipment. That's important," said Marriott, "because a lot of the equipment now in the U.S. has limited RDS capability. We use full-feature equipment and can offer stations alpha-numeric paging or any of



A Flash Comm Satellite Dish at WYKZ(FM), Beaufort, S.C.

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the other data groups."

For stations that want to try it, Flash Comm also will provide alpha-numeric paging software and a pager.

"The strategy is to have at least three or four stations in a market interested, so we can pick the best one to fit our network," Marriott said. Flash Comm will choose stations based on two major factors: coverage area and cost of sub-carrier space.

"In a market like Atlanta, for instance," said Marriott, "we're talking about several thousand dollars a month. If one station is \$1,000 cheaper than another one, chances are we'll go with the station (that charges less), all other things being equal."

Marriott expects that compensation

There was absolutely no incentive for us to implement RDS on our own.

— Glenn Finney

rates to stations "will vary from \$300 in a non-rated market to \$10,000 a month in New York City." In the beginning, however, as the network grows, Flash Comm wants to trade the lease payments for a Harris Exciter.

"We may want the first year free, or the first two years free," Marriott said, "depending on the market size and the dollars we're looking at."

Stations will benefit immediately from Flash Comm's RDS package, he said, adding, "The constraints we put on stations normally aren't a problem. We give them the software so they can go in and change their call letters, change their format, (or) send out pages.

"They can also send out pages over the Internet, which is a feature we've just implemented. They would send an e-mail to Flash Comm, which would be automatically forwarded over our satellite link and (received) on the station's pager."

The stations also have the option to send out radio text with the equipment Flash Comm provides, but "their usage is limited," Marriott said. "We don't want them to do something like a Dow Jones ticker that uses up all the bandwidth. We make sure that the station has

See FLASH COMM, page 16 ►

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Building a Nationwide RDS Net

► FLASH COMM, continued from page 14 enough bandwidth to do typical things, (and) we use the rest of it.”

Jon Roberts, director of engineering at WAOA(FM) in Melbourne, Fla., which has signed on with Flash Comm, sees RDS as an “added value” for listeners. Of particular interest is the RDS traffic feature, which can automatically sense a traffic alert on a station and turn up the volume, even when the station isn’t tuned in.

Roberts said that RDS “probably has not been developed as a revenue generator, other than the fact that we will derive some revenue from the leasing of the 57 kHz channel.”

We utilize its data capacity to send our data to trucks on the highway.

— Bill Marriott

At noncommercial, religious WLPT(FM) in Jesup, Ga., and WGPH(FM) in Vidalia, Ga., signing with Flash Comm meant being able to

get technology the small-market stations likely would not have purchased.

“There was absolutely no incentive for us to implement RDS on our own. It would have made no sense for us to go out and buy an encoder,” said Chief Engineer Glenn Finney. “We think working with Flash Comm will be a good match for us.”

Flash Comm’s Marriott expects to hear similar comments from other broadcasters, as additional leases are signed. “We have constructed the deal to be very attractive to radio stations.” Additional information on the Flash Comm offer can be found on the company’s Web site www.flashcomm.com

BE Moves To Compete In Systems

by Paul J. McLane

QUINCY, Ill. Building on the success of its AudioVAULT, equipment manufacturer Broadcast Electronics Inc. has created a new systems division.

Its director, Ray Miklius, said the Studio Systems Division of BE is a manifestation of the “exceptional growth” of the AudioVAULT digital audio management line. Jeff Bemrose, manager of systems engineering for BE and a former director of engineering for SFX, was named to direct system engineering and turnkey installations under the new division.

Step by step

Miklius said the development of a turnkey unit was “a natural next step” for BE, in light of recent acquisitions of product lines. The company has entered into a partnership agreement with Lighthouse Digital Systems of Grass Valley, Calif., to exclusively market an audio routing switcher called AudioPOINT to radio customers worldwide. BE also has developed a new line of value-priced studio furniture, called StudioPOINT.

BE also has divided its RF Systems Division into two sectors: an RF Transmitters Group, headed by Product Manager Tim Bealor, and a new Studio Link Products Group, under Product Manager Steve Hannah. The latter group will include lower-power transmitters, RPU’s and STL’s. Both will answer to Rick Carpenter, who was promoted to vice president of RF systems for BE.

As part of those changes, BE said it now will include the Marti Electronics product line under the BE banner. Marti products will continue to be manufactured in Cleburne, Texas, and will continue to carry the Marti trade name. BE purchased Marti in 1994. Spokeswoman Tracy Rodman called the change a “repositioning” of the Marti product line, continuing its traditions of quality but associating it more closely with BE service and technology.

Marti changes

With Marti now treated as a product line rather than a separate business unit, Jim Godfrey, former president of Marti, will take over all distributed domestic and Canadian sales for BE.

BE has continued to acquire radio product lines, and is positioning itself as “the world’s radio company.” The company changed hands in 1997 in a management buyout led by former Heritage Media owner Jim Hoak. In late 1997, it acquired the GX440 and TalkPort product lines from Telfax Communications. Other recent additions include the Cellcast and Dolby STL product lines.

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NEWS ANALYSIS

FCC vs. Pirates: No Solution Soon

by Lynn Meadows

WASHINGTON Are they revolutionaries with antennas, people of action and ideals? Or are they madmen using electronics and technology to shake their fists at the federal government? For roughly \$700 and some audio equipment, you, too, could be one of them.

Many industry observers refer to them as radio "pirates." One FCC spokesman said the term is too glamorous. The commission prefers the terms "unauthorized" or "unlicensed" operators. They call themselves "micro-" or "community" broadcasters, and sometimes "pirates." The NAB calls them illegal.

Unknown numbers

How many are there? Because micro-stations are not licensed, an accurate count is impossible. The FCC does not keep track of the number of pirate forfeitures, according to John Winston, assistant bureau chief of the Compliance and Information Bureau. However, he said public and private sector complaints have increased over the past two years.

"In certain cases, some people have become agitated with it and might not like what they hear," Winston said.

NAB Executive Vice President, Legal and General Counsel Jeff Baumann reported at the association's Radio Board of Directors meeting last month that in the previous six months, seven pirate radio stations had been shut down by court action, and 90 more by letter or writs from the FCC.

Winston said that, when the FCC sends an official letter of warning, the unlicensed broadcaster will cease and desist 90 to 95 percent of the time.

The NAB Radio Board unanimously adopted a resolution expressing its concern with radio pirates (RW, Feb. 4).

Sanctions for an unauthorized operator range from administrative fines up to \$11,000, to criminal prosecution, to fines of \$100,000, to a year in prison and confiscation of equipment.

Paul Griffin, who works at Free Radio Berkeley, a micro station in California, estimated the number of micro-broadcasters to be in the hundreds.

"One's too many," said John Earnhardt, a spokesman for the NAB. "It's illegal."

"This is all about money," said Griffin. "These commercial broadcasters are so afraid that they are going to lose listeners to micro-stations that they will do anything to try and shut down this whole movement." He said he and others plan to demonstrate against the NAB during its spring convention in Las Vegas.

"We're opposed to monopolistic practices carried on by the NAB," Griffin stated.

Once legal

Griffin said he would like to see the FCC reinstate some sort of licensing procedure for low-power FM. He noted that low-power FM stations were legal up until 20 years ago.

True, said Winston, until the FCC was petitioned to review the number of stations operating on the FM band.

"It was becoming cluttered and had gotten to the point where a decision had to be made in the public good," he said.

In June of 1978, the FCC issued a freeze on the acceptance of new license

applications specifying less than 100 W effective radiated power. That was followed by a permanent rule issued on Sept. 1, 1978, barring acceptance of applications for new Class D stations.

According to its Web page on low-power radio (www.fcc.gov/mmb/asd/lowpwr.html), the FCC receives more than 13,000 inquiries each year from people who want to start low-power radio stations for local broadcasts. Unlicensed operation on the AM and FM radio bands is permitted for some extremely low-powered devices covered under Part 15 of the FCC rules. According to the FCC, these devices are limited to an effective service range of 35 to

100 feet. On the AM band, they are limited to 200 to 250 feet.

For licensed broadcast stations, the minimum power that an FM construction permit applicant may request remains 100 W. The minimum power for an AM broadcast station that an applicant may request is 250 W. Only in Alaska is it possible to get authorization for a new Class D FM.

FCC Chairman William Kennard tentatively has discussed the idea of establishing legal low-power FM stations (RW Feb. 4). The idea is being kicked around the Mass Media Bureau. There are several petitions for a rule

making on the issue on file.

"To the extent that an NPRM might give comfort to unauthorized operators, politically, the decision might be made not to open that can of worms," one FCC source speculated.

The lack of a legitimate outlet for micro-power broadcasters has stalled the government case against Stephen Dunifer, who founded the unlicensed Free Radio Berkeley in 1993.

On Nov. 12, 1997, U.S. District Judge Claudia Wilken denied an FCC motion for summary judgment against Dunifer for operating Free Radio Berkeley without a license. Her decision, seen in the industry as a big victory for Dunifer, was based on his argument "that relief should not be granted to the FCC because he cannot obtain a license to broadcast

See PIRATES, page 18 ▶

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World Radio History

Micro-Station Debate

► PIRATES, continued from page 17 under the FCC's regulations which he claims are unconstitutional."

More recent arguments between Dunifer and the FCC reiterate the same points.

"Yes, we should apply for a license," Griffin wrote in an e-mail to *RW*, "but the FCC has made this nearly impossible for anyone except the conglomerates that currently are buying up all the media in the country. Micro-stations are trying to make a point by practicing what we call 'electronic civil disobedience.' That is, when the laws make no sense, it's time for ordinary citizens to stand up and publicly break those laws and challenge the laws in court."

Users of the Internet will find plenty of

material written by micro-broadcasters. Some believe that their right to broadcast is akin to a right to free speech. The U.S. Supreme Court, however, several times has upheld the position that denial of a broadcast license is not equivalent to denying a person's right to free speech.

In 1969, for instance, in *Red Lion Broadcasting Co. vs. the United States*, the Supreme Court stated, "Where there are substantially more individuals who want to broadcast than there are frequencies to allocate, it is idle to posit an unabridgeable First Amendment right to broadcast comparable to the right of every individual to speak, write or publish."

Other micro-power broadcasters/



Members of Radio Free Allston are shown during live coverage of the Allston-Brighton parade.

pirates argue about the need to serve a community. They conjure up images of a radio industry where the local grocer or dry cleaner can afford to buy time and

ordinary citizens can get on the air.

Radio Free Allston, 20 W on 106.1 MHz, is an interesting example. First on the air in March of 1997 and ordered off the air in October, the station was endorsed during its brief life by the Boston City Council.

"Whereas the Federal Communications Commission has not made broadcast frequencies available for community use and therefore will not license such stations therefore be it resolved that the Boston City Council supports the right of Radio Free Allston to acquire non-profit status and thus qualify for grants and tax deductible contributions," reads the resolution, dated Aug. 20, 1997.

"Every station has a different attitude about why it exists," said Steve Provizer, founder of Radio Free Allston. "Ours is to provide a broad participatory platform for all voices in the community."

Asked how he rationalized starting something illegal, Provizer said, "I didn't have to rationalize it. I think there is such a thing as civil disobedience for rational reasons." He cited sit-ins at lunch counters in the South as an example.

Before he started the station, Provizer visited local civic organizations to tell them what he wanted to do and explain that it was not legal. He said the leaders of those groups did not care, as long as the station served the community. The unlicensed station was the only media outlet to cover the Boston City Council at-large candidates' forum in Brighton in October. Radio Free Allston also broadcast live from the Allston-Brighton Parade last year.

Radio Free Allston has a legal team that includes the American Civil Liberties Union, and plans to fight its case. In the meantime, Provizer is working to get legislation introduced at the state level to support his cause.

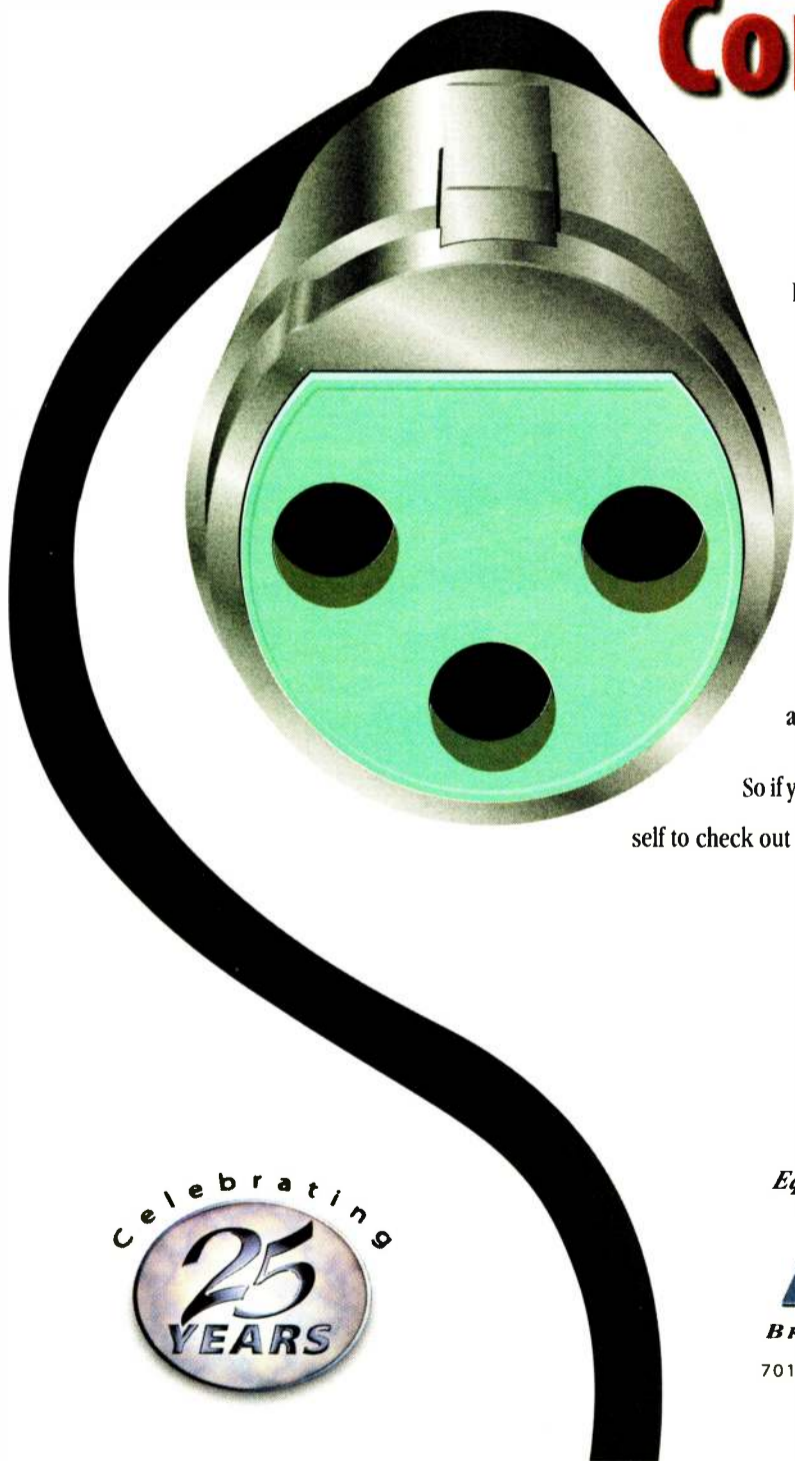
Not everyone who uses the airwaves without a license shares the goals of community broadcasting. Winston said the FCC has dealt with incidents in which an unlicensed operator intentionally interfered with air traffic communication between pilots and air traffic controllers.

Provizer acknowledged a policy at Radio Free Allston that ran counter to other FCC rules. "In our case, we made a group decision saying if there was a serious discussion of an issue going on, we would never tell people not to use difficult language," he said. Otherwise, what he called "difficult language" was aired after 11 p.m.

Winston said that, in the time of an emergency, anyone listening to a pirate broadcaster would not receive EAS warnings of weather threats or national emergencies.

Without stop-gap measures against unauthorized broadcasters, he said, the airwaves would be as chaotic as Times Square would be at 7 a.m. just after the mayor repealed all traffic laws. He stated that his bureau must enforce the laws as they now exist.

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Weak RDS Worries Proponents

by Lynn Meadows

LAS VEGAS Fewer radio stations are using RDS technology, and that worries members of the RDS Advisory Group. It met during the Winter Consumer Electronics Show in January.

"The most important factor discussed was the decline in the number of stations (using RDS) and how we could collectively deal with it," said Scott Wright, member of the advisory group and project engineer for Delco Electronics. "Since many products are now available, even more so since we saw new introductions at CES, we must convince broadcasters that the time is now."

No official count of stations using RDS exists, but Wright said a look at any of the top markets shows the decline is around 50 percent.

The Radio Data System is technology for transmitting data on the 57 kHz sub-carrier of FM stations. Operating at 1,200 bits per second, RDS met with disinterest among broadcasters when it was introduced in the United States in 1993.

Switching signals

Among its features, RDS uses a "program type code" to help listeners switch to the best signal transmitting their preferred format, whether news, rock or classical music. That feature has made it popular in Europe, with its national networks.

Manufacturers have a vested interest in getting more stations to use RDS. Wright said. Proponents now hope to go market by market to show broadcasters what RDS can do for them.

"Exactly how we do that is yet to be

discussed," Wright said. He hopes to get the Consumer Electronics Manufacturers Association involved. A CEMA spokesperson said the idea was being discussed.

Three years ago, CEMA sponsored a program in which RDS equipment was distributed free to broadcasters in the top 50 markets who agreed to use it. At the time, some broadcasters refused the equipment. Some argued that there were not enough receivers available and no one would see the data. Others, like the CBS Group, said they wanted to wait until an AM RDS standard was developed.

Many more RDS receivers are on the market now. At the meeting, Wright discussed the addition of RDS to several car manufacturers' receivers. Ford will ship around 350,000 RDS-equipped vehicles in 1998 and 600,000 next year, he said.

Kenwood, Pioneer, Denon, Alpine and Clarion offer RDS receivers. RDS encoding products are made by Circuit Research Labs, Modulation Sciences, Rohde & Swartz and Tectan. Some offer paging capability and on-the-fly message changing capability. Most retail for over \$1,000. Inovonics offers an endcoder that retails for about \$400.

"What is hoped is that all manufacturers of radios will work with local retailers and broadcasters market by market to coordinate the rollout of RDS," Wright said. "This will ensure the availability of receivers as well as the availability of broadcasters in a given area. Plans are for a core group to work on this following CES."

The group also discussed a new self-certification program to be administered

by CEMA. For a registration fee of \$100 per year, a manufacturer can put the RDS symbol on any of its RDS equipment that it certifies to be compliant with the standard.

Updated standards

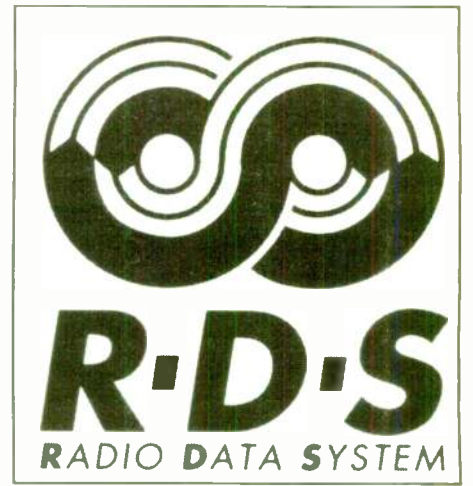
The RDS Advisory Group is concluding a project to coordinate the European and American RDS standards. Two new program types are being added, one for "weather," and one for "college" that college stations can use. Wright said many receivers are being designed to respond to dynamic changes in program types.

A station can use the "weather" code, for instance, when the announcer begins the forecast. Some receivers can now be programmed to interrupt a CD or cassette when the weather (or news or sports) program type is transmitted via RDS from their radio station.

The new standard will also make 11 of the 32 data groups that make up RDS available for Open Data Applications.

Anyone with an idea for a data application will be able for an "Application Identification Code," a four-digit hex code. They then can program whatever they like to be sent to various receivers.

One use of Open Data Applications is in conjunction with the Emergency Alert System. The FCC recommended that stations use RDS in conjunction with EAS. In this way, when a receiver detects an EAS warning on the station it



is monitoring, it will turn itself on.

The Open Data Applications could be of interest to broadcasters for a number of applications. Wright said a station could make money by leasing out the bandwidth to the developer of an Open Data Application, or could develop a data service itself.

The Open Data Application, he said, "really gives the RDS standard a long life," because users can develop applications based on their own needs.

The new backward-compatible standard likely will be accepted this quarter.

Participants at the meeting also heard a presentation by GEODE ELECTRONICS Corp.

The company proposed to enhance RDS with technology called Color Radio, which would let designers generate color screens, variable sized fonts, and line graphics for an elegant presentation of RDS data.

Richard Sampson: A Life Dedicated to Broadcasting

by Lisa Romanello

EL CENTRO, Calif. Colleagues remember Richard Sampson as a man who built several radio and television stations and who dedicated most of his life to broadcasting.

Sampson was 85 and still working as chief engineer at KXO-AM-FM in El Centro, Calif., when he died of cancer on Dec. 24, 1997. KXO General Manager Gene Brister said Sampson grew up in the business. In the early 1930s, Sampson put the first radio station in Jerome, Ariz., on the air.

Brister said, "Dick was from the old school. When they went to school, (they went) not just to learn how to replace integrated circuit boards, but to learn principals of electronics. They really understood how to make a radio transmitter, how electronics function."

Brister described Sampson as one of the last of his kind in the industry.

KXO Vice President Carroll Buckley, who knew Sampson for 26 years, agreed. In 1971, Buckley became news director at KECY-TV in El Centro. Sampson led its studio construction and was chief engineer. Buckley said Sampson was down to earth and practical in his approach to engineering.

"He was loathe to buy a new piece of equipment when he could fix the one that was there," Buckley said.

Buckley recalled how he went to Sampson for help when he wanted a crawl to roll the credits over his one-man newscast, but didn't have the budget to buy one. Buckley said they made a crawl with two coffee cans, black construction paper and a plastic label-maker.

"It was way beneath Dick," he said, "but he got a real kick out of it because it was someone else trying to do a professional job and make things look good."

Buckley said Sampson also could explain things so that a non-technical person could understand, including modern computer technology. Buckley said, "Dick was one of a kind ... not a typical lug wrench-type technician, but a true engineer. He was doing it for the love of broadcasting."

Sampson was raised in Riverside, Calif., where he attended Riverside City College and radio engineering school. In addition to KECY-TV, he is credited with overseeing the purchase of equipment and managing the studio construction of several California stations: the former KCSB(AM), now KCKC, in San Bernardino,

See SAMPSON, page 20 ▶

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GP-3	3	6,000W	1.5	\$1,900
GP-4	4	6,000W	3.4	\$2,600
GP-5	5	6,000W	4.3	\$3,150
GP-6	6	6,000W	5.5	\$3,700

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Model	Bays	Power	Gain	Price
SGP-1	1	4,000W	-3.3	\$690
SGP-2	2	8,000W	0	\$2,690
SGP-3	3	10,000W	1.4	\$3,595
SGP-4	4	10,000W	3.3	\$4,500
SGP-5	5	10,000W	4.1	\$5,300
SGP-6	6	10,000W	5.2	\$6,100

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HSSC Field Tests Are in Dispute

by Bob Rusk

LAS VEGAS An ongoing dispute is holding up the effort to establish a voluntary standard for high-speed FM data subcarriers. The disagreement centers on field-test data compiled by the National Radio Systems Committee.

According to Digital DJ Inc., the data contain discrepancies.

Digital DJ is one of three companies that have submitted high-speed subcarrier systems to the NRSC for evaluation. DDJ voiced objections at the recent committee meeting here, held during the Consumer Electronics Show.

"We are not going to approve the field test (results) as they are," said Philip Moore, Digital DJ Senior RF Systems Engineer. "They did the field test pretty hastily."

Specifically, Moore charged, "There was not enough documentation on the field test. (There were) calibration flaws. There is just no telling what happened during the actual field test without redoing the test."

In asking the NRSC to redo the field test, Moore said, "We paid for the test. We expect them to do it properly."

But David Layer, senior engineer, NAB Science and Technology and NAB staff representative to the NRSC, said it is unlikely that the field test would be redone. The NAB, a sponsor of the committee, "would have a hard time getting behind additional testing," he said.

Much of that reluctance, Layer said, is because Digital DJ has been unable to convince the subcommittee of any flaws in the test.

"More than one subcommittee member (has) asked Digital DJ to offer some concrete, quantified evidence that the test results were flawed, for example, by comparing packet error rates obtained under this test effort with their own inter-

more or less in agreement."

Digital DJ could strengthen its case, Moore said, if the company could conduct tests on its own. But, he said, Digital DJ lacks the necessary equipment.

"Putting that aside," Moore said, "if you just look at the tests that (the subcommittee) left out that have to do with main channel compatibility, they don't have any data. They just left it out. They

Marshall said it is essential to have just one standard covering the entire country for the effective transmission of traffic data.

nal data and highlighting a discrepancy," Layer said.

Layer said, "This is typically how questionable test data is identified, by comparing it to predicted or simulated results. However, Digital DJ could offer no such data. Their objections could not be substantiated in this manner, and many subcommittee members felt that the absence of quantified errors significantly weakened Digital DJ's position."

Layer said Mitre Corp., another proponent of high-speed subcarrier systems, "has offered many examples of this type of comparison for their system and shown that the NRSC test results and Mitre expectations are

did this without checking with the committee and didn't follow their procedures regarding calibration."

Layer disagreed.

"I don't think that anything improper was done," he said. "We stand behind our test crew. The test crew has a certain amount of latitude to make minor changes to procedures, as they see fit."

Progress

Despite the stalemate between Digital DJ and the NRSC, the other proponents, MITRE and Seiko Communications, made progress at the January meeting. The 67 kHz-compatible versions of the MITRE and Seiko systems were accepted into the NRSC record. (There is not a 67 kHz-compatible version of the Digital DJ system.)

"These results, along with the original laboratory data test results presented last February (1997) — which have also been accepted by the subcommittee — form a solid basis for technical comparison of the systems," Mitre Consultant Jim Marshall said.

Once the lingering data test issues are resolved and the NRSC can move forward, one possibility is that MITRE and Seiko could join forces.

"Seiko proposed to the NRSC a system which would permit multiplexing of our system," said Gary Gaskill, director

of systems architecture for Seiko Communications. "That is a real possibility. It has the potential to allow for a standard that could fulfill most of the needs of the applications for FM subcarriers."

Marshall said although MITRE does not support the Seiko proposals specifically, in general the creation of a "hybrid waveform that uses a variety of coding/interleaving/duty factor options riding on a single modulation would allow a diverse set of applications to be well served."

The disadvantage of such a hybrid approach, he said, "is that there is no hardware for these new waveforms and testing has not been done on the new feature sets."

"Developing such a hybrid could be attempted either by the subcommittee directly, or, if a new proponent enters the fray or two or more existing proponents get together, a new waveform could be submitted to the committee for consideration."

The MITRE proposal was designed as an FM subcarrier-based traveler information system. Such a system could be used by the Federal Highway Administration for the broadcast of traffic data to vehicles on highways.

Regardless of which high-speed subcarrier system might ultimately be chosen, Marshall said it is essential to have just one standard covering the entire country for the effective transmission of traffic data.

"It is hard to tell which direction (the subcommittee) will take, given the politics of the subcommittee," he said. "However, from the point of view of the Intelligent Transportation System community in general, and FHWA in particular, a national standard for ITS data is an absolute necessity; so an NRSC standard is highly desirable. (But) in terms of ITS needs, the process has taken much too long already. I expect that if a process does not move forward more quickly in the near future, high-speed FM subcarrier standardization to support ITS applications will be moved to a new venue."

"This would be unfortunate for the broadcasters, since their input is very important to the process."

More participation in the subcommittee would be helpful, Marshall said.

The discussion will continue in April, when the NRSC meets during NAB '98 in Las Vegas.

'A True Engineer'

► SAMPSON, continued from page 19

KMNY(AM), Pomona and KICO(AM), Calexico. Brister said Sampson also traveled overseas and worked in Guam. He is survived by his wife and three children.

Sampson's colleagues remembered him as a kind man with a marvelous, if dry, sense of humor. Brister said up until about five years ago, Sampson still climbed a 500-foot TV tower regularly.

Buckley explained, "If a light went out he (Sampson) thought nothing of trucking on up there to replace it. He looked disappointed when I finally asked him to let someone else do the climbing. I told him he was too valuable."

"Dick Sampson probably has forgotten more in his lifetime than a lot of engineers ever learn," he said. "Radio and television will miss him."

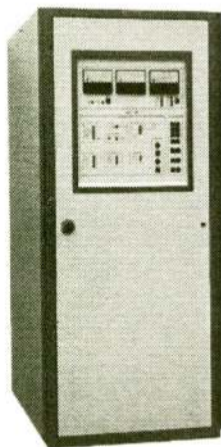


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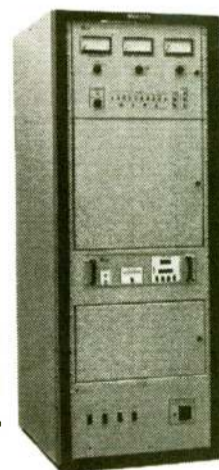
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New IBOC Proponent Emerges

► IBOC, continued from page 1

"There is (now) another serious player attempting to solve the problems of IBOC. (DRE) has gotten a long way in their system, to the point where they did show an exciter and a receiver."

Miller said, "What we showed was a pseudo-FM radio station." The equipment included a Broadcast Electronics FX-50 Exciter, an Orban stereo generator, a Telos Systems Zephyr audio codec, a Denon Electronics CD player audio source, a Cutting Edge Omnia audio processor and a conventional FM receiver.

"The level of integration that we have achieved in both the exciter unit and the receiver unit is extremely impressive," said Miller. "We have the exciter unit built with field-programmable gate array implementation. The bottom line is, no further integration is required. This unit could be transferred into production in a (few months), which would allow broadcasters to bring this up on the air at the appropriate time."

DRE has a strategic alliance with TriTech Microelectronics, a major semiconductor manufacturer that is underwriting a substantial portion of this effort, Miller said.

In the planning

"In addition, an alliance with Telos (Systems), who would be manufacturing and supporting the DRE exciter unit at the broadcasters' site, is being planned." Telos would provide a compression algorithm, much as Lucent Technologies is doing for USADR.

Telos President Steve Church said, "We are hammering out details of an alliance now, and expect to have an announcement within the next few weeks."

"The DRE system performs superbly in the lab," Church said, "and the demonstration is very impressive." He said the staff at DRE "are probably the sharpest to

have gone after the IBOC problem, and it seems they have invented something that will finally get digital radio happening in the USA.

"We look forward to formal testing and field trials to be sure, (but) at this point we're pretty enthusiastic."

Laird of Heritage Media said one of the biggest problems with IBOC has been "being able to get product to a receiver manufacturer." He termed the DRE alliance with TriTech and the likely alliance with Telos "a biggie."

DRE has "been able to take all the input from the previous testing, where problems were found, and come up with a solution," Laird said. "What we saw looked viable. I came from (the demonstration) with the impression that they have something that broadcasters are really going to want to check out."

Field tests

DRE now will move forward with field testing of its FM IBOC system, Miller said, "to demonstrate the performance of the system to the satisfaction of broadcasters, transmitter and receiver manufacturers, and spectrum regulators, most notably the staff and administration of the FCC."

DRE, Miller said, has also designed "in concept" a similar system for use in the AM band. The company said it expects to have an AM prototype available in the second quarter of 1998. USADR already is working on both AM and FM DAB systems.

The DRE system was designed under the technical direction of Vice President of Engineering Derek Kumar, who is not new to the DAB research front. According to sources at USADR, Kumar worked previously for Electronic Decisions Inc., which had been a subcontractor to USADR. The latter organization then purchased the EDI intellectual broadcast property, and scrapped the FM IBOC system Kumar designed at EDI.

Rick Martinson, project development manager at USADR, had little to say about the new competing DRE system. His only comment: "We are building a complete system," an apparent reference to DRE's lack of an AM system to date.

Glynn Walden, the director of engineering for CBS Radio who is working closely with the USADR research team, described what DRE is doing as "an FM demonstration."

More About DRE

In a letter to the NRSC DAB Subcommittee, DRE states that in-band, on-channel terrestrial broadcasting in the existing AM and FM frequency bands is the preferred approach to implementing DAB. But IBOC DAB, it said, represents an extreme technical challenge because of the limited available bandwidth, difficult interference conditions, and low tolerance to bit errors.

Digital Radio Express has developed patent-pending proprietary technology which "addresses the known deficiencies of previously demonstrated IBOC

"We're not just doing demonstrations. We've done demonstrations," Walden said. "We're building a real system, totally integrated AM and FM. We've never demonstrated FM without AM. We're broadcasters and there is no solution without AM."

Additional information on the DRE system design will be made available in April, at NAB'98. The company will have an exhibit in the Special Technology area and will present two technical papers at the NAB Broadcast Engineering Conference.

The NRSC has reactivated its DAB Committee. See page 10.

systems," said DRE President Norman Miller.

The core DRE technologies include trellis coded multiple carrier modulation with time and frequency diversity, fault tolerant multipath equalization, fully independent and redundant sideband processing, hierarchical forward error protection, and advanced post-detection diversity combining.

According to Miller, the DRE communication technologies are combined with advanced Moving Picture Expert Group audio compression to deliver near CD-quality stereo at bit rates up to 128 kbps.

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2	X +	15:01:50		RADIO	00:14	AUDIO	RadioWAVE! Jingle
3				CONGA	00:11	AUDIO	CONGA - Gloria Estefan
4				EURO	00:15	AUDIO	European Jingles
5	X +	15:01:49		HARVEY	01:30	REC	Paul Harvey News
6	X +	15:01:49		WINNER	00:13	AUDIO	Emping Industry Music

Event #2: 15:01:50 - Playing WaveFile: c:\b\audio\radio wa...
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Freinwald on EAS, Industry

► FREINWALD, continued from page 1
Seattle/Tacoma area in 1957 and began his radio/TV career there in 1961. He has been with Entercom-Seattle for a year-and-a-half; earlier, he worked for Viacom for 10 years.

Freinwald spoke to RW's Brian Galante.

RW: 1997 was supposed to be the shake-out year for the Emergency Alert System. Are the bugs worked out or does the system have a ways to go before it's reliable?

Freinwald: Is it 100-percent reliable? ... No. Will it ever be bug free? I think it will, but remember, EAS is, in our country, put together in about 50 different ways. The commission set out specific guidelines in their rules about how EAS functions and then gave them to each state to create their own system. ...

In Seattle, we're creating a rather robust system that is, quite frankly, probably much different than anywhere else in the United States. We're fiercely proud of the way that EAS is going here in Seattle and the state of Washington.

There are, however, other areas of the country that don't have any EAS or state program. What is very, very dangerous is for anyone to think that EAS means the same thing everywhere. It does not.

RW: What problems are station engineers telling you they still have with EAS?

Freinwald: The biggest problem they're having in this area is understanding the complexities of the EAS equipment. We find station engineers still trying to figure out how to program filters and how to program their encoder/decoders so they will respond in the proper way.

EAS innovation

RW: As you've been a key person for setting up the local relay network in Washington state, please describe what the stations there did ... taking us through the path of the audio alert.

Freinwald: EAS can be thought of as four bulletin networks. There's the National Bulletin Networks, which means the EANs or when the White House wishes to speak to the country. This is currently distributed to all the different states via the primary entry point (PEP) stations.

The second aspect of EAS is the NOAA Weather Radio. The weather service is an integral player in EAS and is the second source of EAS programming. The third one is the states. Of course, this varies from state to state, but here in Washington we have a state origination point, which is an emergency operating center, or EOC. This is the source of the state of Washington's information. Finally, the fourth category is the local area.

In the case of network number one, KIRO(AM) Seattle is the primary entry point for EANs. They are broadcast to the greater Puget Sound area on KIRO, which is 50 kW on 710. That covers a lot of territory, but not the entire state. The station is monitored at the state EOC and then is input into the State Relay Network. This allows the EAN to be broadcast to virtually the entire state of Washington simultaneously.

In the case of NOAA Weather Radio, there are four forecast offices that NOAA operates. They are located in Seattle,

Portland, Spokane and Pendleton, Oregon. These four offices output into NOAA Weather Radio transmitters, covering the majority of the state, and certainly the populated areas. Our EAS program involves NOAA to a significant extent.

The third system is the State Relay Network, a system that is somewhat unique to the state of Washington. It consists of the state EOC and a microwave system that allows the state EOC to address mountaintop transmitters all over the state that are on a VHF frequency. With this, the state can transmit EAS messaging using standard EAS equipment to any combination of these mountaintop transmitters.

Since literally every broadcast station in the state can receive one or more of these mountaintop transmitters, we can

distribute the EANs as well as any state bulletins.

Our state is topographically divided into two distinct zones, western and eastern Washington. We may have an occurrence that involves only the eastern or western side of the Cascade Mountain Range, or at other times one that involves the entire state. For example, if Mount St. Helens decides to spout off again, we can reach the entire state.

Finally, the Local Relay Networks function in an entirely different way. We modeled the state network and developed a system in each EAS area of distributing EAS information locally. Herein lies the problem. The central Puget Sound area, or metropolitan Seattle, consists of six counties. Whether they're 911 dispatch centers, sheriff's offices or emergency centers, there's about 25 organizations within these counties that make inputs to the Local Relay Network.

What we needed was an electronic method whereby any one or combination of these entities could get into the electronic media — radio, television and cable systems. What we've created is a very simple UHF repeater system that enables all these offices to simultaneously reach all sources of electronic media instantly.

We can conceive of no other way to make this happen. The thought of local primary stations set up by the commission is almost a laugh, a failure from the get-go. Local primary stations are not about to let their broadcast stations become a relay source for everybody's emergency alert. It would do nothing but clog up the airwaves. Broadcasters are interested in public service, but not to the point of allowing their radio stations to sound poor just so some other station can receive the information. That's why we created the Local Relay network, which is what makes Washington's EAS plan quite different from the others.

RW: As a group engineer of five stations, how has consolidation affected your job?

Freinwald: I am significantly more busy. ... I find that 75 percent of my work now

is on desk, and the rest of it is involved with hands-on.

What I do is probably different than what the average bear does. In addition to managing personnel, approving payments for everything and handling all of the finances and purchase orders, I'm involved with antenna site management. The company operates a pretty-good-sized broadcast combined facility in a place called West Tiger Mountain. I'm also the site manager for that facility. ...

Entercom-Seattle consists of eight stations, divided into two different camps — the music group and the talk group. The talk group is KIRO(AM), KIRO-FM and KNWX(AM). They're located in a studio complex in the downtown Seattle area. Our other group I'm involved in is KBSG-AM-FM, KNDD(FM),

KMTT(FM) and KISW(FM).

Of those five, every station has a standby transmitter site at a different location in addition to the main transmitter site. We have about seven or eight different transmitter sites in this group alone, not to mention our studios, which are in three different ones in downtown Seattle. If an insurance inspector comes in and wants to see everything, you'll probably put on about 150 miles. We're working on getting these sites consolidated.

RW: What are the most interesting products you've seen as of late?

Freinwald: We just got a bunch of the 360 Systems Instant Replay systems, a couple of digital audio workstations and a Comrex HotLine codec for remote broadcasting. They're the most interesting products right now, and that's what we're buying.

We recently purchased two DAWs, a ProTools and an Audicy. This equipment joins several other DAWs operated by Entercom-Seattle: several VoxPro three Session 8s, a PR&E ADX and several Orban DSEs.

People shortage

RW: What is the most pressing problem station engineers are telling you about?

Freinwald: The biggest concern right now is trying to find people who work in this industry. We have a critical shortage. The last time I checked the Society of Broadcast Engineers job line, there were 10 pages of help wanted ads. I know we have a couple of job openings here, and I've been turning over every rock I can find.

I've discovered that the young fellows working in a smaller market aspiring to move to a larger market, which was the norm years ago, are gone. We're at the point now where we're forced to go into other industries, like home entertainment repair, to find people to work in our industry. Everybody here is looking for people.

RW: How did you get into the business?
Freinwald: I got into the business, like most people, by accident. I moved to the

Tacoma, Washington, area and got involved in a vocational training program in high school. It turned out that their electronics program was oriented toward broadcasting. The high school actually operated an FM broadcast station, and some electronic broadcast programs were oriented toward that way. They had KPCS(FM) and a ham radio station, W7SBZ, which incidentally allowed me to get involved in amateur radio. They are both since long gone, but the amount of influence was considerable.

RW: Whom do you admire in radio engineering today?

Freinwald: The people I admire are the folks that are able to stay on top of the industry, the multiple broadcast clusters. I certainly admire our director of engineering, Marty Hadfield. He's been blessed with working for a good company that is technically oriented and able to take advantage of technical innovations, see the opportunity and go with it in a hurry.

Getting started

RW: How do you recommend people starting out today get to where you are now?

Freinwald: I started by hanging out at the local TV and radio stations asking when they work on the equipment and if it was okay to watch. Today, you just don't find that happening. In fact, there was a television station here in our area had a policy of only hiring people who were hams. I came to find out they did that because those were the people who had a genuine interest in electronic communications on a personal level and not just on a professional level. They took a real sincere interest in what they were doing. We've lost that dedication to craft that we saw before.

RW: What do you suggest for engineers who are out of work? What types of jobs can their skills allow them to transition to?

Freinwald: I can't imagine that anyone who is any good in this industry would be out of work. If you are out of work, then you need to get to school. Two things you need to do if you are out of work: one, get into a program that teaches you how to repair electronic equipment, and number two, get involved with computer systems.

RW: What facility upgrade projects are in the works for your group?

Freinwald: We've done three projects as of late. One that is ongoing is the upgrade of our West Tiger Mountain facility, located east of Seattle on a mountain peak 3,000 feet above town. We'll be installing the 10th FM station up there at the end of this month, weather permitting. That's certainly the largest combined facility anywhere around here.

Right after that, we're moving one of our radio stations so that the studios will be on the same floor as another one of the radio stations that's in a separate building a mile away. The latest state-of-the-art equipment will be going in there.

Following that, we'll be building another combined FM facility that will allow us to consolidate all five of our old FM stations so that the standby facilities will all be in one place instead of scattered all over. That will be another master antenna combiner system, and it will probably occur in the summer or early fall. This year is certainly packed full of construction problems for us.

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DX-Peditions: Hobby Can Pay Off Nicely

Mark Durenberger

In the Nov. 26, 1997 issue, I wrote about resources supporting the re-emergent interest in medium-wave (MW) DXing, and suggested you may wish to evaluate this avocation.

An understandable early objective of any new hobby is meaningful return from a minimal investment, so you can decide whether DXing is a pursuit worthy of your time. You can approach MW DXing with the expectation that, if you follow certain reception guidelines, you will get solid results. The unexpected additional reward will be the sudden appearance of a signal you never expected to hear, courtesy of unpredictable propagation.

Successful DXing depends on good information and proper equipment. The information resources are available through the Web, as noted in our previous article, and in the publications of the International Radio Club, the National Radio Club and others. Propagation forecasts can be heard through the shortwave facilities of WWV, the radio station of the National Bureau of Standards.

Let's talk about the equipment, in particular, the tradeoff between antenna performance and receiver cost.

In DXing, it is a fundamental truism

that by getting more from the antenna, you need less help from the receiver. You can spend a lot for selectivity and sensitivity in a receiver, but you can also earn enhanced performance right at the antenna by putting some thinking into the antenna system. This tradeoff makes the hobby rewarding, because the antenna is one component in which you are rewarded directly for good engineering work.


Location is everything

Three popular types of MW DX antennas are active (amplified) whip antennas, tuned/active loops and the several variations of long wires. Your listening location may have everything to do with the type of antenna you can use.

If you do not have room to spread out, whip or loop antennas may be the best choice. Neither uses real estate; used properly, both can be effective. They can stand on their own or, by electrically phasing a whip against a loop, you can create a receive array that is highly directive and sensitive, yet immune to local noise.

If you are forced to choose between the whip and the loop, you probably will choose the loop. Loop antennas not only are bidirectional, but have inherent noise-rejection characteristics compared to

See HOBBY, page 27 ▶

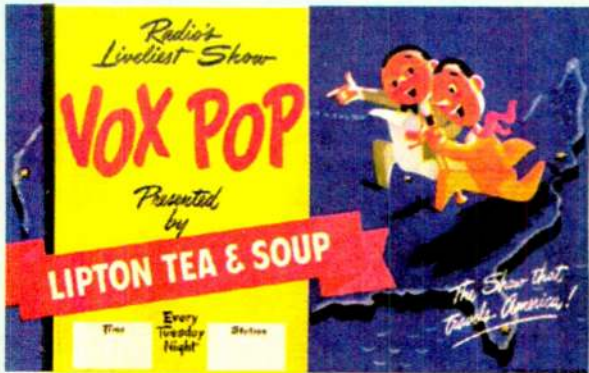


RADIO CHRONICLE

"Vox Pop," which got its name from the Latin for "voice of the people," was one of the first "man on the street" radio interview shows. In 1932, Parks Johnson and some of the staff at KTRH in Houston decided to hang a microphone out of the window of their Rice Hotel studios and talk to some "average citizens." The idea caught on quickly, and by 1935, Parks was on the air nationally for NBC.

Flash forward to 1947. The new sponsor, T.J. Lipton Inc., did not think its products got enough attention on the program and insisted that each guest (as many as six per show) be presented with a box of Lipton products.

Johnson, sole owner of the show, did not like the tactic, and after negotiations failed he took the unusual step of firing his sponsor. Many a radio performer had been fired by a sponsor for low ratings, but never had a performer fired a sponsor! Newspapers



around the country picked up the story. Johnson was hailed as a "radio knight," a man of high moral principles who refused to compromise. The favorable publicity meant "Vox Pop" had little trouble finding a new sponsor, and the show continued until 1948 for American Express.

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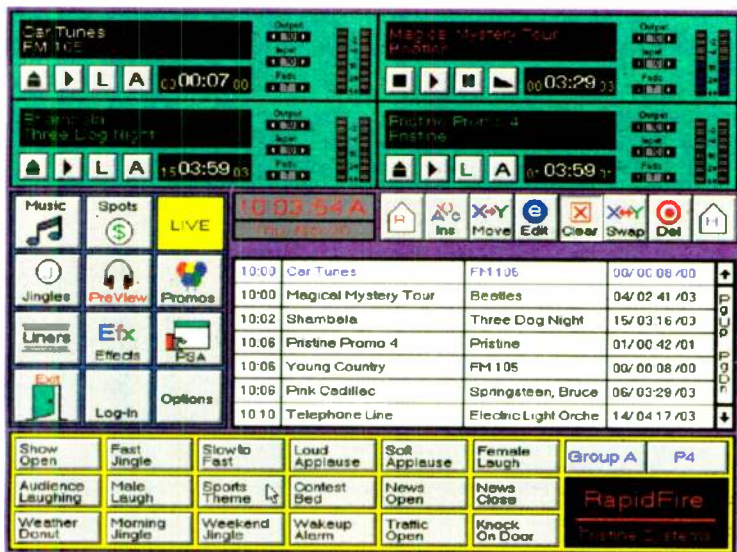
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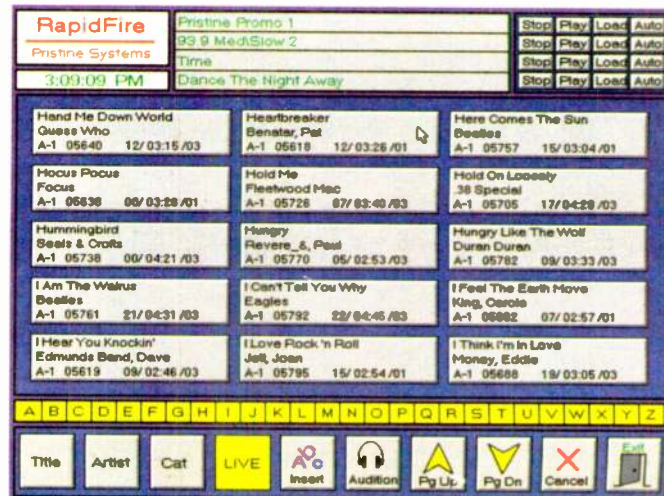


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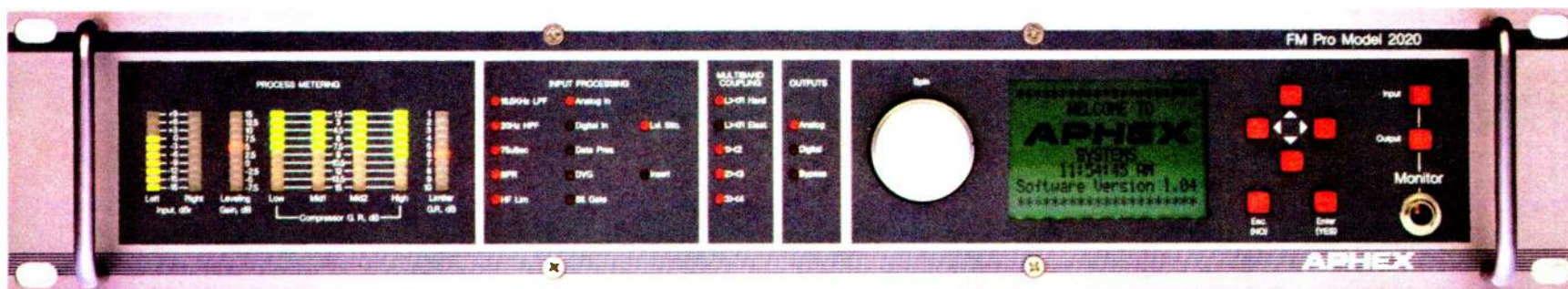
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DXing Considerations

► *Hobby, continued from page 25*

whips or short wires.

Loop antennas are a basic component of the "road kit" most DXers carry in their vehicles. A good loop and some accessories may be all you need for the majority of your DXing. Armed with this simple "car pack," you quickly can escape a noisy environment to do some serious DXing with minimum effort.

If you have a limited budget, you can even use the car receiver to capture MW stations on 10 kHz spacing. Few AM car radios receive quality signals, but an amplified antenna in front of those radios can do wonders. I use the Kiwa Pocket Loop and regeneration module with the new Kiwa car-coupler. This combination can make a dumb car radio actually work like a respectable receiver!

Loops vs. long wires

One skywave bounce is about all a typical medium-wave AM signal can tolerate before it is absorbed. A single-hop, high-angle signal will excite a loop antenna quite nicely, and the active loop's "Q" and pickup pattern will provide a degree of selectivity and directivity.

But if you want to do long-distance listening, you'll probably need an antenna with a low acceptance angle, because the single-hop signals you seek may be arriving from near the horizon. This is where Beverage antennas come in.

A Beverage is a simple long wire, on the order of a wavelength or so. On the MW band, a Beverage should be 1,200 to 1,800 feet or longer. The Beverage pickup pattern is essentially a "figure 8," with side-lobe performance depending on length and other parameters.

"The longer the better" is an acceptable rule with Beverage antennas, although you will hit a law of diminishing returns beyond a few thousand feet. You also can go shorter than the recommended minimum, but you may sacrifice directivity and noise performance.

Beverage antenna deployment is not really demanding unless you are trying for the Nth degree of perfection. A spool of 18-gauge stranded insulated wire will do fine. There are differing schools of opinion as to whether Beverages can lie directly on the ground. A lot of hobbyists feel that is fine, as long as the wire run is reasonably level and you can preserve the

straight-line path of the antenna.

At the receiver end, you can match the antenna to the input of the radio, through a toroid arrangement. At this transformer you can depart from the straight-line requirement of the Beverage and use coax to haul the signal to a (warm!) receiver location.

Termination

Far-end termination is key to pickup directionality. If the wire is not terminated on its far end, the pickup will be bidirectional along the wire axis. Terminating the antenna on its far end will create a unidirectional pattern, accepting signals coming in *toward* the receiver.

Terminations for medium-wave Beverages of the proper length typically range from 500 to 800 ohms.

One final thought on the use of Beverages. Be careful about static build-up, particularly in a dry environment. At the least, protect the input of your receiver with diodes such as 1N914s.

A good way to see if Beverage antennas are worth the effort is to try fanning out a few shorter antennas, rather than hauling out a super-long wire on your first DX-pedition. Shorter antennas are easier to deploy and recover, and you can switch among different wires to effectively "steer" the pickup axis. You can also phase any two antennas to create electrical nulls.

Phasing techniques earn their salt when you are trying to eliminate a signal or reduce interference. The choice of antenna combinations makes phasing a very flexible tool. If you are after a steerable null, phase a pair of identical antennas such as two loops or wires

at right angles. The null will be at the bisecting angle of the antennas. If you use small loops for this purpose, it is easy to move the loops, and thus move the null.

If you are trying to suppress strong local signals or electrical interference, use antennas of dissimilar performance. A popular approach is a wire or whip, phased against a loop. That will eliminate most of the signal appearing in both antennas while retaining the directivity of the loop. But do not expect deep nulls with this approach, unless the band-pass performance of the wire is close to that of the loop (an unlikely situation).

Phasing can work well, depending on the relative locations of the signals and your "patience quotient." When the ionosphere is moving, time relationships are changing and you may end up chasing nulls all night. But with practice, you can literally wipe out a 50 kW station 20 miles up the road, to hear a weak adjacent station a lot farther away.

Much of the fun in DXing is in the antenna. Use an active whip or tuned loop in an urban environment, assemble a simple "car pack" or plan to spend some time in the great outdoors at the business end of a Beverage. Wherever you go, you will be delighted by the unpredictability of MW reception. I can promise you a lot of fun and return from this hobby. It rewards your investment!

■ ■ ■

Mark Durenberger is general manager of the Group W Network Services/Teleport Minnesota in Minneapolis. He has co-developed several products in use in the broadcast industry.

FEED LINE

Carefully Plan Your Diplexer Design

W.C. Alexander

This is the sixth in a series of articles about constructing an expanded-band AM facility. The previous part appeared in RW Feb. 4.

Unlike single-frequency antenna tuning units (ATUs), which often are constructed on open-frame chassis with little or no shielding from other components, diplex filters must be shielded well from other components and filters in the system. This typically means that each filter must be enclosed in its own shielded enclosure with no common walls with other enclosures. Sometimes this means constructing the filter in a metal box and inserting that box into another common metal housing. Other times it may mean placing the filter in a completely separate metal enclosure. The configuration and layout of the diplexer will be determined by the designer after he completes the electrical design of the diplexer and examines the physical layout of the site.



the insertion effect of the bridge. Correct all reactance readings for frequency.

Information supply

Here is where you come in. The design engineer will need a good deal of information before planning your diplexer. You will have to provide this information for the engineer or else pay the engineer a premium to come to your site and gather the information.

Remember: Accuracy is everything. Mistakes at this stage have tremendous potential to cost big dollars and cause delays later. Discuss with the design

engineer what will be needed. Use this partial list as a starting point.

Self-impedance measurements on the regular- and expanded-band frequencies for the driven element, and *driving point impedance measurements* on all regular-band directional elements in the array for all modes of operation. If you have an impedance bridge, oscillator and detector or have access to one, you can make these measurements yourself. For self-impedance measurements, be sure to disconnect all ATU components from the tower before measuring. If part of a directional array, your design engineer will tell you whether to float (open) or short the other towers in the array during the self-impedance measurement.

For driving point impedances, after inserting the bridge, be careful to read just the phasor for the proper phase and ratio values on the antenna monitor, thus tuning out

Base currents on all regular-band elements. Measure these with a toroidal or thermocouple ammeter of known accuracy.

Power of the regular-band station for each mode of operation.

Directional antenna parameters (phase, field ratios and base current ratios) of the regular-band station for each mode of operation.

Schematic diagrams of all existing antenna tuning units. If you don't have

See PLAN, page 29 ►

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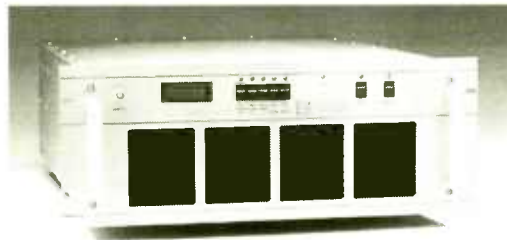
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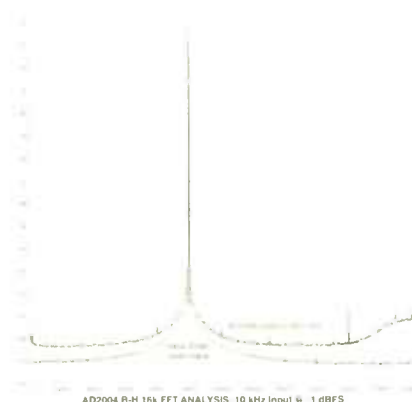
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READER SERVICE NO. 104

A New Program to Monitor EAS

Useful Utility EAS Watch for Windows Users Is Available for Free on the World Wide Web

Alan R. Peterson

and the last time and date they were recognized. A scrolling window shows the last 100 lines of data received from the EAS unit.

If you need to track the events logged by your EAS encoder/decoder in a specific time period, your first thought might be to save all of those little slips of printout paper in a folder.

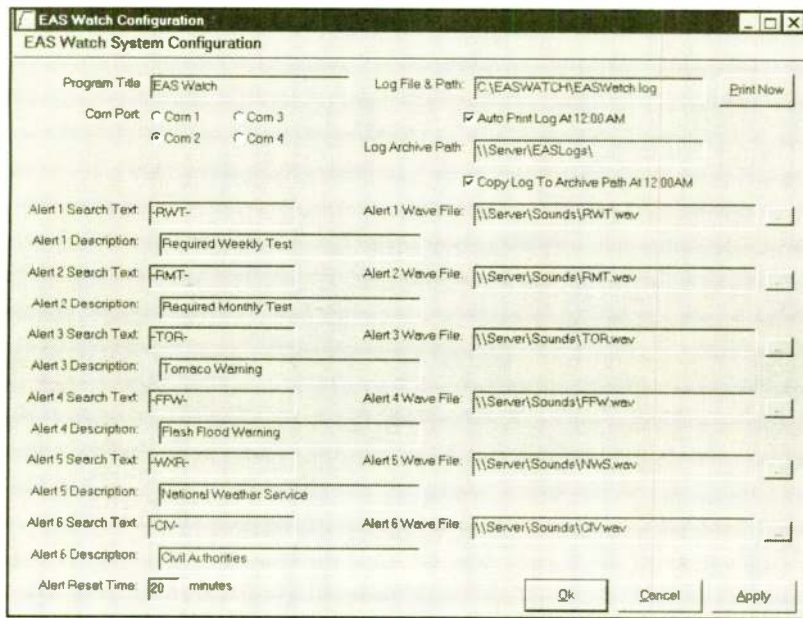
A better way was recently posted on *broadcast.net* by Kirk Wesley: EAS Watch is a freeware utility that runs in the background on a stock Windows 3.1 (or higher) PC.

The program essentially is a serial port scanner, observing the data that moves across the serial port and copying it to a log file on the hard drive and/or directing it to a printer. It continuously scans data looking for any text matches, pre-determined by six variable search filters. When it finds one, it makes a note of the date and time and can start another program in response.

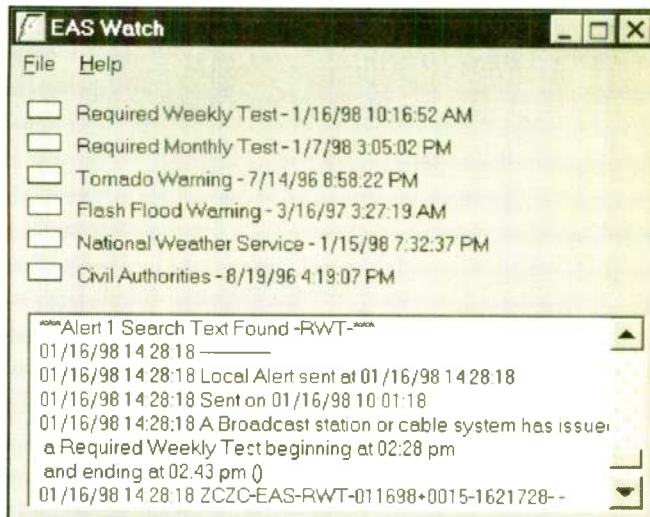
The main screen displays the descriptions of the search filters

By Wesley's own admission, the utility "isn't much to look at," but all relevant information is present on the main screen.

The Setup page lets you choose the text for



The Setup Page



The Main Screen of EAS Watch

the six search filters and the specific actions you want the computer to take when a filter recognizes one of them. Possible actions include play-

Wesley's program initially was created for the Sage Endec. "Because that is what I had to work with at the time. I haven't had the opportunity to check it out on any other systems but it should work with all of them."

EAS Watch likely will work with all EAS units in the field, he said, "as they all have serial ports that supply logging information and access to the raw EAS data stream."

The only possible problem might be the program's data rate. EAS Watch initially is set at the default baud rate for the Sage, which is 9600, N, 8, 1. If monitoring a unit other than the Sage, the program's INI file can be changed to respond correctly.

"I am hoping other users will let me know the specifics for other boxes so I can update the documentation to include more detailed instructions," said Wesley.

EAS Watch is a free utility and can be found by going to www.broadcast.net and clicking on the "Bware" icon.

Kirk Wesley is on the engineering staff of JACOR Communications of Cincinnati. Reach him via e-mail at kirkwww@ibm.net

Work on Design With Engineer

▶ PLAN, continued from page 27

the original schematics, you can sketch some yourself, identifying the values of all components as best you can. Capacitors will have values and ratings stamped on them; coils usually have a manufacturer ID plate with the coil value. Provide copies of any field notes or other information on the installation and tune-up that you can find.

A complete and accurate drawing of the site layout. Pay particular attention to the vicinity of the tower bases, tuning houses or tuning units, and either make the drawing to scale or give dimensions. This information is critical in planning the mechanical construction and layout of the diplexer.

The design engineer may ask for more information, particularly after he reviews the first set of data you send him. His goal is to create a diplexer that will be transparent to both the high- and low-frequency transmitters, provide excellent isolation, prevent the creation of intermodulation products and provide for the safety of those working at the site. His success largely depends on the quality and accuracy of the information you provide.

Diplexers are long lead-time items. The process, from gathering information at the site, to completing the design, to bidding out the project, can take several months. Manufacturing can take several more months, so if you intend to complete your construction before your CP expires, you need to be moving right now. You may be able to get an extension on your CP, but then again, you may not. It is much better to plan to finish on time.

Besides the diplexer itself, other considerations come into play when sharing a site with an existing station. Start by taking a look at the existing transmitter building or room. Ask:

- Is there adequate space to add a

10 kW transmitter?

- Is there rack space available for stereo, processing, monitoring and remote control equipment related to the new station?
- Is the air conditioning or ventilation system adequate to handle a 10 kW transmitter in addition to the existing load?
- Is there adequate electrical power available at the site?
- Is there room on the existing remote control system, or will an additional unit be needed?
- How will you get the program audio and remote control data to the site?

If you are adding an expanded-band station to a site that currently houses a 1 kW or lower, regular-band station, you likely will have to upgrade everything at the site, starting with the building. Chances are the power service to the building is single phase and low capacity, so that will have to be upgraded. The air handling system certainly is inadequate for a 10 kW add-on. You need to anticipate these things and make plans to deal with them.

On the other hand, if you are diplexing at a site that already houses a 10 kW or higher regular-band station, you may be in good shape on power and perhaps on air conditioning (if you employ an efficient solid-state transmitter).

Trenching

Plan your transmission line run to the tower or driven element so that it is as short as possible and does not interfere with existing transmission line runs. If the lines at the site are buried, it is not advisable to run a trencher in the same area. Think about the ground system, too. If you must trench, do so in the same direction as the buried radials (as opposed to across them). This will result in fewer radial cuts and resulting repairs.

Using an existing site makes a lot of sense for those who already own an operating site. The design, construc-

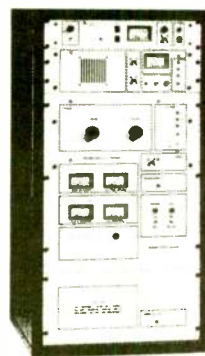
tion and operation of a diplexer involve significant costs, but they usually are much lower than those involved in a new site. The costs of upgrading the electrical system, cooling system and the building itself can be shared between the two stations, because both stations will benefit. Upgrading an existing structure can cost considerably less than building a new one.

The key is planning.

Cris Alexander is director of engineering for Crawford Broadcasting in Dallas. Contact him at (972) 445-1713 or via e-mail at cbceng@compuserve.com

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Learn From the History of Tower Falls

Our 'Man of Steel' Finds Lessons in Past Calamities

Troy Conner

A couple of weeks ago, I spoke with M.C. Bowers, a gentleman of 81 years. He told me a number of wonderful tower stories, having spent many of his years as a broadcast engineer. We talked for several hours and covered a lot of territory.

I enjoy talking with folks who have been around long enough to see the dramatic changes in the broadcast industry. Much of this recent history commonly is thought of as passé, as "old news." In this digital age of satellites, CDs, computers and the Internet, we tend to forget our wireless roots. At the same time, we fail

sometimes to see the explosion of wireless opportunities.

When I ponder the history of radio, I see all of the technological expertise and the countless hours of plain, hard work that went into a system now so seamless it is almost ignored. I see a frenzied history of almost continuous evolution and innovation, from the oldest, simplest AM, to frequency modulation, to stereo, and now RDS and the prospect of DAB.

Ignored medium?

Two of the stories Bowers told me were unusual enough that I would like to pass them on. I will not mention names, to protect the innocent, as it were.

Being an avid rock climber, I know more than a couple of climbers who have survived horrible falls that should have killed them. Statistically, falls (from almost any height) are one of the most common killers.

Tower work is, and unfortunately will remain, a dangerous occupation. Falls are almost always fatal. So it was refreshing to hear a survival story.

On a June day years ago, a small guyed tower was going up in Ohio. The tower "contractor" recently had been self-promoted from contract engineer to tower erector. Two standard 20-foot sections of tower had been stacked, and a set of temporary guys pulled to tension at 40 feet. With the gin pole in place, the third section was lifted into place, topping out at 60 feet.

Here is the initial problem. A set of permanent guys should have been installed and fully tensioned at 50 feet. Instead, a second set of temporary guys was pulled at 50 feet using three temporary cable grabs.

The way I see it, about 15 minutes spent using the proper hardware at this point probably would have prevented this impending disaster.

Too temporary

With a set of improperly terminated temporary guys at 40 and 50 feet, the gin pole was jumped, and the fourth section lifted and bolted into place. Now 80 feet was standing, and a third set of guys was rigged temporarily at the top of the section.

Here's where things get dumb. The temps from 40 feet are raised to create the 80-foot guy level, and again three cable grips or grabs utilized to fix the upper ends of the guys.

So essentially we have 80 feet of tower and probably 30 to 40 feet of gin pole supported by two sets of guy wires at 50 and 80 feet. This would be dandy if the cables had been terminated using the proper hardware. In reality, we have a teetering mass supported at any given time by a handful of slip-type cable grabs. Also, it is now nearly 8 p.m.

This apparently did not bother our intrepid tower erector. Once again the gin pole was raised, and the fifth section was raised and bolted into place. At this point, one or more of the cable grabs slipped. The tower, undoubtedly pulled by the other sets of guys, fell, erect and intact, like a tree, with our now bug-eyed tower climber along for the ride.

Normally I would now be telling you that the climber was killed. Miraculously, this fellow escaped to tell his tale, although Bowers said the man quickly retired from the tower business. He survived either through divine intervention or by dumb luck, or perhaps through a combination of the two. By falling into a marsh and by falling alongside the structure, our hero was merely slapped violently into the mud, not



crushed by the tower or into it.

A tower normally would not fall in this fashion. A guyed tower usually will fall within a radius of about 40 percent of its height. Towers do not fall like trees; they spiral or pretzel toward the ground, being somewhat constrained by the intact guy wires.

Up on the ridge

Bowers also related a story of a tower he observed being erected. The tower was going up on a ridge in Tennessee.

Apparently this structure had some design problems. Its intended height was 600 feet, but by the time the tower had reached 300 feet, it had visible bows between the guy levels. I suspect that, in addition to

Tower work is, and will remain, dangerous. Falls are almost always fatal. So it was refreshing to hear a tower crash survival story.

being a bit short-guyed, the design had not taken into account the guy anchors being way down either side of the ridge, far below the foundation of the structure itself.

The structure eventually did reach 600 feet, for a short time, prior to its collapse.

An interesting part of this story is that a wooden phone pole was utilized as a gin pole. I also do not know where they got the iron workers to work on a tower with such obvious problems.

A vote for RDS

One unrelated topic I would like to mention is the Radio Data System, or RDS. I just installed a top-of-the-line Pioneer radio/CD player in my truck, to help pass the time. The unit I chose has an RDS decoder. I must say, what a neat idea. Now when I am driving about the country, I know at a glance the call letters of a station and the station format, if the station is so equipped.

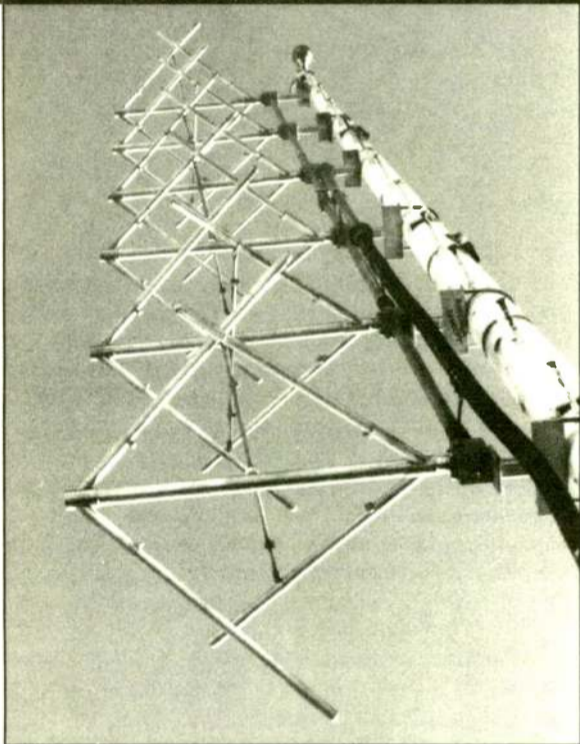
Unfortunately, the public generally is not aware of this subcarrier technology, because so few manufacturers equip their receivers with RDS decoders. Denon, Pioneer, Kenwood and a few other manufacturers offer RDS, but usually only in certain high-end models. I hope consumer awareness and demand will result in lower prices and greater mainstream acceptance.

At the same time, all you station managers who have been putting off RDS need to equip your stations. This technology has the capacity to return a bit of long-lost novelty to radio. Till next time.

■ ■ ■

Troy Conner is the owner of Tower Maintenance Specialists. Reach him by phone at (704) 837-3526 or via fax at (704) 837-1015.

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Workbench

Radio World, February 18, 1998

Rags, Rags, Lots and Lots of Rags

John Bisset

I am amused at the things that "turn us engineers on," and the source of cleaning rags tops the list. Thanks to all who wrote. Last time, we included a rags source from Vince Fiola, a studio furniture manufacturer and cabinetmaker. George Levites of WEVD(AM) in New York offers another source to add to your *Workbench* Business Card Contact file.

The catalog includes 10 different grades or types of cloth wiping rags, available in 25- or 50-pound put-ups. Clean T-shirt rags are about \$60 for 25 pounds, and \$103 for 50 pounds. You will throw these rags away after use, so it makes sense to buy the cheap T-shirt material.

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If you live near a large city, you might try calling a diaper service. Worn out diapers are really cheap, very clean (surprisingly) and, of course, absorbent! George advises that McMaster offers the diaper cloth material, but it is expensive, nearly \$200 for 50 pounds! Considering what we use the material for, T-shirt rags are the most economical.

Thanks, George, for the contact. Readers may wish to access the

McMaster catalog on the Internet. You must qualify and establish an account to obtain a hard copy catalog. The company does not pass their catalogs out like Radio Shack does! Everything in the catalog is on the Web site, and you can place orders there, too.

If your capital expense budget includes computers for the sales staff, save some money and consider the Monorail offered at Comp USA. Ellis Terry, the DOE for Douglas Broadcasting, and his assistant, Kent Kramer, showed me the Model 7350 they installed for their sales force in Washington. For \$1,200 you get a powerful computer with a very small footprint. The computer and monitor are one cast-iron assembly. It features 16 MB of RAM, a 1 GB hard drive, a 33.6 kbps fax modem, keyboard, mouse and built-in speakers. Just what a salesperson needs!

The manufacturers are ex-Compaq engineers who set out to build a better (and more affordable) mousetrap. The system comes with Windows95 and fits nicely in a sales cube. The small footprint frees up desk space, too.

Logitek's monitor panel is a great way to monitor a variety of sources. Whether you want to compare program to air, or

your competition to your signal, this pushbutton selector panel is great.

John Diamantis, CE for WBQB(FM) in Fredericksburg, Va., just completed a new transmitter/master control tech area.



A simple switch modification permits routing of the Logitek selector panel audio to an external monitor.

He included one of the Logitek monitor panels but wanted a way to route the audio to his JBL monitor speakers as well.

Figure 1 shows the modification he added. The switch routes the audio to either the Logitek internal speaker, or to the monitors, where fine audio adjustments can be heard.

Reach John at (540) 373-7721.

My love affair with the Continental Power Rock 5 kW AM transmitter spans nearly two decades. I have lost track of the number of middle-of-the-night conversations between me and Continental Field Service Engineers Ken Branton or Dave Chenoweth, tracking down some elusive problem. Perhaps you have had similar problems with this model, or per-

haps the transmitter has been problem-free for you. In my case, we seem to lose driver transistors or switchmod transistors for no apparent reason. It has always been a mystery.

Not long ago I spoke to Continental's Ken Branton, who shared some very interesting findings. Although he has no easy way to prove his assertions, it is Ken's opinion that aberrations on the voltage lines feeding the transmitter seem to set off a chain reaction that destroys the transistors.

Ken's opinions are based on several installations where Sola voltage regulators were installed in front of each transmitter. One installation was in Guatemala, which has extremely bad power. A Sola 15 kV isolation transformer is ahead of the feeds for their two Power Rocks. The transmitters run flawlessly.

A customer in Trinidad has gone a step further, adding an energy transfer unit made by Leibert. This magnetic synthesizer and power conditioner watches over both TV and FM, and is so powerful you can lose a phase and still get full three-phase power up to two-thirds the operating value. That may be more than we need here in the United States, but we have been "conditioned" to believe our power is clean. And that's not necessarily so.

Ken told me about one customer who experienced a breaker trip once or twice a week. He contacted the power company, which installed a monitor. This particular monitor kept events in memory. When a fault occurred, it would spit out a paper graph for the previous 20 milliseconds. After a week of this, they examined the memory and saw a 500 volt-damped sine wave on

See TIPS, page 33 ►

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A Case of Transmitter Trauma

Dutch Doelitzsch

"We're off the air."

This may be the most dreaded phrase in radio. It is also what I heard when I answered my cellphone one evening. The call came as I was leaving a wedding to go across town to the reception.

I arrived at WDDD-FM in Marion-Carbondale, Ill., around 6 p.m., and the silence was deafening. We had been off the air for about 20 minutes. The main 20 kW transmitter was down, and operator attempts to get the backup 20 kW transmitter on the air were not successful.

The problem was readily apparent: high VSWR. As a result, the main transmitter had tripped, which kept the auxiliary from coming up. A check of the in-line wattmeter confirmed that we had either a feedline or antenna problem in the main system.

Unlike many stations, ours has a redundant feedline and emergency single-bay antenna. It took just a few seconds to re-route exciters and antenna switches to feed the emergency system. Although we would be at reduced power and antenna height, at least we would be back on the air.

Murphy's law was at work, however, because the back-up system, too, was showing a very high VSWR of more than 3:1. I backed off the power to 3 kW to

► **TIPS**, continued from page 32

the line. When the transmitter was shut down, the blip was still on the line. The power company technicians had no idea what created this phenomenon. The addition of an isolation transformer ahead of the transmitter stopped the shutdowns.

Another client in upper New York state had numerous problems with failures of switchmod and driver transistors. He decided to put the entire building on an isolation transformer. His problems went away.

In my client's case, the transmitter is at the end of the line. Any garbage on the line ends at the transmitter site. There is no isolation transformer on the transmitter, though we have smaller Solas on the filament supplies of both the FMs and the Power Rock.

Ken referred me to the Graybar catalog. They sell a General Electric D.I.T. drive isolation transformer. Sola has a variety of models too. On the Continental Power Rock, Ken says a 7.5 kV should be adequate. A 10 kV model would be overkill for a 5 kW transmitter, but might allow rack equipment to be included.

The bottom line, if you know you are going to have line problems, is to save yourself the headaches and consider the power conditioning. It is cheap insurance.

Ken Branton can be reached at Continental Field Service, (214) 388-5800.

■■■

John Bisset is a principal with Multiphase, a technical services company. Reach him at (703) 323-7180. Printed submissions qualify for SBE recertification credit. Fax submissions to (703) 764-0751, or send them via e-mail to wrwbench@aol.com



Dutch Doelitzsch looks over a fully refurbished antenna system.

protect the transmitter and began putting a plan of attack together. By this time our station engineer had arrived and we began checking.

My worst fears were confirmed. Even though we have complete redundancy, both systems had problems. To make matters worse, there was still a week left in the spring ratings period. Panic soon

engulfed all of us at the station. Although the company operates six stations in the Marion-Carbondale market, WDDD-FM is the largest operation and the market leader.

At this point in any crisis situation, it pays to analyze the information methodically and avoid a costly mistake. We chose a triple attack plan. First, we would cease operation of the station at 10 p.m. and check everything that could be checked from the ground. Second, we would need a tower climber to help us ascertain the exact nature of the problems. Then, we could try to make the best of a bad situation and get as much coverage as possible, as soon as possible. Third, we would try to get a full tower crew here as soon as possible to make the repairs.

I called Electronics Research (ERI) in

See CRISIS, page 35 ►

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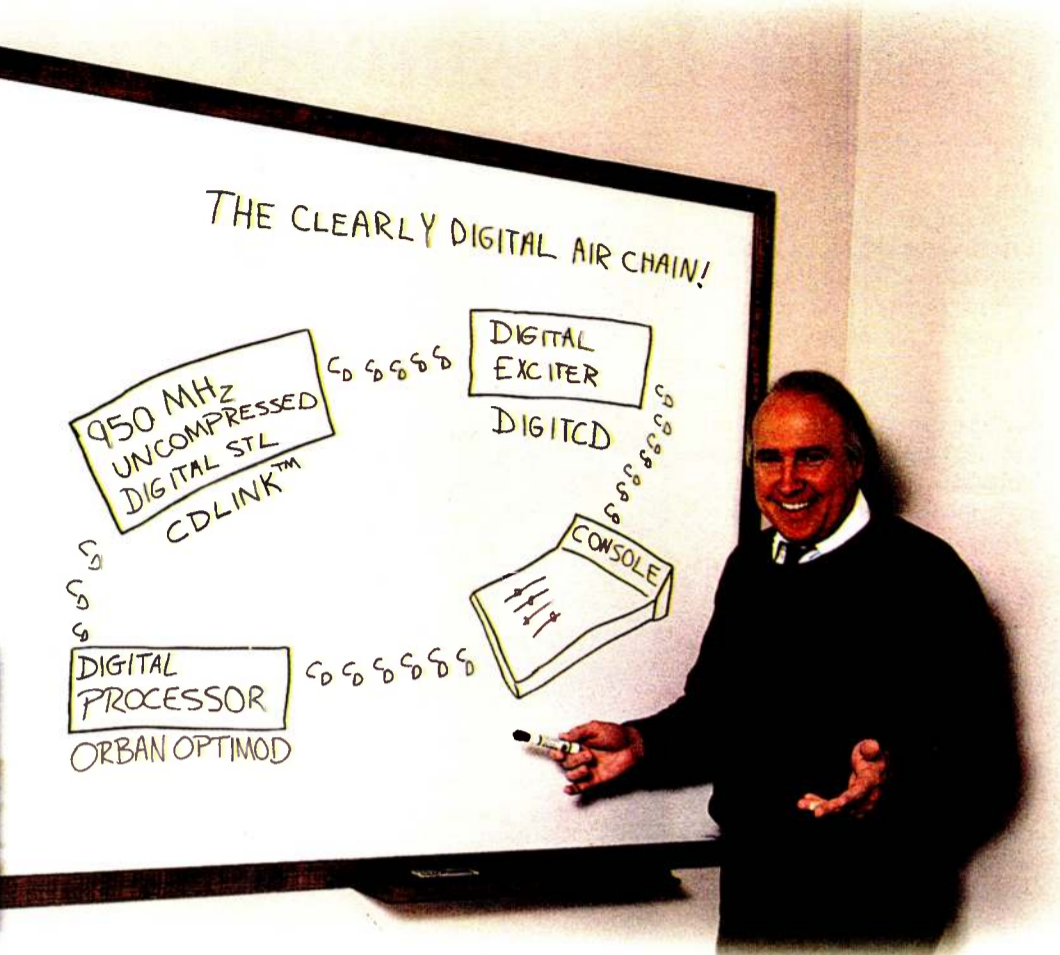
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Dave Obergoenner exclaims, "What a novel idea that a manufacturer looked at all the pieces that an engineer has to put together and made a product that actually fits—everywhere!" Dave is the corporate Director of Engineering for the twenty-seven radio stations in the Zimmer Radio Group



The Ultimate Sound In Radio.

By Dave Obergoenner
Director of Engineering
Zimmer Radio Group

Most good engineers and programmers have it in their head, the ultimate sound, quite simply the best sounding radio station ever. Sometimes we think we've been close. We may have gotten our station almost to the ultimate sound, or much worse, our competition may have gotten close (too close for comfort) to the ultimate sound in radio. I too have heard that sound in my head and have never quite been able to attain it.

Oh, I know what it would sound like. Clean, no distortion, big wide frequency response, loud but not sounding too processed, a super low noise floor, perfect separation, in short a signal that will just jump right out of the radio when your listeners and advertisers tune to it. I've been close a number of times.

Suddenly radio, and the whole audio world for that matter, was going digital. I have to admit, I tried a lot of it, and most of it sounded just plain bad to me. Early generation A to D and D to A converters, the sharp filters (before over sampling) and then digital compression, the ultimate insult...digital compression on top of more digital compression! Lets just throw away huge chunks of the signal. We'll trick your ears, they'll never know it...ya right. Sorry not these ears, not on my radio station, not if I can help it at least. It was time to just say NO to lossy compression.

Now we can. Thanks to the fine engineers at Harris and Orban, we can now put together the fully digital, uncompressed digital audio chain for radio. It uses standard types of equipment we are all used to: an Optimod, an STL on your present frequency, and an exciter. Not just any STL, stereo generator and exciter. Harris has introduced *the missing link!*

The Harris CD LINK™, together with the digital Optimod and the DIGIT® digital exciter and its

digital stereo generator, it works to form a flawless, digital audio chain. And it's UNCOMPRESSED all the way.

The system works with your current STL antenna system. In fact, it will work with a lot less signal than you may have with your current STL system. We put the system on the air with what was a noisy composite system, only about 80 microvolts. The CD LINK™ produced a perfect AES/EBU digital output signal. The bit errors were lower than I would expect to find in most CD players. The CD LINK™ even comes with a built-in bit error counter, so you can be sure. What you put in is exactly what you get out. Even with a poor signal. This is the best of digital with none of the drawbacks.

When you combine the CD LINK™ and the Orban Optimod 8200 with its digital I/O card, and the DIGIT® exciter with its digital stereo generator...now you can get there...The Ultimate Sound On The Radio.

I remind you that the idea of all this cool new digital stuff is to make radio sound BETTER. That won't happen if it becomes yet another tool to make the station sound more distorted.

If you have a backup transmitter at your site you may be wondering, if I have all the AES/EBU digital coming out of this new STL system, how do I come up with a composite signal to feed the backup exciter? Good question, I'm glad someone at Harris thought of it before me! The new CD LINK™ STL receiver is available with a built in, good old standard, composite stereo generator. It is an option though, so you should order it with the unit. I didn't think of it, I'm glad Tom Harle our sales guy did.

I must say: I was a little nervous about trusting the reliability of our station to a totally new product. To the best of my knowledge, Harris has never built a real STL system before. I've heard some other digital STL systems lock-up after power failures. There's no way I want to put all

that noise on the air until someone can drive to the transmitter to push the reset button. The CD LINK™ has not let us down. It has been through some killer electrical storms and power failure/surges. The CD LINK™ has been 100% reliable. It comes back up fast, and has made absolutely no unpleasant sounds on the air, only great sounding music.

This is truly a terrific example of great systems integration. It is obvious that the people at Harris did their homework. Even when it came to making the CD LINK™ interface with other manufacturers' equipment (Orban and Burk). We plugged it together, turned it on, and it performed flawlessly. I wish some other broadcast equipment manufacturers would learn from this example.

Well, now I have it. The sound that has been in my head for all these 27 years in this business is finally on the air at one of our stations. It took the combination of the Optimod 8200 (with a tiny bit of pre-processing), the uncompressed Harris CD LINK™, and the Harris DIGIT® exciter/stereo generator to get there, but I finally have The Ultimate Sound On The Radio. And we didn't have to apply for a new STL license, or even call the phone company and try to order a T1 line. That's O.K., I didn't want to put my station back in their hands anyway.

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Transmitter Trip Creates Anxiety

► CRISIS, continued from page 33

Indiana. I was able to locate the company vice president at home. He understood our need and immediately started trying to locate a crew, rigging and the equipment that might be needed. He also gave me the home number of their installation and construction supervisor so we could maintain coordination of the project.

While ERI was trying to assemble a crew on Father's Day weekend, I called a



A tower worker prepares to install feedline.

was nothing more that could be done on the main until the morning.

High VSWR on the line

The local tower climber was true to his word, arriving at 6 a.m. sharp. Our instructions to him were simple: Disconnect the emergency antenna from the emergency line and attach a dummy load.

We had to do some tests to determine next step. With the dummy load connected, the emergency line still showed high VSWR. The emergency antenna (a single bay) was lowered to the ground. While the climber went up to the main antenna, we checked the single-bay antenna, using the exciter and wattmeter. It checked OK. When the climber was at the top, he disconnected the main line from the main antenna and installed the dummy load.

The line was checked using our jerry-rigged test set up. The line VSWR looked okay. We also checked the line for resistance with the dummy load.

It showed a high open resistance value, indicating, at least at low power, that the main line was okay. When the main line was removed from the antenna, the climber noticed a few particles of black residue on the insulator on the main line. We were convinced that the main antenna had problems.

A mounting quickly was fabricated for the single bay and it was sent to the top. The climber attached it to the feedline and tower. When he was clear, we resumed operation at low power (approximately 7 kW into the single bay). I talked again with ERI and advised them of our tests. Fortunately, a crew had been assembled and they would arrive Monday morning.

The crew arrived that day and went to

work. Thunderstorms and wind slowed our progress, but by Monday evening the bottom bays were on the ground and there was no doubt that a burn-out had occurred.

Fortunately, our VSWR fault sensors had contained the damage to just the antenna. Without the sensors, the power would have continued to be fed, destroying the feedline as well. New parts were received on Tuesday, but repairs again were slowed by the weather. While we had the entire antenna on the ground, it was rebuilt with new bullets and completely cleaned.

Lightning and heat

By Wednesday the weather was good, and the crew was busy by 5 a.m. By noon, all the bays had been replaced, and the antenna retuned. Full 50,000 W power operation commenced at about 1 p.m., less than 90 hours after the burn-out occurred. If the weather had been better, operation could have been restored at least a day earlier.

I can't say enough about the prompt and courteous attitude of the ERI team. They were as concerned as we were

about being off the air and really came through for us in the pinch. To some extent, a situation of this type renders you almost helpless, and very vulnerable. The pressure on everyone is enormous, and it helps to have a team effort.

Looking back on the events, it appears that the antenna took a heavy lightning strike a few days before and set up the conditions for the burn-out. The intense summer heat (near 100 degrees) made the situation worse. The system could no longer dissipate the heat, resulting in a near-meltdown at one of the bullets, with the resulting high VSWR.

Our experience offers some lessons. First, a high VSWR overload sensor is a good investment. It can minimize damage to your transmitter, feedline and antenna. Second, if you have a backup system, test it regularly. Third, do not panic or try to maintain normal operation into a damaged system; further damage will result. Finally, get good technical advice early to pinpoint the extent and nature of the problem.



Dutch Doelitzsch is chairman and CEO of the seven Southern Illinois Radio Group stations and a Certified Professional Broadcast Engineer. Contact him at (618) 997-8123.

local tower climber and arranged for him to make a climb at 6 a.m. to help us pinpoint the troubles. I had told ERI that we would be able to tell them the nature of the problem on Sunday morning, and, if possible, that they should have the crew ready.

By this time approximately two hours had elapsed, and it was time to start trouble-shooting. First we checked the main antenna system. The building is about 200 feet from the base of the tower, with an underground 3-inch line to the tower. We have a line junction at the base, and then the 3-inch line continues to the top of the 500-foot tower. The line was disconnected at the base for testing.

Our test set-up used a spare exciter as an RF source and a Bird wattmeter. It was apparent that the problem was either the tower feedline or the antenna. There

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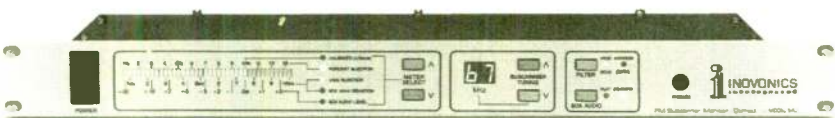
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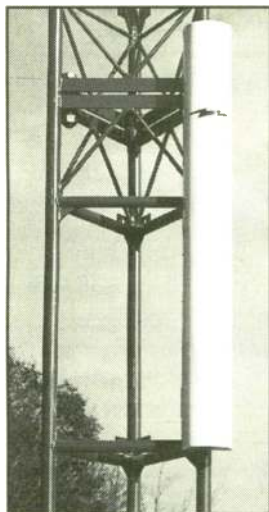
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Andrew Booster Antenna

Offering 18 dBi of signal gain and weighing 13 pounds, the 50-degree beamwidth ShadowMaster booster antenna from Andrew Corp. provides an additional solution for broadcasters faced with signal penetration challenges. Available in horizontally or vertically polarized versions, the ShadowMaster is suitable for regions where obstacles shadow or block the broadcast signal. Multiple mount adjustment features facilitate installation.



The antenna features a profile that is 60 inches in length, 7 inches in width and 6 inches in depth, and it minimizes windloading without sacrificing signal gain.

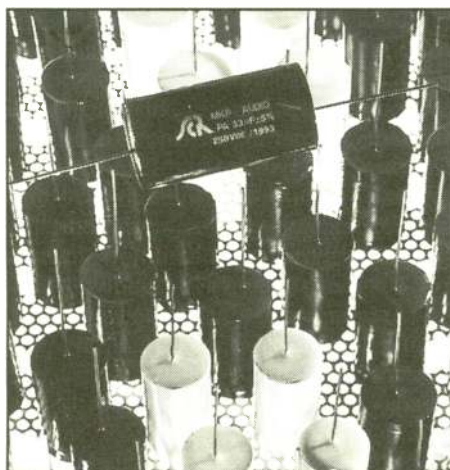
For more information from Andrew in Illinois call (800) 342-5473 and request bulletin number 10199; fax (708) 349-5222; or circle Reader Service 11.

SCR Audio Equipment Capacitors

The audio equipment capacitors made by the French company Société des Condensateurs Record are manufactured from two strips of aluminum or tin foil separated by two polypropylene films. The thickness of the films determines the working voltage of the capacitor.

Non-inductive and moisture resistant, the capacitors are offered in either cylindrical or rectangular shape and come with two coaxial copper-coated wires as outputs. Polyurethane resin seals the capacitors.

SCR capacitors come in nominal voltages ranging from 100 V to 1,500 V and in capacitance tolerances ranging from



±2 percent to ±5 percent.

The capacitors can be used at any temperature from -13 to 158 degrees Fahrenheit and exhibit no piezoelectric effect. Loss angle is less than 15×10^{-4} at 10 kHz.

For more information from the French Technology Press Office in Illinois call (312) 222-1235; fax (312) 222-1237; or circle Reader Service 37.

Panduit Heat Shrink Tubing Printer

A new, 24-pin flat bed, dot matrix printer, the PTR1, is available now from Panduit Corp. The PTR1 Printer, used in conjunction with your PC, is designed to print any combination of numbers, let-



ters, symbols or custom legends on heat shrink tubing for OEM applications.

The 10-pound printer allows the user to produce small to large runs of a specific identification label or marker, as needed. It features short, straight-through label feed.

Harris Audio Bit Buddy

The belt-pack-portable Audio Bit Buddy from Harris Corp. allows the user to check digital audio or analog audio signals. Digital and analog program audio can be monitored by the headphone output while L/R levels are displayed on the LED bargraph meters.

Critical signal parameters such as sampling frequency, emphasis, professional/consumer format and data errors are displayed while monitoring AES/EBU or S/PDIF signals. The digital input monitors sampling frequencies from 30 to 50 kHz, automatically. The Audio Bit Buddy also functions as an emergency D/A converter.



For more information from Harris in Indiana call (765) 962-8596; fax: (765) 962-0671, Web site: www.broadcast.harris.com; or circle Reader Service 63.

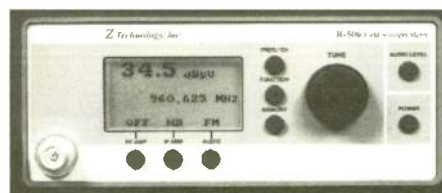
Heat shrink tubing is available in sleeve widths of 1/2 inch, 1 inch and 2 inches and expanded tube diameters of 1/8 inch, 1/4 inch and 1/2 inch. The tubing is furnished on rolls of 500 to 2,000 markers.

The PTR1 printer is compatible with Panduit PAN-MARK 2.0 for Windows labeling software used on Windows 95, NT, 3.1, 3.11 or higher computer systems.

For more information from Panduit Corp. in Illinois, call (800) 777-3300, ext. 7337; fax: (770) 889-9264; Web site: www.panduit.com; or circle Reader Service 89.

Z Technology Inc. Field Strength Meter

A precision measurement instrument, the R-506 from Z Technology is a portable, battery operated, synthesized field strength meter. The meter covers 5 MHz to 1,000 MHz and allows tuning in 1 kHz frequency steps. The R-506 has 100 dB dynamic range and measures signals from 0.32 μ V to 32 mV. It has a 50-ohm input impedance.



Optional software offers several measurement routines to control the R-506 with a PC. The product also includes a protective soft case, collapsible antenna and AC battery

charger/power.

For more information from Z Technology Inc. in Oregon call (503) 614-9800; fax: (503) 614-9898, Web site: www.ztechnology.com; or circle Reader Service 115.

Raltron Electronics Oscillator

Designed for remote radio-based applications, the new model RTXO-119 Temperature Compensated Crystal Oscillator from Raltron Electronics Corp. features high stability over time regardless of temperature. The RTXO-119 output frequency is specified to remain

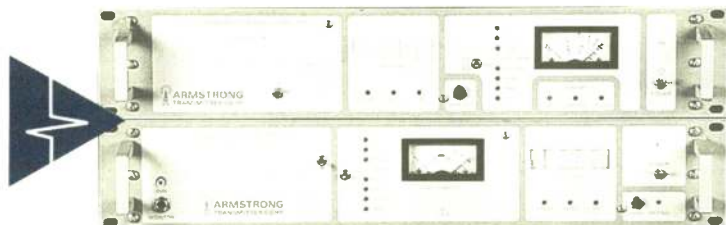


within ±2.5 ppm over its operating temperature range, from -22 to 167 degrees Fahrenheit.

The RTXO-119 contains a voltage-control feature that provides frequency modulation of the output signal in order to carry voice and data. Frequency pullability is specified for a range of ±4, according to an input control voltage from 0.5 V to 4.5 V. When left unmodulated, RTXO-119 provides a reference frequency for RF transmission.

For more information from Raltron Electronics Corp. in Florida call (305) 593-6033; fax: (305) 594-3973; or circle Reader Service 167.

Frequency Agile STL Systems



If you are looking to deliver clean, crisp audio to your transmitter via microwave, Armstrong FML-10 STL system offers unsurpassed audio purity in a rock-solid, feature-packed package.

Built to tough manufacturing standards throughout, FML-10 system features microprocessor controllers, advanced PLL circuitry, ultra linear VCO and front panel frequency programmability with digital frequency readout.

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Avocet Instruments Delay Canceller

A product that removes delayed audio or echoes of remote audio from the off-air return heard at remote sites, the Delay Canceller from Avocet Instruments permits remote talent to use the air feed as their return audio from the station. Conventional "mix-minus" systems require a dedicated return path to the remote site.

Used at the remote site, the Delay Canceller uses a special DSP program to compare audio being transmitted to the studio with audio being received at the remote site via the on-air signal, satellite link or microwave path. As the Delay Canceller recognizes transmitted audio in the receive path, it adapts to remove it. The unit will compensate and correct for transmission delays of as much as 800 ms.

Applications for the Delay Canceller include sports announcing, remote talk shows or in-studio use where audio delay introduced by digital equipment has made off-air monitoring difficult.

For more information from Avocet Instruments in Oregon call (800) 443-0728 or (503) 671-9424; fax: (503) 671-9626; Web site: www.avocetinst.com; or circle Reader Service 193.



PRODUCT EVALUATION

PhoneDock PD1: Versatility, Value

Paul Kaminski

Those of us who run smaller newsrooms sometimes wish we could be two places at once. The people at Innovative Devices must be attuned to our needs. The company has developed the PhoneDock PD1 Multifunction Hybrid. It solves problems specific to newsrooms, and can help in the master control room as well.

Inputs, output

The PD1 makes a good stand-alone workstation. With a mic input, three line inputs and a mix output, one can record actualities or reports directly to any recorder, such as a hard-disk news editing system, MiniDisc recorder or even the old reel-to-reel, without using a mixer. The opto-isolated hybrid has front-panel controls that allow you to manually answer the line, balance the send level from the inputs and, if necessary, jack up the output from the phone so you get a clean recording. (Using the mute button mutes the inputs, so the output from the phone can be even cleaner.)

The news

director gets increased flexibility and better coverage without sending the overtime budget skyward.

This is a good small newsroom application. But the PD1 has enough capability to handle the bigger news rooms, too.

At Canadian station CKNW Radio in Vancouver, Chief Engineer Mark Friesen uses the PD1 to help his news department record telephone audio actualities, with an elegant twist.

"The PD1 has rock-solid DTMF (touch-tones) switching, so we set up one on our PBX system as a news recording

workstation. To route a call to the record workstation, all the news person needs to do is dial up the extension for the PD1," he said.

The unit offers two relays, eight digital remote control outputs and easy programming. I even changed parameters from an ancient communications program; most parameters can be changed by DTMF tones. You can set up the PD1 to record without operator intervention. With auto answer and beeps for operator feedback, your night news person or stringers could file voicers (or wraps, if they had the equipment) from more than one event



The PhoneDock PD1 Multifunction Hybrid

without having to return to the studio after each event.

In the past, this would mean having a night editor, tape operator or desk person in the newsroom waiting for the calls. With the PD1, the morning editor/anchor can check out what has been recorded the night before and incorporate the actuality/reports into the newscast. The news director gets increased flexibility and better coverage without sending the news department's overtime budget skyward. The unattended recording option could be inexpensive insurance in a busy newsroom when multiple stories are breaking and all the desk people are tied up.

The PD1 can be used as another program source for automation systems. Dial-up remotes, remote monitoring or switching of programs (useful when a satellite is down) would not seem to be a problem. A reporter covering a hastily-called news conference at the site of a flood or toxic spill can dial up the station, enter the

proper code and go on the air.

With remote monitoring of the EAS system, once a station person receives remote EAS notification, he or she can make a decision whether to break into programming with the PD1 system. It will work for telephone quality remotes as well. Hook the outputs to a routing switcher and the last-resort emergency program switching/monitoring problem is solved without a trip to the studio.

One thing the PD1, version 1a, does not do as well as I might like is put calls on the air through a console. There is no dedicated caller-only output. Even when we fed

mix-minus to the PD1, and we listened to the PD1 channel through our Mackie 1202 VLZ, we got a noticeable level shift.

When we muted the send, the receive audio was clean and clear, even when located 8 inches from a SVGA monitor and a fluorescent desk lamp.

Innovative Devices said the trans-hybrid loss is 15 dB, which would seem to account for the leakage. A newer model, which debuts later this year, will have a digital hybrid built in with a resulting trans-hybrid loss of 40 dB.

Hook up

The PD1 was easy to hook up. Line-level connections were on 1/4-inch TRS jacks. For those with any familiarity with a soldering iron, proper XLR to 1/4 inch connections could be fabricated easily. The 1/4 inch TRS style connections are completely compatible with my Mackie 1202 VLZ's 1/4 inch TRS line-level input and output connections.

The operating manual (Version 1c.1) was detailed enough for engineers, yet simple enough for an operator like me to understand. The programming connector cable (DB-9 to six-pin mini-DIN PS/2 mouse-type connection) was included.

Customer service via e-mail or toll-free

Product Capsule:

PhoneDock PD1 Multifunction Hybrid



Thumbs Up

- ✓ Two relays and eight DC outputs
- ✓ Touch-Tone (DTMF) ready
- ✓ Easily programmable
- ✓ \$499 price
- ✓ Clean feeds on mix-minus

Thumbs Down

- ✓ No caller-only output



For information, contact Innovative Devices in Utah at (888) 890-7424 or circle **Reader Service 141**.

telephone was quite good; the service reps were especially patient with me. The unit uses a wall transformer for power, and can be run on 12 VDC.

Innovative Devices sells the PD1 for \$499. The updated version with digital hybrid circuitry will cost a few dollars more, and would indeed be an attractive, all-in-one box for a radio broadcast facility.

As configured now, it is a one-box newsroom workstation solution, whether used as a manual coupler for phone interviews or taking in reports, or programmed to auto answer and record for night reports. In master control, it can be used as another program source, with the capabilities to break into programming and control playback of continuity (sort of a live-assist via DTMF) if programmed properly.

When you compare the one-time cost of the PD1, including programming and connection costs, to the recurring costs of a master control operator standing by to record feeds or punch switches on a remote or football game, you find a quick payback. This is true particularly when that person can be reassigned to another, more productive task, perhaps covering news in the field.

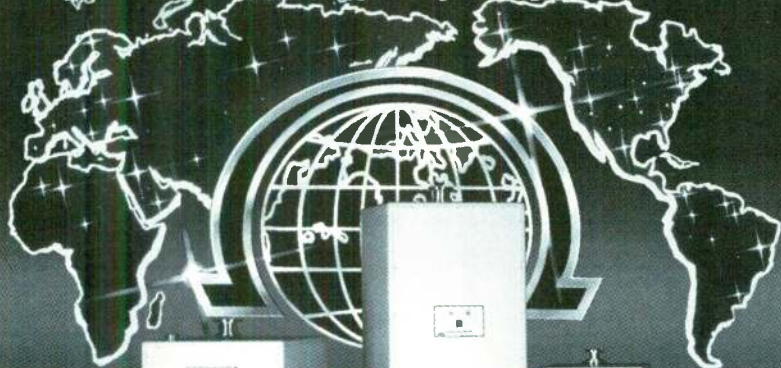
The PD1 is a tool that can help broadcasters increase their flexibility and creativity at a reasonable cost.

■■■

Paul Kaminski is the host of Motor Sports Radio's weekly programs "Race-Talk" and "Radio Road Test." E-mail him at motorsportsradio@compuserve.com

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February 18, 1998

STATION SNAPSHOT

WBGZ(AM) Comes Full Circle

S.D. Yana Davis

When WBGZ(AM) signed on the air 50 years ago in Alton, Ill., as WOKZ(AM), the station studios were atop the Hotel Stratford downtown.

Last spring, WBGZ moved back into a refurbished Hotel Stratford, this time taking up residence on the ground level, with studios visible through storefront-style windows. But Alton no longer is the sleepy, small town it was 50 years ago. It is now considered part of metropolitan St. Louis, which allows WBGZ to position itself in the St. Louis market as a "suburban hometown" station.

Only holding

"As far as Alton, Godfrey and the surrounding area, we're it for local news," said Sam Stemm, vice president and general manager of WBGZ and one of three partners who own Metroplex Communications. WBGZ is the only holding of Metroplex.

Stemm said the 1 kW signal is more than enough to cover northwest Madison County, Ill., a small but vibrant part of the Illinois portion of metropolitan St. Louis.

The WBGZ news/talk format features local talk shows during all but two hours from 5 a.m. to 6 p.m. weekdays, punctuated with local reports from two full-time news people. "We cover the local city councils, school boards, local school sports. Every morning we drop by the police departments," to focus on news of interest in the WBGZ coverage area, said Stemm.

"I like to think of WBGZ as a 'poor man's KMOX,'" Stemm said, referring to the famous 50 kW AM licensed to St. Louis. Stemm said listeners can get plenty of St. Louis-related news on KMOX and other large stations in the market. Only WBGZ, he said, localizes its coverage to Alton and its surrounding area.

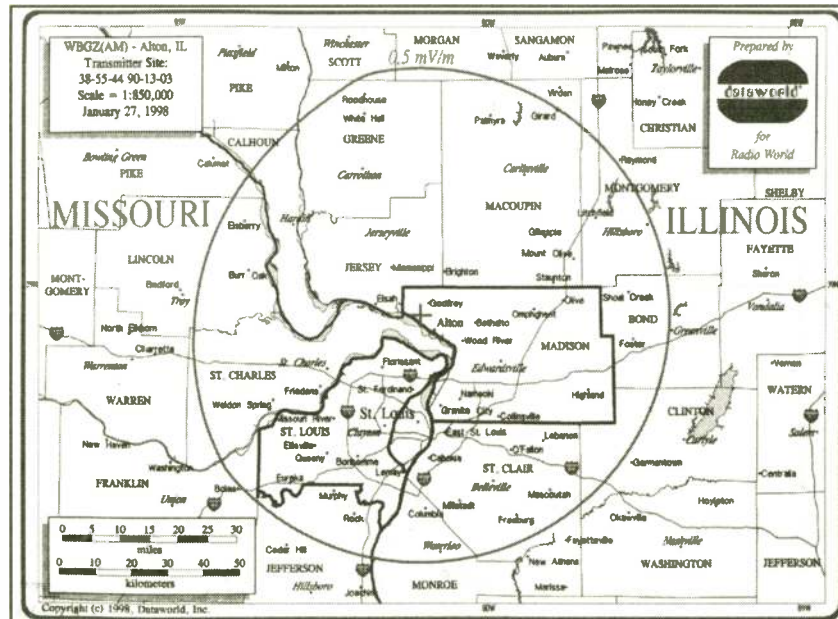
Three sales people beat the Madison County bushes for the station's mostly local advertising revenues, which Stemm said amounted to about \$500,000 last year. Stemm claimed WBGZ's revenues had increased dramatically earlier in the 1990s following the change to news/talk, and are now growing at a "healthy industry average."

"We do tons of promotions," Stemm said. As one might expect, these are tied in with local advertisers and designed to build both revenue and audience. WBGZ conducts at least one major promotion every quarter, with traditional turkey and Christmas tree giveaways during the winter holidays.

Stemm said WBGZ now claims as many as 30,000 weekly listeners, although the station does not subscribe to Arbitron. Stemm said he has commissioned independent audience surveys, including a recent one by Broadcasters, a radio research firm based in Florida.

"We sell based on results, not based on numbers," he said. "Our advertisers are usually very happy with the results they get."

music was dropped altogether after Stemm and his partners decided WBGZ's greatest opportunities were in



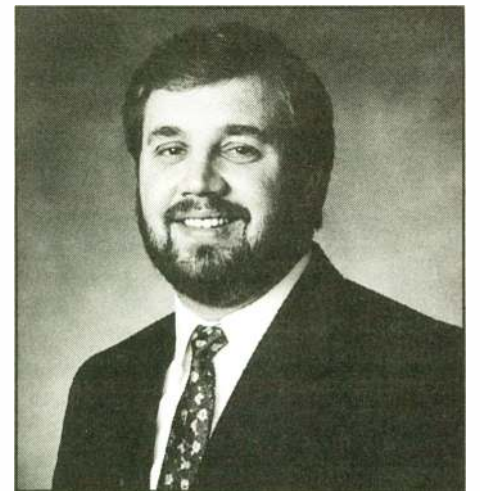
Finding WBGZ's strengths and developing its niche position made for a long process of trial and error, beginning in the late 1970s, about the time Alton and nearby Godfrey were subsumed into the growing metropolitan St. Louis market.

For many years, especially during the 1980s, WBGZ programmed music "which was selected on the basis of not offending anyone," Stemm said. The

local news, sports and weather and local issues talk.

Stemm wanted something else for the station: a permanent and prominent location.

From 1989 until last year, WBGZ studios were in a Ramada Inn, in a less-accessible part of Alton. The station had moved there in 1988, after the heirs of the late station owner sold WBGZ, and the building where it had been located for 20 years, to two different interests.



Sam Stemm

Stemm was program director of the station at the time. Three years later, he and his partners purchased WBGZ.

"We had to pick up and move virtually overnight," Stemm said. They moved to "temporary" quarters at the Alton Ramada in space that was designed to be a conference room. This became home to the staff and studios for eight years.

Stemm and his partners, now owners of the station, were in a position to look for new, permanent quarters starting in 1994. A year would pass before they settled on a new site. The new location brings WBGZ back to the building where the first studios had been nearly 50 years earlier, when the station began broadcasting.

"In the late spring of 1995, a local company bought the historic Hotel Stratford," as part of an overall downtown redevelopment program, Stemm

See WBGZ, page 39 ▶

Sky's the Limit for Entrepreneurs

Dee McVicker

More broadcast entrepreneurs are going airborne via satellite with productions involving just one event or one show, according to bird handlers like ABC/GlobeCast Satellite Services, NPR Satellite Services, and upstart Florida company International Broadcasters Network (IBN) Radio.

"Prices are definitely better than they were in the '80s and certainly in the late '70s for people who want to use satellite on a part-time basis for syndicating purposes," said Bob Donnelly, vice president of engineering for ABC Radio Networks.

Providers

Donnelly said ABC/GlobeCast Satellite Services offers its uplink services for less than what similar services charged a decade ago. Today, it has capacity available for long-form as well as occasional programming on Satcom C5 transponders 15, 19 and 23. It offers 20 kHz SEDAT, mono and stereo; 15 kHz DATS, mono and stereo; and 7.5 kHz DATS, mono. Access to its New York uplink facility is done over T1 backhaul or VSAT, depending on program origination.

NPR Satellite Services, the satellite distribution arm for

National Public Radio, offers Galaxy 4 access for commercial networks and one-occasion concerts or weekly programs starting at \$150 an hour, depending on time slot and contractual commitment. The footprint of Galaxy 4 covers all 50 states as well as the Caribbean.

For \$50 to \$100 more per hour, upstart company IBN Radio of Ft. Lauderdale, Fla., can get broadcasters C-band access on GE-1, a bird that covers the North and South American continents.

All three satellite handlers cited digital technology as the primary reason entrepreneurs are able to make satellite services more viable today. Digital has lowered the bar of program distribution pricing over land and air, and it has made satellite delivery more practical for the one-program or one-event broadcast entrepreneur.

Digital
technology has
opened up many
new satellite
opportunities.

Digital advantage

Digital, for example, enables programmers to imprint their satellite-delivered programs with the necessary ID for affiliates-only reception, and hence, control barter arrangements with stations. This can be especially important to entrepreneurs uplinking programs on Satcom, a commercially popular satellite in use by all the major networks and therefore

See BIRD, page 40 ▶

WBGZ(AM): Small Budget, Great Results

"The (WBGZ) studios are in the Hotel Stratford, in Alton, Ill. Actually, they're in the basement of the building. The on-air studios are visible from the street, down an incline," said Rick Dearborn of RDA Systems in St. Louis, which designs and implements studio renovation and consolidation projects for broadcasters and other clients.

Every aspect of the design and move of WBGZ was Dearborn's responsibility. The actual move was completed in the space of a few days in May of 1997.

"WBGZ is a small-market station, and their budget was limited. What they've got is a really great facility now. And \$275,000 paid for everything, which is about what you'd expect a large-market station to spend on just one room."

Dearborn characterized WBGZ facilities as a "typical news/talk" design, with three studios, including on-air, talk studio and production, in a single line with large windows allowing visual contact among all three.

The station digital audio system is a SMARTS Broadcast Systems Generation 2000. The main control studio mixer is an Audioarts R60; an existing Broadcast Electronics board was used in production.

The daily deluge of telephone calls is handled efficiently with a Telos ONE plus ONE telephone hybrid system with a 1A2 interface. Air and production mics are Sennheiser MD421s.

The studios can go live independently or simultaneously. "The rack room has a Ramko routing switcher so that all signals are available in all studios," Dearborn said.

In the talk studio, RDA used Shure SM-99 podium-style microphones. An Electro-Voice ELX-1A mic mixer is recessed into a table, visible only to the on-air host interviewing the guests.

The news staff also can access the audio system. Audio is loaded onto the SMARTS system, allowing news announcers to play interviews and recorded packages.

Besides working with an architect on overall design, RDA Systems also designed the furniture, plotted and subcontracted wiring, selected equipment and determined the best design for the Hotel Stratford facilities.

The WBGZ air signal is fed through an Aphex Compellor and Orban OPTIMOD. A telco loop connects the station to its transmitter in nearby Godfrey. But, with all the new equipment and facilities, one important piece of technology has yet to be replaced.

"Actually, WBGZ is still using the same Collins 1 kW tube transmitter they signed on with in 1948," Dearborn said.

Dearborn's careful planning paid off, in the eyes of his client.

"Rick did wonderful work," Stemm said.

— S.D. Yana Davis

► WBGZ, continued from page 38

said. "WBGZ had been there originally from 1948 until 1959. We began talking to the new owners and worked out a verbal agreement."

So far so good, but Stemm, whose radio background is in programming, had no idea what to do next.

Outdated equipment

"Much of our equipment was very outdated. It was a real dilemma. Our contract engineers did not want to touch it, even to repair it, because the sheathing might fall off a wire or something when they opened a panel, much less move it to a new studio." Stemm needed someone to design and oversee the construction of new facilities in the Stratford.

One of Stemm's partners, an associate dean at an Alton area community



The 1951 WBGZ Studio, Located on the Mezzanine of the Hotel Stratford

college, recommended Rick Dearborn of RDA Systems in St. Louis.

"I knew from the first meeting Rick was the one for the job," Stemm said.

RDA systems designed new studios, and coordinated equipment purchases and subcontracting for the move back to the Hotel Stratford. (See related story).

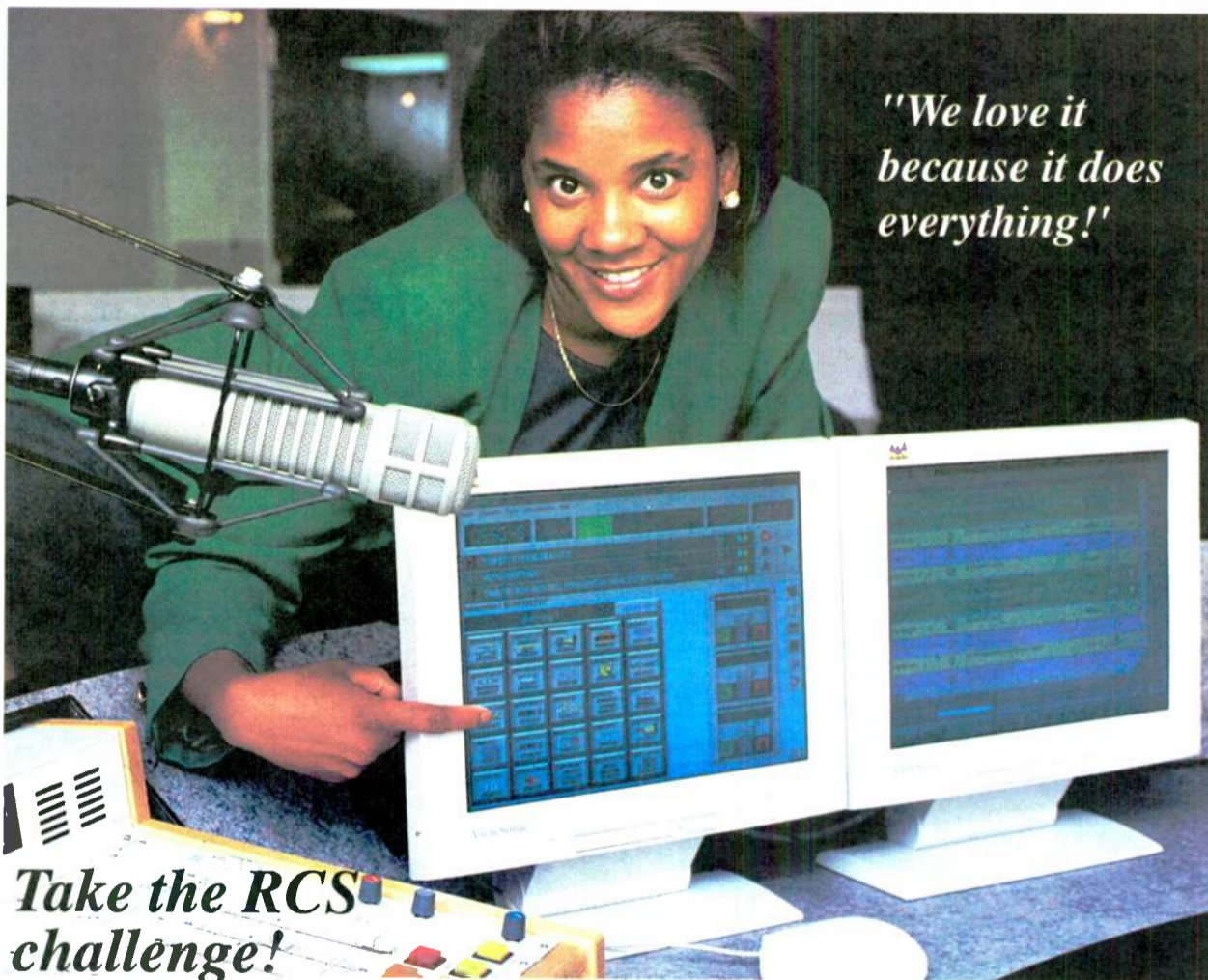
WBGZ continues to try to improve both programming and revenues, Stemm said.

"We're dealing with locally owned and operated businesses, almost exclusively, for our advertising, and that's who we're looking for. We don't even bother to call on advertising agencies for the big accounts. If something comes our way from them, fine, but we're not looking for it. And, our audience is mostly local, which is what we expect and want."

S.D. Yana Davis is a freelance writer and radio marketing consultant in Knoxville, Tenn. E-mail him at yana-june@aol.com

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Satellite Services

► BIRD, continued from page 38
widely accessible by commercial stations today.

Likewise, advances in digital compression have widened the available band space and the opportunities for getting on the Galaxy 4 satellite, known as a public radio vehicle. George Gimourginas, director of business services for NPR Satellite Services, said the company offers all forms of satellite delivery, whether for a day, an hour or a single event.

"We can build an uplink for you, we can sell the downlink packages, and we can put you up where other stations who may already have the

receivers can pick you up," he said.

Both ABC/GlobeCast Satellite Services and NPR Satellite Services offer C-band access to satellites that come ready-made with station patrons who have the necessary dishes and receivers to pick up an entrepreneur's program. Similarly, many local and regional sports networks offer entrepreneurs uplifts on their satellite carriers with access to a niche market.

For affordable coverage, new satellite delivery company IBN Radio is an option. It is one of the few national satellite services aimed at the broadcast entrepreneur. "There are some guys who already have shows, for example, but

they're looking for added time. What we're doing is offering it to broadcasters for only the time they need," said IBN Radio President Vann Ferguson, an entrepreneur broadcaster with his own satellite-fed show who offers GE-1 C-band access to others with similar needs.

Island success

After a string of radio and TV successes, Ferguson opened a digital on-air and production facility in Ft. Lauderdale to produce a



The IBN Radio Studio in Ft. Lauderdale, Fla.

weekday show aimed at the Bahamas market. In 1997, IBN Radio hopped on the GE-1 satellite, taking only four hours each weekday for its program and leaving the rest of the 24-hour time slot to the open market.

The service is affordable, with North and South American access, but it does have a downside: Entrepreneur broadcasters probably will need to supply satellite receivers to end affiliates. The upside is that potential affiliate stations are likely to have the satellite dish required for reception, and General Electric satellite receivers can be had for as little as \$1,200, according to Ferguson.

Digital technology has lowered the bar of program distribution pricing over land and air.

Available airshifts are patterned after typical radio schedules. All barter arrangements and distribution contracts are between the station and the broadcaster distributing the show. Like ABC/GlobeCast Satellite Services and NPR Services, IBN Radio offers its Ft. Lauderdale studio facilities for a nominal fee, although broadcasters can link up to IBN Radio over ISDN line from anywhere in the nation.

The idea of subletting satellite time and space to other upstart entrepreneurs grew out of what Ferguson saw as a maturing of radio programming. "What I think this does is bring more stations in line to carry more programs. Instead of one guy dominating a bunch of stations, an entrepreneur on one station can go on a multitude of stations," he said. He believes affordable satellite delivery is a win-win for entrepreneur broadcasters on both ends of the dish: those receiving and those sending programming.

Donnelly agreed, summing up the entrepreneur broadcaster's new freedom by citing the popular Microsoft slogan: "Where do you want to go today?"

Dee McVicker is a regular contributor to RW. Reach her at (602) 545-7363, or via e-mail at roots@primenet.com

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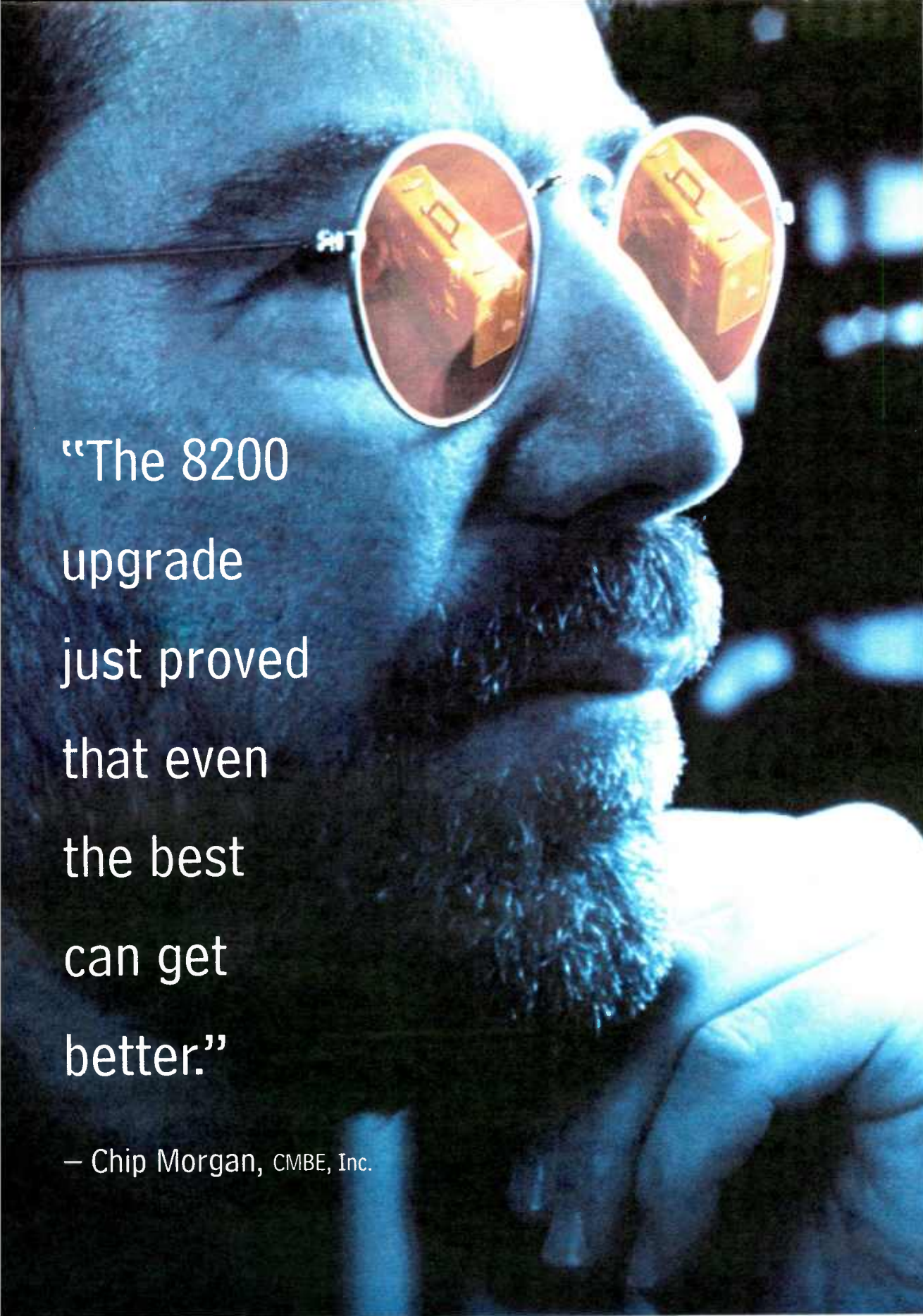
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An FCC Perspective on Inspections

**Ronald Ramage
FCC Inspector**

In response to recent articles in RW about unattended operation, FCC Inspector Ronald Ramage offers this perspective from the other side of the inspection.

There are numerous ways to monitor and control a broadcast facility. As an inspector, my job is to determine if these various operations meet with both the intent and the letter of the FCC regulations governing them. This job has become more complex since the establishment of the unattended rules which allowed licensees more flexibility in the operation of their station(s).

Unfortunately this increased flexibility has led to some confusion in the broadcast industry as to what each licensee must have to meet the minimum requirements for the monitoring and control of their station(s).

The unattended rules were established in a 1995 Report and Order, FCC 95-412, in Docket 94-130 relating to the monitoring and control of the technical parameters and EAS functions of broadcast facilities. In those regulations are terms such as "attended," "unattended," "automatic transmission system" (ATS) and "highly reliable equipment." I have found several instances in which a licensee appeared to be spending too much time trying to determine whether he or she is operating attended vs. unattended, using ATS or non-ATS equipment, or using highly reliable equipment or not, instead of concentrating on the more important issues associated with the station's operation in the community.

How to comply

In looking at the monitoring and control requirements, the bottom line is that all stations must be able to use common sense to demonstrate, at all times, compliance with the following:

1. EAS: Stations must have EAS equipment, installed and operational, which can receive at least two EAS sources. Stations must retransmit all national-level messages and required monthly tests within 15 minutes of receipt. Stations must conduct weekly tests of their EAS equipment. Entries are to be made in the station log documenting the EAS activations sent or received by the station. See §§11.51, 11.52, 11.54, 11.61 & 73.1820(a).

2. Monitoring: Stations must have monitoring equipment that enables the licensee to verify compliance with power, modulation, AM mode of operation, AM directional operation and, where applicable, tower lighting. If modulation monitoring equipment or AM field strength measurement devices are not available at the station, then provisions must be made so that this equipment is available readily upon request by the commission. See §§73.69, 73.1213, 73.1350, 73.1560 & 73.1570.

3. Control: For all stations, in the event that the station develops an out-of-tolerance condition of excessive power or excessive modulation, the licensee has three hours to either reduce power or terminate operation until the problems can

be fixed and licensed operation restored. In addition, AM stations have three minutes to either reduce power or terminate operation to correct an incorrect mode of operation, directional parameter(s) or excessive field strength at monitoring points. This three-hour (or three-minute) time frame is calculated from initial development of the out-of-tolerance condition and not necessarily from the time the problem is detected. See §73.1350(d)

Time limit

Note: §73.62(b)(5) states that AM licensees have 24 hours to measure and log every monitoring point at least once for each mode of operation should an out-of-tolerance condition occur. If the directional parameters indicate out-of-tolerance conditions, then the station is

The main thing I look for when making these determinations is effort.

still required to terminate or reduce power within the three-minute requirement. The licensee may then operate for temporary periods to allow the problem to be traced by personnel. Appropriate log entries are to be made showing when the station was on the air along with the results of the measurements taken.

4. Procedures: Licensees must establish monitoring procedures and schedules for each station that ensure that the station can demonstrate compliance. This includes schedules for periodic calibration of all required station equipment. See §73.1350(c)

The most common confusion about unattended operation arises from the references in the rules to "highly reliable equipment." Licensees often construe this to mean that they can place the equipment on the air and walk away for extended periods, without means of monitoring the station's operation.

In an effort to allow the most flexible, cost-effective station operation possible, the commission permitted licensees to operate their station(s) without automated transmitter monitoring and control equipment. However, the commission also stated that if this decision resulted in an increase in technical violations, then individual licensees may lose this privilege. Licensees must realize that operation without constant monitoring does not imply that they can operate without any monitoring at all. They also need to realize that there are other, non-technical, rules that apply.

When I inspect a station and find it in an out-of-tolerance condition, then I have found that:

1. It is much harder for a licensee to prove they have highly stable equipment that would allow them to operate without constant human or automated monitoring for extended periods of time.

2. The operation should be reviewed to determine if monitoring procedures and schedules had been established and why they were not sufficient to catch a violative condition prior to the inspection.

3. The operation should be reviewed to determine if the station was monitored within the last three-hour or three-minute time frames. While there are no FCC-specified minimum monitoring

schedules, there is the requirement to correct operation within the designated three-hour or three-minute time frames. For AM stations, the review will determine if the station was monitored within three minutes after mode and directional pattern changes.

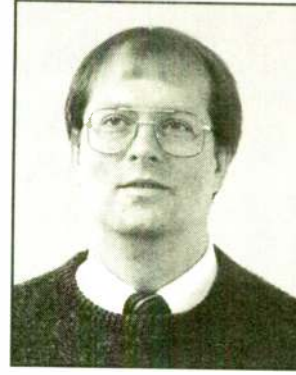
4. The operation should be reviewed to determine from where the station is being monitored and whether control of the transmitter can be obtained within the designated three-hour or three-minute time periods to correct or terminate operation until the problems can be fixed and licensed operation restored.

I am aware of a few situations in which an AM licensee has claimed that their automatic switching (with no auto-

matic monitoring) allowed their station to remain with daytime power at night, or with the incorrect directional pattern for that time of day. This does not excuse the licensee from the requirement to monitor and to terminate out-of-tolerance operation within three minutes after such changes occur.

5. The operation should be reviewed to see if sufficient metering is available to monitor power and modulation and how this metering is used to monitor the station.

6. The operation should be reviewed to determine the last date of calibration of equipment associated with the detected problem.



Ronald Ramage

Effort

The main thing I look for when making these determinations is effort. I realize that equipment malfunctions and problems that cause out-of-tolerance conditions can and will occur. What I am looking for is the effort the licensee was putting forth to detect and correct such problems prior to the inspection.

In addition to situations where there is no automated monitoring equipment, I have found that numerous licensees have elected to install equipment that constantly monitors the transmission system and is configured to contact designated station personnel in the event of an out-of-tolerance condition. In this type of operation, it

See FCC, page 45 ►



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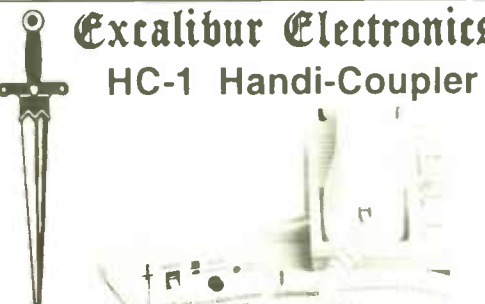
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STATION FINANCING

One Step Closer to the Lawyers

Dain Schult

You have found your financing. You have located the station of your dreams. You have inspected it when no one else was there (or at least when no one was paying attention to you). Your initial due-diligence turns up nothing but good things about this station. You and the seller have agreed to a price.

Now what?

Prelude to a purchase

You and the seller must execute a Letter of Intent. This serves as a prelude to the Asset Purchase Agreement that you will use as the definitive agreement between you and the seller and which you will share with the FCC. Normally the commission never sees the LOI.

Just like everyone has their own favorite Chinese restaurant, everyone has a different format for the LOI. I have seen one-pagers that basically say, "You and I have agreed to do a deal and the price is \$XX.XX," to 15-page monsters that are really more mini-contracts than a simple LOI.

Before I had a team of lawyers to save me from myself, I used a form that was

about three pages long. Now it is twice as long but covers more of the waterfront and provides better protection to both me and the seller. In this case, bigger really is better.

What should normally be included in the LOI? Keep in mind that every deal will require some kind of special wording or specific paragraph to satisfy either the seller or you:

First, what is it that you have agreed to? The LOI starts off like a regular letter. You either address it to the seller directly

or to the broker representing the seller. It starts with a statement that says that the purpose of the letter is to express the mutual interest you and the seller have in your buying arrangement. You list the station call letters and actual city of license. You list the seller as a corporation unless it is a partnership of some kind or a sole proprietorship. You list the state of incorporation of the seller and do the same for your company.

This is where you also list the assets to be purchased. You do not want to list

every stick of furniture here but you do want to cover the "biggies": broadcast equipment, antenna, transmitter and associated transmitter building, tower, station vehicles, buildings, land, office furniture and furnishings, all applicable licenses including but not limited to (there's a phrase you will often see in LOIs!) FCC, state and local permits and licenses, etc. This is also where you list things such as "both tangible and intangible assets," any trademarks or servicemarks that belong to the station, and the disposition of the Accounts Receivable (AR).

Everyone has a different approach on AR. I'm from the "If You Don't Ask, You Don't Get" school. Therefore, I automatically ask for the AR right out of the box. (This is where future sellers I may deal

Every deal will require some kind of special wording or specific paragraph to satisfy either the seller or you.

with need to stop reading.) Sometimes the seller agrees to include the AR as an asset. Other times we dicker over a specific amount, normally 50 or 60 cents on the dollar, which will be paid for the AR as a separate asset.

Remember one crucial truth: Everything is negotiable. Negotiate early and often before you sign anything.

But if you do not ask, you really will not get. If you let something slip by, or if you fail to list something as an asset, it is often difficult to get it added to the asset list later. Your mantra: "Buyer beware" all the way.

Pay attention to what you do. The phe-

A Typical LOI Breakdown

If your deal is for \$350,000 total, it might look like this in the Letter of Intent:

- \$200,000 in cash to be paid at closing, including any and all earnest money deposited in escrow beforehand.
- \$25,000 in cash to be paid at closing in consideration for Seller's covenants not to compete with Buyer.
- \$125,000 in a non-amortizing note for a term of four years to the Seller at 10 percent simple interest annually, with quarterly interest payments, no pre-payment penalties and secured by a senior lien on the assets of the station by Seller.

Obviously there are any number of other variations on how this part of the deal can or would be structured. Each one will be different.

— Dain Schult

nomenon of "new car fever" can wreck you. This occurs when you are so excited about a particular station that you fail to stay on top of the details, especially as they relate to what is and is not going to be an asset of the deal. Make sure you have a clear idea of exactly what it is you are buying, and then make sure that the clear idea is expressed correctly on paper in the LOI.

Split the cash?

Second, you list the sales price and how it will be paid to the seller. Normally you list how much will be paid at the time of closing. This is followed by how much you will pay the seller as a covenant not to compete. Typically you split the cash amount of the deal between straight cash and the non-compete, though it is all paid at once at closing.

See LAWYERS, page 46 ▶

Inspection Expectations

▶ FCC, continued from page 43

is permissible to configure this equipment to contact a mobile phone, pager or other phone numbers or locations prior to contacting personnel at a fixed location. However, someone must be on duty at a known fixed location to take the call in the event the problem is not corrected.

If a remote control or alarm point is established at any point other than the main studio or transmitter site, then the licensee must notify the FCC, Mass Media Bureau, Audio Services Division, 1919 M. St., N.W. Washington, D.C. 20554, within three days of initial use of this location. Notification is not required if responsible station personnel can be contacted at the transmitter site or main studio during all hours of operation. See §73.1350(g) and the FCC Unattended Question and Answer Fact Sheet, September 1997; the Internet address is provided in the box accompanying this article.

These are just a few of the items to

consider when determining how well your operation complies with FCC rules and regulations governing broadcast operations. I encourage anyone with questions on broadcast-related items to contact the FCC. The commission has established a National Call Center at (888) CALLFCC to handle questions, including those relating to broadcast. If the personnel at the call center cannot answer the question, they will forward the caller to someone who can.

■ ■ ■

The author is assigned to the FCC, Compliance and Information Bureau, Kansas City Office, from which he has conducted broadcast inspections for more than 14 years. Reach him at (816) 353-8934 or via e-mail at rramage@fcc.gov

The views expressed in this article are those of this author and do not necessarily reflect those of the commission.

Self-Inspection Lists

Ron Ramage, the author of the accompanying article, is the primary author of the FCC, CIB, Broadcast Inspection Checklists, designated FCC Bulletins CIB-18-AM, CIB-18-FM and CIB-18-TV. These bulletins are available to the public through the FCC Forms Distribution Center at (800) 418-3676 or through the Internet at the following URLs:

AM checklist: www.fcc.gov/cib/bc-chklsts/am.html

FM checklist: www.fcc.gov/cib/bc-chklsts/fm.html

TV checklist: www.fcc.gov/cib/bc-chklsts/tv.html

To download a copy of the FCC Unattended Question and Answer Fact Sheet, go to www.fcc.gov/mmb/asd/bickel/noonehome.html

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◆ STATION SERVICES ◆

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Outdoor Life in Bloom

Staying in tune with the outdoors doesn't necessarily mean having to freeze all winter; listeners can get their outdoor fix via car, home, office or wherever a radio is accessible.



JONES RADIO NETWORK™

Jones Radio Network is now taking charge of affiliation agreements and distribution for the program "Outdoor Life Radio." Now carried on 165 U.S. radio stations, "Outdoor Life Radio" focuses on the diverse landscape of outdoor activities.

Host Scott Linden treats listeners to informative tips and techniques on activities such as camping, fishing, wildlife watching, boating, RV travel, hunting, mountain biking, outdoor fitness and natural history.

"Finally, radio listeners have a relevant, informative show that actually gives them practical ways to enjoy the outdoors," said Linden. "Our alliance takes 'Outdoor Life Radio' to the highest level."

Distributed on CD, the 60-second program also features actualities, celebrity interviews and on-air giveaways.

Production of the program will remain in Oregon where the "Outdoor Life Radio" studios are located.

In a separate announcement, Jones Radio Network said it now offers "The Jimmy Carter Entertainment Reports." Two separate reports feature hot news and gossip from Hollywood or Nashville.

Carter is an Emmy award-winning entertainment reporter.

Reports are live, interactive and customized. Call-ins to station morning shows are available on weekdays.

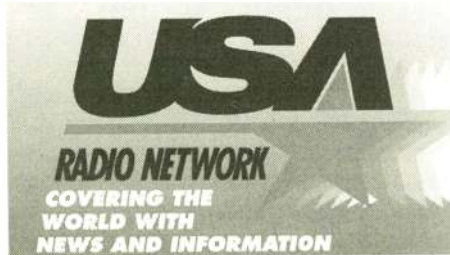
Carter has spent 14 years on Nashville television, and is known for his weekly appearances on "Today's Country" and "The Crook and Chase Show" on TNN.

For information from Jones Radio Network in Colorado, call (303) 784-8700; fax (303) 799-0551; or circle Reader Service 34.

Radio Recipes

A teaspoon of salt, a dash of paprika and a minute-and-a-half of radio. Betty Crocker is coming back to the airwaves.

USA Radio Network has launched "Ask Betty, the Radio Show," a 90-second daily report covering lifestyle issues, kitchen and food trends, family and children's nutrition concerns and healthy eating. The program now is available to radio stations across the country on a market-exclusive basis.



According to David Dix, director of communications for General Mills, millions of listeners were devoted to the Betty Crocker cooking show during its last radio run. "Betty Crocker is a nationally recognized authority," Dix said. "Betty is still the best source for news and nutrition and food."

Five original episodes of "Ask Betty" will air weekly, and each pro-

gram will include a Web address and toll-free telephone number for listeners who wish to attain more information about the content of the shows.

For information from General Mills contact Jack Sheehan in Minnesota at (612) 540-7092; or circle Reader Service 60.

Cupid Visits the Airwaves

Valentine's Day may be over, but Cupid can keep working some of his magic through radio.

"Cupid's Quiver: A Valentine's Day Meditation on Love," is available free to all public radio stations. Presented by KMUW(FM) Wichita and The Necessary Theater, the program features a variety of romantic contemporary tunes, romantic Shakespeare Sonnets, and three original radio drama pieces.

"Cupid's Quiver" combines the above elements to create an atmosphere of the humor, pain and life-changing power that accompany romantic love. The dramas include "My Therapist Bob," a humorous look

at the insecurities of dating, "Driving as a Form of Therapy," a portrayal of the demise of a relationship, and "Happy Valentine's Day, Mr. Prince," a story of a young student with a crush on his teacher, who then ponders the situation years later.

The program can be picked up through various feeds, taped and replayed as often as wished.

For more information from KMUW(FM) contact Joe Vincenza in Wichita at (316) 978-6789; or circle Reader Service 8.

Station Services is here for you! Use it. Send us your announcements about newly syndicated programming, reference tools or other items that stations around the country can use. When possible, include graphics. Send your items to:

RW Station Services
P. O. Box 1214
Falls Church, VA 22041

Lessons in LOIs

► LAWYERS, continued from page 45

interest earned on the earnest money

Making a list

Next you need to list how much, if any, seller financing is involved and the basic terms of that note. You should list the amount, interest rate, whether the note is amortizing or non-amortizing, whether there is a balloon payment at the end, prepayment penalties, and so forth.

There will be earnest money paid at the time the LOI is executed by both parties, and escrow money will be applied to the cash portion of the payment at the time of closing. It is good to go ahead and list who gets to keep the

**Remember
one crucial truth:
Everything is
negotiable.**

while it is held in escrow until the deal closes. Remember the "if you don't ask" line at this point. On the other hand, you may just want the interest earned to be applied to the deal, too. It is six of one, half-dozen of the other on this front.

Next time we will learn how the big type giveth and the little type taketh away.

■ ■ ■

Dain Schult is a 30-year broadcast veteran and consultant with experience as a DJ, general manager and group operator. He is based in Austin, Texas.

Got a question or suggestion for Dain? Send an e-mail to RW at chamaker@imaspub.com and let us know.

Small but Powerful

Dain Schult's column about station financing has generated plenty of mail and calls. But why bother writing about station financing at all? Isn't that era dead, now that superconsolidation and mega-owners are the norm? RW asked Schult to reply.

Small markets will always be available to the individual entrepreneur-type operator. Granted, major markets are gone for mom-and-pop operators, and most medium markets are disappearing as opportunities too, but even the Hicks brothers do not have enough money to buy every station in the country.

I had to shift the emphasis of my own group from strictly medium markets to a mixture of medium- and small-market properties in Texas. The nice thing about a small-market deal is when you own either the one or two stations in the market, you can then be the Capstar or Clear Channel of that market. No one else is going to be able to come in on top of you. You can then direct your attention to the business of competing with the local paper and cable television operation.

Just like George Bailey discovered in Bedford Falls, you too can have a wonderful life in a small town.

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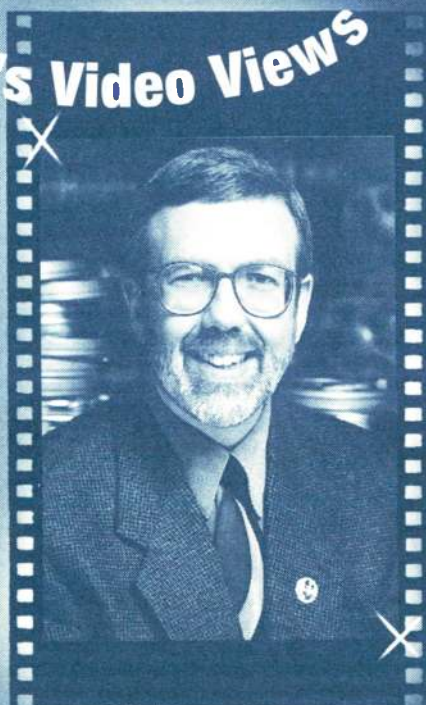
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World Radio History



PR&E Wins 21-Studio Emmis Deal

Emmis Broadcasting is going digital in Indianapolis.

The company has signed a \$2 million contract with **Pacific Research & Engineering** for facilities consolidation and integration services. PR&E equipment and services will include 19 of its new Integrity Digital Broadcast Consoles, making this among the largest projects involving digital radio

consoles in the United States. The contract also includes systems integration and custom studio furniture.

Twenty-one studios will be built for five stations located at Emmis headquarters in Indianapolis, plus network origination studios for Network Indiana and AgriAmerica Network. The electronic and furniture components will be built during the first three quarters of 1998 for an on-air target of Dec. 1, 1998.

Emmis CEO Jeff Smulyan, in a statement released by PR&E, said, "Emmis has selected state-of-the-art digital equipment for all the studios in our new Indianapolis corporate headquarters, including two on-the-street showcase radio studios."

PR&E announced separately that China National Radio, the largest operator of radio networks and stations in

China, ordered two Integrity Consoles. The agreement was made through distributor Infosto Group.

For information from PR&E in California, call (760) 438-3911; or circle Reader Service 111.

Disney Signs T1 Agreement

GlobeCast North America signed an agreement with **Walt Disney World** to provide full-time T1 service between the Disney-MGM Studios in Lake Buena Vista, Fla., and the ABC/GlobeCast radio facilities in New York and Los Angeles.

ABC/GlobeCast's T1 service is a digital/audio circuit that will deliver the programs of on-air personalities broadcasting live from Walt Disney

World. From New York and Los Angeles, the signals will be uplinked and transmitted via satellite to the radio personality's local station.

For information from GlobeCast in New York, call (212) 885-8700; fax (212) 885-8701; or circle Reader Service 137.

TOT Uses Stereo Codecs

Telecom Organization of Thailand (TOT) ordered more than 150 CDQPrima 210 stereo codecs for use in its 2 mbps network. The codecs are manufactured by **MUSICAM USA**, and were ordered through its distributor in Thailand.

MUSICAM USA Director of Sales and Marketing David Lin said TOT plans to use the Prima codecs along with multiplexers from Swiss-based ASCOM Transmission to offer end-to-end high-fidelity audio to broadcasters, in place of equalized lines.

The manufacturer said it continues to see strong business from telecommunications networks, including customers in New Zealand, Asia and South America.

For information from MUSICAM USA in New Jersey, call (732) 739-5600; fax (732) 739-1818; or circle Reader Service 163.

Z-Spanish Network Turns to Spread Spectrum

Z-Spanish Network recently installed two **Moseley Starlink 9001SS 2.4 GHz Spread Spectrum Links**, allowing it to set up wireless STLs despite a lack of 950 MHz frequency space.

Moseley said spread spectrum technology, which does not require an FCC license, allowed its customer to establish primary studio-to-transmitter links for two of its stations in Sacramento, Calif.

Separately, Moseley also reported that **Home Shopping Network** chose its MRC-2 system to monitor and control VHF/UHF transmitter sites nationwide.

For information from Moseley Associates, call (805) 968-9621; fax (805) 685-9638; or circle Reader Service 189.

WRMF Adds Lightning Protection

Fairchild Communications station **WRMF(FM)** in West Palm Beach, Fla., installed a **Lightning Master Streamer Retarding** brand lightning protection system.

The system is intended to protect the station tower from structural and equipment damage and operational problems caused by lightning.

Lightning Master provides services including bonding and grounding, surge suppression and structural lightning protection.

For information from Lightning Master, call (813) 447-6800; or circle Reader Service 215.

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"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.**

Let's Be Creative Out There!

Randy Stine

Creativity. The word is simple enough. My dictionary defines the word "create" as to "cause to exist; originate, to bring about, or produce." In radio, creativity is vital. In particular, radio commercials must be creative. They must inform, entertain and sell.

Broadcasters from across Minnesota and a few neighboring states came to Minneapolis recently for the Midwest Broadcasters Conference and Telecommunications Expo. A goal of the conference, hosted by the Minnesota Broadcasters Association, was to provide radio professionals with a chance to improve their creativity skills in the areas of writing and producing commercials.

Those 12-to-15 ad units per hour that most stations run often are overlooked when it comes to the overall sound of a radio station. Jim du Bois, president and CEO of the MBA, said the conference sessions sought to overcome this problem.

"Traditionally, our conferences have concentrated on programming techniques, sales and engineering," du Bois said. "We haven't very often dealt with the creative side of radio. This year we decided to show our members how they can pump more creative energy into their commercials, while avoiding the cookie-cutter approach."

The Hip Spot

Panelists offered tips on producing the "hip spot," a more compelling commercial product.

"Sometimes you have to think small," said André Bergeron of Voiceworks studios in Minneapolis. "Big bombastic commercials are good for selling big bombastic products.

Over-production for the sake of creativity has killed many great ideas for commercials.

— André Bergeron

Over-production for the sake of creativity has killed many great ideas for commercials."

Bergeron recommended that radio stations use all of their available talent. "Take an inventory of everyone available to you, from the receptionist to the sales manager," he said. "If they have legitimate talent for doing voices or accents, you can write with those people in mind."

Keep in mind that many receptionists and salespeople are drawn to those positions by the thrill of the on-air light. Give them a chance to shine. You will boost morale, and maybe uncover a diamond in the rough.

Who comes up with great ideas for commercials? Dan Culhane, production director for KFAN(AM) in Minneapolis, said this should be a collaborative effort. "Ideally, you have the salesperson and

client come up with an idea starter," Culhane said. "Then things are turned over to the copy writer and production for them to do their jobs."

If you work at a small radio station in a rural area of Minnesota, or anywhere for that matter, you may not have the luxury of a copy writer. If you do, the person also may work on the air, handle traffic and answer the phone. In that case, Culhane admitted, much of the copy writing will have to fall to the sales department.

"But it's not their specialty," he said. "They generally are more concerned with numbers. That's why it is so important to keep the lines of communication open. Everyone here is always bouncing ideas off each other."

Sales pitch

The relationship between sales and production is of vital importance when it comes to creativity. No one knows the client better than the person who makes the sale. The salesperson knows how far production will be able to push the creativity envelope.

Jim Gullickson, general sales manager at WEEZ(FM) in Mankato, Minn., said, "Instead of just handing a tear sheet ad from the newspaper," he said, "a good salesperson should serve as an idea starter, and give the production people enough time to develop that idea."

That brings us to the subject of time. Although many incredibly creative spots have been dreamed up overnight,

most are not. The client will say "I need this on by tomorrow," and sales usually will go along with it. This kind of hectic production pace does not lend itself to award-winning spots.

Session speaker John Olson, president of Olson+ Co. in Minneapolis, said in-house radio production lacks two things when compared to ad agencies: time and money. "Radio broadcasters are surprised by the time and money spent to produce a great spot. Typically, we'll take months to develop, write and cast a commercial," Olson said.

According to Olson, any radio ad produced overnight could have been much better with time. "A quickie commercial can be good. But that same commercial, given time, could have been great with your creative people brainstorming on it," he said.

Ah, the brainstorm. Usually the typi-

cal production director sits at his mixer board, praying to God for an idea to strike him out of the blue. In the real world, creativity comes from collaboration. The more people you can use as a sounding board, the better.

One technique used by Olson, whose clients include Mall of America and Musicland, is word association. "Think of what your client is selling," he said, "then come up with maybe 100 things that make you think of that product. Once you have that list, pick one or two and run with it.

"From there, even something obscure can be turned into something people can relate to."

Olson encouraged people to take notice of the ideas of others. "Get your hands on award books from the advertising field. You can see what other people have done, and use it to stimulate your mind," Olson said.

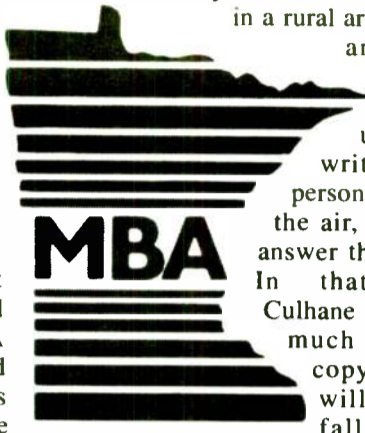
Once the idea is born, the spot must be written. According to Bergeron of Voiceworks, "People are so visually oriented now, most spots

are written for the eye and not the ear," he said. He advises the use of "language of the spoken word. Say the words out loud and then write them down. You will be surprised at what you see. You will see that it is shorter on the page."

But what about those days when you just do not feel creative? Gullickson of WEEZ said it is difficult to be creative all the time. "No one is at their creative best day in and day out. It takes patience sometimes for great commercials to come about," he said.

■ ■ ■

Randy Stine is the news director at WXIK(FM) in Lansing, Mich.



Jim du Bois

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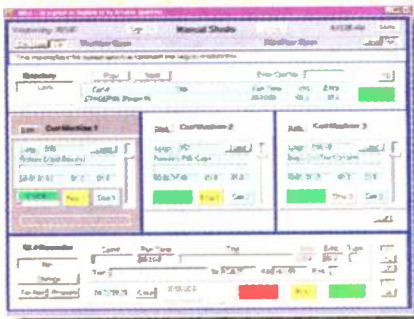
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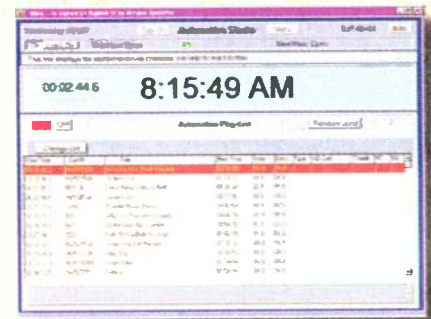
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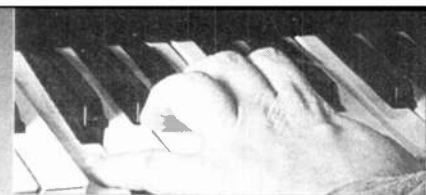
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Studio Sessions



**Making Music
For Commercials**
Page 53

Radio World

Resource for Radio Production and Recording

February 18, 1998

Off to See the A&H MixWizard

Part I of II

Ty Ford

There are a ton of small-format mixers on the market. But what I like about the Allen & Heath MixWizard 20:8:2 (\$1,295) is that this board comes with eight busses. Very handy when used with an eight-track recording machine.

First, we'll take a thorough look at the 20:8:2. Next time, it will be put to work in the studio.

Jolly Olde England

The MixWizard is made in England. The circuit boards are wave-soldered instead of hand-assembled. The manual is perhaps a bit too succinct; I have been spoiled by applications-based manuals, such as those from Mackie.

Most live sound pros will find the MixWizard trivial in terms of complexity. The person buying his or her first modular digital multitrack (MDM) could probably use more help than the 24-page manual offers.

The MixWizard's metal case has a rotatable connection pod. The jacks can be positioned straight out or straight down from the back, but not straight up. The straight-back position slants the mixer at 15 degrees. Rubber feet keep the mixer from scratching a tabletop surface. In the straight-down position, the whole mixer fits in a 10RU space. To change positions, back off a screw on each side, swing the pod and tighten down.

The face panel of the MixWizard extends past its sides, terminating in rackmount flanges. There is a standard IEC power jack and cord; no wall warts or line lumps.

As the "20:8:2" name implies, the MixWizard has 20 inputs, eight busses and a 2-mix output. There are no submasters, which may make it less attractive for live sound use. Inputs 1-8 accept balanced XLRs (pin 2 hot) and quarter-inch TRS plugs or unbalanced TS plugs.

EQ for you

Each of the eight mono inputs has an unbalanced insert jack, -30 dB pad, trim control and mic preamp. The MixWizard has four-band EQ with two swept midranges and a fixed Q of 1.9. All four bands allow ± 15 dB adjustment.

The top band is a 12 kHz shelving EQ. Mid Filter 1 sweeps 500 Hz to 15 kHz. Mid Filter 2 sweeps 35 Hz to 1 kHz and the low band shelves at 60 Hz. The EQ has a hardwire bypass switch.

There are six Aux sends, set up as Cue 1 and 2, Aux 3 and 4, Aux 5 and 6. Cue 1 and 2 are taken pre-fader and post-EQ with post on, and can be set up as a stereo cue or two mono cues. Auxes 3 and 4 are pre/post switchable. Auxes 5 and 6 are post-fader.

A center-detented pan pot is next, followed by a Channel On button, a post-EQ

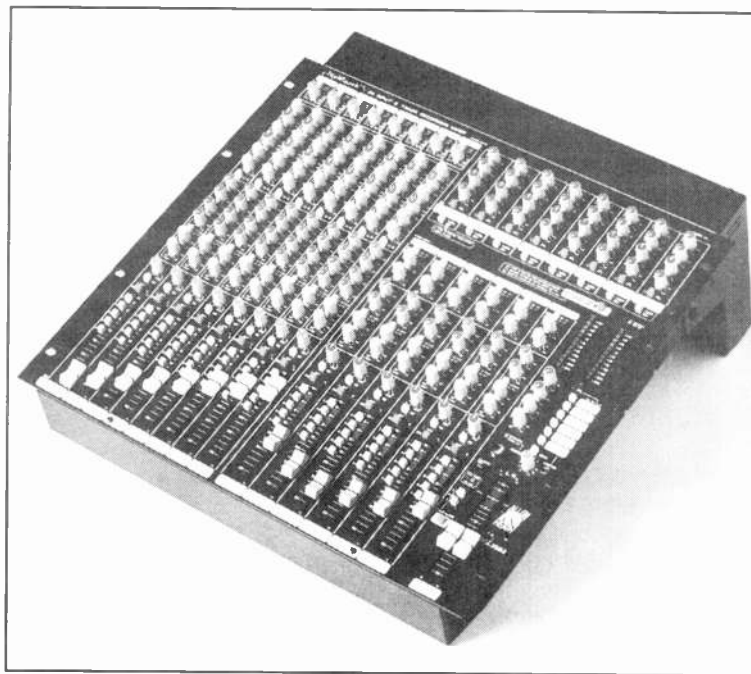
pre-fader Peak light that doubles as a Solo/PFL (Pre-Fader Listen) indicator and a PFL button.

The Peak light fires 5 dB below clipping. While valuable for keeping radical

mix and separate stereo headphone mix.

The two most valuable features of the MixWizard are Tape Reverse and Mixdown.

Tape Reverse allows track bounce



Allen & Heath MixWizard 20:8:2 Mixer

EQ tweaks under control, it would be handy to have one close to the first gain stage to catch hot signals. A master PFL light in the monitor section lights to indicate a PFL button is engaged somewhere.

Bus assignment buttons are set in pairs: L/R, 1/2, 3/4, 5/6, 7/8. Each channel's pan pot can be used to selectively route the audio to a single bus. The eight busses are switchable between -10 and +4 dB via a back panel switch. The bus inputs are TRS, but unbalanced. The bus output are impedance balanced, but not differentially balanced.

The stereo side

The six stereo inputs are configured to accept one or two quarter-inch plugs for mono or stereo operation. An unexpected surprise was that the jacks were spaced precisely to accept my old double-prong patch cords. The Master L/R Insert jacks, Monitor Outputs and -10 Tape I/O are spaced the same way.

Unlike the mono channels, the stereo inputs do not have Insert jacks. A level switch replaces the gain pots and there is no mid-band EQ. There is only one cue control, but Auxiliaries 3, 4, 5 and 6 are implemented as they are on the first eight channels.

The third section is a group of eight Tape Returns. This is a convenient addition to a small-format mixer that lets you do a simple monitor mix. Each Return has Cue 1-2, Aux 6 Send, Pan and Level controls and a PFL button and light.

These let you adjust the level of each return track, add effects on Aux 6 and pan each track to set up a stereo monitor

without patching. The eight tape tracks coming back through the Tape Return section can be routed individually to the main channels where the processing and effects flexibility can be used. Tape Return 1 goes to fader 1 where audio can be EQ'd, sent, returned and routed back out to any of the busses without patching.

The one-button Mixdown routes all Tape Return channels to the first eight tracks of the mixer. This moves all tape audio back to the most flexible channels of the mixer without having to repatch. You do have to deal with reassigning the busses, but that is a small price to pay.

Got more than eight tracks in your final mix? In addition to the eight mono and six stereo channels, the eight mono tape returns can be used during final mixdown for a maximum of 28 inputs.

The way out

The Output and Monitor section is rather complete for a small-format mixer. A retracted sub-panel switch phantom-powers the first eight channels. A red LED confirms phantom power is on. There is also an internal "disable link" that allows each channel to run individually without the phantom.

Two 12-section LEDs marked from -30 to +16 are the only metering on the

See WIZARD, page 53 ▶

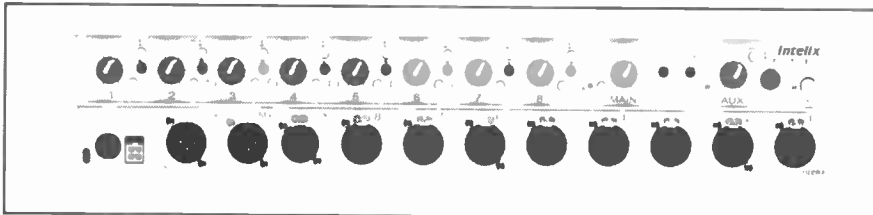
SHORT TAKE

Transplanted Trimmers On New Intelix Mixer

Intelix took its popular 8002MCB mic/line mixer and performed one little tweak to the design, moving the trimmers off the back panel to the front. The result is the 8002MCB-FP mixer. The change has made a huge difference.

A lot of features are packed into the 1RU Intelix mixer. Each input is mic/line selectable, routable to the Main or Aux outputs (effectively making this an 8x2 mixer) and each has a 120 Hz low-cut filter.

A built-in compressor/limiter has



The original 8002 was intended for use in remote broadcast vehicle racks and for field production. Although it performed well in that regard, many engineers could not reach around to the back panel to adjust trimmer pots when the 8002 was rack-mounted.

The company listened, and the new incarnation of the mixer now places all controls — even the set-and-forget ones — on the front. The back panel now holds only the power connectors, eight XLR inputs, the Main output XLR and both Aux In and Aux Out connectors.

front-panel controls for ratio (1:1 to inf.:1) and threshold (-40 to +20 dB). Phantom power is available at the mic inputs and an LED meter displays levels from -18 to +12 VU.

As with the original 8002 mixer, a padded cloth carrying case and a charger/battery are available as options. The new 8002MCB-FP has a list price of \$799.

For information, contact Intelix in Wisconsin at (608) 831-0880 or circle Reader Service 218.

— Alan R. Peterson

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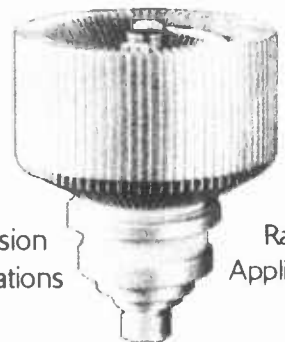
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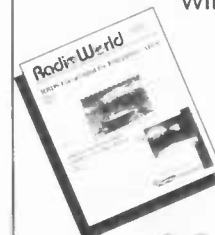
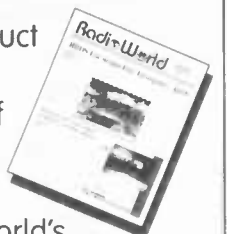
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Writing Songs to Sell Some Suds

Part II of IV

Stephen Wilke

In my first article on where production music comes from, I gave a general overview of the way the music composer interfaces with the needs of an ad agency when they are creating a spot. Here I will describe real-life examples and try to show the range of concerns and how they get handled.

Music is used in our world for social and spiritual expression. It is a basic fiber in our culture and there are many ways it can reflect back upon our lives in commercials.

When you are trying to "brand" something, you create a jingle that registers

Even though I am about to describe the process of creating the score for a TV spot, most of the lessons port directly over to radio advertising.

I was approached by a director and his friends from an agency working on a Bud Lite spec spot for television. They had no money at this point and were getting demos from other music houses. We offered to take a shot at it too; at least we could use it on our demo reel.

Now this is not the usual ad agency approach. They usually pay a demo fee to cover musicians and studio costs. In most cases, they select you for a job with an already established budget. We accepted this and began to figure out what they were looking for.

The dialogue-driven spot featured two con men selling an apartment with a refrigerator that magically provided beer every time the door was opened. The agency wanted dreary apartment music to begin, a "magical" sound every time the door opened, finishing with some "fun" music.

My partner and I watched the final edit of the spot, considering our post-scoring task. We followed the

pace, trying to decide what style and tempo would work best, then played a few CDs to see if anything clicked for us. We decided on a '50s-style track, thinking it would make the characters' sleazy behavior in the spot less offensive and more innocent and playful.

A few simple accents up front established the dreary feel while allowing the reactions of the characters to come through. The magical door would be accomplished by a colorful sonic texture

that would say "ta-da!" in a wispy way.

With only 30 seconds, three 10-second musical sections would have a lot to say. We decided on a typical blues chord progression for the "fun" part.

That meant making it through a complete musical cycle of blues, matching the rhythm of doors opening and closing, getting out of the way of end dialogue and still buttoning up the whole commercial.

A one, a two ...

I usually start by just playing the commercial over and over, singing a melody against it to find the tempo and structure most likely to work.

The best structure hits naturally on certain important points and lets you emphasize others by hitting off-the-beats. Shortening a musical phrase from, say, four beats to three or two also helps track the spot.

Within packaged radio production libraries, music is phrased so copy points can be adjusted to land on little "buttons" for emphasis. Here, the process is reversed, with the music written to follow the action rather than the other way around. Of course, no rule says radio production music cannot be written in this same manner.

We found a melody that seemed quirky and fun. Once we put up a click track (reference timing track similar to a metronome), we finessed the piece until

See SUDS, page 54 ▶



What sounds right when writing music for beer commercials or health care centers?

familiarity to the consumer every time it plays. At other times you are trying to give the commercial some attitude without calling attention to itself.

Playing pops

Sometimes you arrange a popular piece of music that helps validate the product, bringing with it the qualities and values that make a consumer feel good. A celebrity in a commercial accomplishes the same goal.

A&H Eight-Bus Board

▶ WIZARD, continued from page 51

board. While I would like more meters, their cost and placement on the mixer probably made them prohibitive.

The meters follows the audio monitor switching so you can read levels on Cue 1-2, Aux 3-4, Aux 5, Aux 6, 2Tk-1 return, 2Tk-2 return or the L/R output by punching them up with the monitor selector.

Interrupt logic on these buttons lets you hear the L/R mix with no buttons engaged. Press the 2Tk-1 button to hear the recorded signal, then press the Cue 1-2 button to check the talent's feed without having to release 2Tk-1.

PFL always takes priority. If a PFL button is engaged, the 20:8:2 sends the source to the headphone and monitor outputs without affecting the main L/R output. A Mono button allows checking for phase or polarity anomalies without disrupting the main outputs.

If you work alone with an open mic and don't want to deal with muting monitors, use the Cue To Phones switch to send the stereo Cue 1-2 signal to the

headphone jack. The rear-panel L/R monitor outputs are still hot and can be controlled by the Monitor Level control.

Just like on the big boards, there is a talkback circuit. A balanced TRS jack on the back panel accepts a dynamic mic. Gain is set by a small screw adjustment in the Output and Monitor section. The signal can be routed to Cue, L/R and busses 1 through 8, separately or together.

A handy 1 kHz tone source is sent to channel eight, where it can be routed to any effect or output bus. The tone hits channel eight before the Insert so it interrupts any audio coming in. Channel eight's Insert Send can then double as an oscillator output.

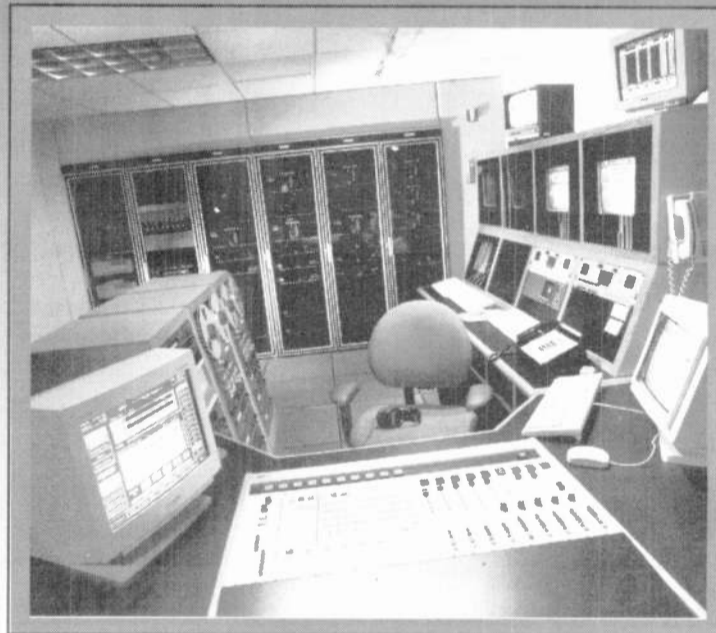
That's the road map of the Allen & Heath MixWizard 20:8:2. In the next part, I will get into what happened during a typical 8-track tracking, overdub and mixing session with the console.



Reach Ty Ford at www.jagunet.com/~tford

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First Job? Don't Expect the Moon

Alan R. Peterson

One event I enjoy every year around this time is the Intercollegiate Broadcasting System annual college radio convention in New York City. This three-day event has been well documented by me in past issues of *RW* because it always leaves me feeling good about the future of radio.

It also fills me with dread knowing that, every year, I cheerfully give up-and-coming broadcasters the secrets of how to put me out of work. And that I pay out of my own pocket for that privilege.

One comment from last year's sessions made me think. I was describing show prep material, comedy services and sources of creative inspiration for the competitive radio air personality. I was explaining the cost involved, when one male student with ambitions of doing a morning show asked me, "How do I get my station to buy these for me?"

Pay your way

I suggested that this probably would not happen until about the second or third job down the road, and for now he would likely split the costs with the station or foot the bill entirely himself.

"Well (*bad word*), why should I?" was his response. "I'm working for them, so they have to provide me with the tools I need to do my job."

Point heard, but not exactly taken. And there are lots of reasons.

"Air talent" is one of the least-expensive occupations in which to start. Dentists need X-ray machines, computerized sinks, movable chairs and an office to put it all in. Photographers spend thousands for cameras, lights, chemicals and a building with a nice high ceiling. Recording studios will drop half a million dollars just on a console. But radio talent? Headphones, some CDs, a pleasant voice, maybe a few magazine subscriptions, and your "personal toolbox" is ready.

This fellow believed he *was* his own personal toolbox, and everything else had

material to set him or her apart from the show across town, across the hall or even in the next daypart. How often have we heard the same statistic from USA Today repeated on the air by three different jocks, each one thinking they were first to use it?

There is danger in spreading one source of show prep across all dayparts. It is difficult to stock the station with generic material and have it sound fresh around the clock. Even more difficult is for a station to subscribe to, and pay for, a service to be used solo by an unproven newcomer. Read further to see why.

Bring tools

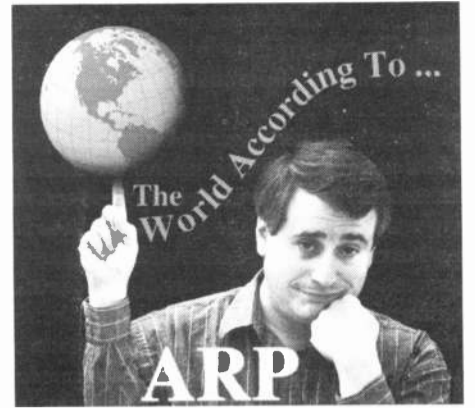
Check out the classified ads for automotive technicians, bricklayers or carpenters. (Someday you may *have to!*) Most say, "Must have own tools."

It is a given within these trades that if you know how to do the work, you have your own tools. One person may lay mortar with a 3-inch trowel and another uses a stale slice of rye bread to do the same job, but each uses the tool with which they work best. Radio is the same: Bring your own tools to do your best work.

Some prep material works fine across all dayparts, such as celebrity birthday lists and TV gossip. But the "6:15 Joke of the Day" likely would flop if retold during office listening time. Recycled in a promo, it works; but after 6:15, everybody has heard it.

Put in simple terms, the only person really concerned with your career is you.

to come from the station. True, certain "glue" items such as cart labels and soap in the washroom are not paid for by the talent, nor should they be. But an air talent must maintain a private stock of



It also boils down to "How much of a performer can you be?" This young man simply wanted reams of material delivered to him, so all he would have to do is move his mouth and be brilliant. Again, two or three jobs from now he may enjoy this luxury, but every capable jock I know has a personal "cart stash" of effects and music, and uses every waking moment to prep their show.

Oops, missed

Even the silliest thing observed while driving to the station can top generic material. On my way to work one day, I noticed workers punching a hole for a through-wall air conditioner into a commercial building that housed a popular karate academy. Jagged boards and insulation were dangling out of the wall and the black tar paper underlayment was visible from the road.

During an early break in my show, I mentioned the hole in the wall and suggested that it actually happened when somebody inside tried to karate-kick a board in half, missed the target and wrecked the wall with their foot.

Because the academy was on a high-volume road, lots of folks saw the hole and got the gag. Any other day, that building would have been just a blur on the landscape. The academy owner first thought I was bad-mouthing his business, but changed his mind once the phone calls began coming in.

Tell me that same audience would have reacted as strongly to a repeated "did you know" factoid from earlier in the day.

You want what?

Finally, managers know that jocks are transient and will only put in a few years of service at best. Almost none want to pay for a newcomer's education. Stations help job-seekers enough already by making the C-10 cassette supply entirely too accessible. I can think of few managers who would say, "Sure, I'll drop a few hundred dollars on prep material for your untested, unproven show, for the sole purpose of your getting a better job and leaving me high and dry!"

Put in simple terms, the only person really concerned with your career is you. If you think a joke service will work for you, buy it yourself, at least for now. If you want a silly effects CD for your show, get it. Come to work armed for battle and you win the job.

Any investment made in yourself now always pays off later when the good jobs come. I hope my young friend who demanded the spoon-fed show got the message.

■■■

Information on the 1998 IBS convention can be found at www.ibsradio.org or by calling Fritz Kass at (914) 565-0003.

Beer and Beatles Meet in Studio

► *SUDS*, continued from page 53

it gave us the most opportunities to hit picture points. The "tada" would be played without click track so it would hit in just the right place.

Now we needed a combination of sounds to capture the proper essence: an organ sweep followed by a combination of synthesized bells and textures, along with harp and real bells.

The opening accents also were played without the click track so they could move naturally against the dialogue. We used bass and guitar only — creating a tense "uh-oh" feeling — leading into an organ passage linking to the fun '50s track to come later. The spot felt as one piece, even though it had different feelings for different sections.

We used a saxophone as a lead instrument because it could complement the melody and give some character to the overall effect.

After arranging, recording and crow-barring things into place, we presented the agency with our track. This was the moment when we hope for that spark in their eyes.

We didn't get an enthusiastic response. At least not at first. We got requests for other ideas, at which point we asked that they wait and see what the other music houses did. If they liked our track and wanted to give us the job, we would explore their ideas.

Well, one of the head honchos loved the track. They came back and made it the theme for a campaign of Bud Lite spots including a Super Bowl follow-up spot.

That healthy sound

For another example, I enjoy writing music for health care spots because in most cases I get to write beautiful tracks with a lot of color in the orchestrations.

In this case, the agency had a strange request: The writer had "Eleanor Rigby" by the Beatles in mind. The spots took on more of a technical, professional quality than a human caring approach, so we started to brainstorm.

The problem was how to capture the sound of Eleanor

Rigby so the client would be satisfied, we would support the picture edits and not end up in court.

Our first task: Listen to Eleanor Rigby. Our analysis: Eighth-note string patterns pulsing under an unusual melody structure. We argued with ourselves whether it could be done and still have the client (and not the Beatles) recognize the similarity.

Play it like this

The easiest thing to do was pulse some string parts in a similar rhythmic pattern but with different musical chord progressions. Then we played with melodies and fragmentations of the melody. It kept coming out too far away or too similar.

Continuing, we tried changing the key from major to minor. This matched the seriousness of the picture better. In the end, we created a unique piece that maintained dear Eleanor's qualities.

All creative processes work within boundaries that help focus their results. In this case the client liked the track, but my partner and I wondered, "If we started with no expectations, would we have composed a more appropriate

track?" The client was happy, though, and that is what mattered most.

I have not really covered music theory, application and the kind of ear required for the diverse styles of music I am asked to write. Frankly, this is not the place for it: I would have to write a book to tell all the war stories.

For instance, how do you take the Bud Lite theme and work it into a campaign of spots that are uniquely different in character and musical style? Suffice it to say, it is a life's journey.

In Part III, I will take you through the technical recording processes of commercial music.

■■■

Stephen Wilke writes music for commercials with his own company, *Open Sky Music Productions*, and is a sound engineer at *Swell*, a full-service post production facility in Chicago. Reach him through *RW*.

All creative processes work within boundaries that help focus their results.

Save Valuable Data With Seagate Utility

Read G. Burgan

So you don't back up your hard drive, eh? Your computer is a disaster waiting to happen.

When your entire audio inventory is locked up inside a spinning platter, you must always practice caution and diligently perform backups to your system. But even if you are a conscientious backer-upper, the restoration process can be slow and cumbersome.

First, you will have to restore your operating system — if you can find it — and that often means first locating and loading SCSI or CD-ROM drivers. Then you must load the backup software itself, find the correct backup tapes and then finally restore your files.

Hard-drive manufacturer Seagate has a much better way: Seagate Backup Exec Version 2.0 for Windows 95.

Extra protection

Seagate Backup Exec works much like ordinary backup software. But in addition to backing up your selected files on the medium of your choice, it also creates an emergency backup diskette. Should your hard drive experience a fatal crash,

Check to be sure your backup hardware is supported.

replace it and then boot your system using the emergency backup diskette.

At the DOS prompt, type in "restore" and the backup program will load any necessary drivers for your backup device, identify the backup set(s) on your backup medium, and ask you to select the appropriate one.

After that, Backup Exec restores your drive without any intervention on your part. When you are done, it will report how many files were restored and if there were problems with any of them.

I generally evaluate new software on two criteria: Ease of learning curve and how well it does what it is supposed to do. I give Seagate Backup Exec good marks on both.

Although Seagate includes a well-documented manual, I found the software so intuitive that I was pretty much able to install it and begin running a backup with little more than a glance at the manual.

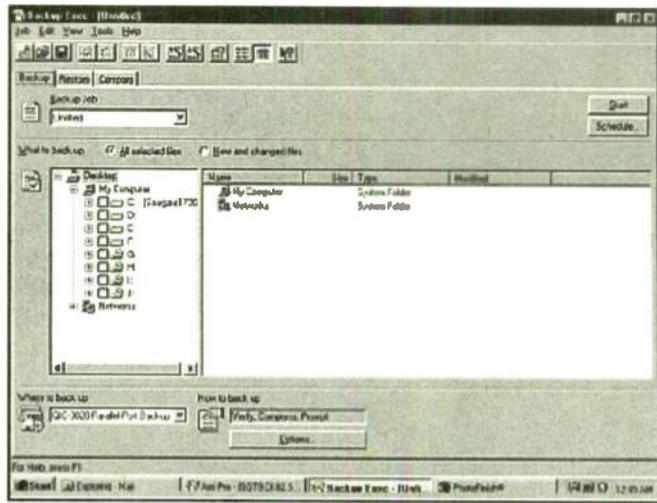
You can backup and restore entire drives or selected files on an incremental basis. If you want to restore a drive without first reinstalling the original operating system, you need to make a new emergency disk every time you do a full backup.

Restoration

Restoring a hard drive was duck soup. In fact, more like chicken soup. After running the obligatory *fdisk* command, partition activation and formatting sequences on the new drive, all that was necessary was to type "restore" and Backup Exec did its stuff.

A while back, I tried the same thing with Seagate's leading competitor, which promised the very same features. The restoration phase took 24 hours. That's right, the hard drive ground away for a full 24 hours. When it was done, the computer could not boot from the restored operating system. That company's technical staff finally admitted that the program did not always work with every backup device.

Seagate has a remarkably long list of compatible backup devices that will work with its software. Before you consider Backup Exec, go to their Website and



A Backup in Progress Using Seagate Backup Exec 2.0

Seagate Backup Exec for Windows 95 comes on a CD-ROM and has a retail price of \$149, but is likely available at a street price of about \$65.

For information, contact Seagate Software Inc., 708 Fiero Commerce Park, Suite 5, San Luis Obispo, Calif., 93401; telephone (800) 327-2232; visit the company Web site at www.seagate.com or circle Reader Service 192.

Read Burgan is a freelance writer and a former public radio station manager. check to be sure your backup hardware is supported. Chances are good it is.

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Wired thing

Y O U M O V E M E

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system interconnect is now faster than ever before.

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The 16000 makes everything easy—with programmable salvo switching, stereo linking, PC software control,

scheduled event switching, universal serial ports for distributed control networks, and employs the full range of SAS remote control panels.

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◆ PRODUCT GUIDE ◆

Products for Radio Production

Mail info and photos to: RW Product Guide, P.O. Box 1214, Falls Church, VA 22041

Digigram Audio Board

The PCX11+ digital audio card is a high-quality two-channel signal processing board designed around the Motorola 56000 DSP family of chips.

The board is capable of both linear recording and playback, and can perform simultaneous realtime MPEG compression/decompression. The compression ratio is programmable to rates up to 1:48. At 128 kbps (1:6 compression at 48 kHz), one minute of mono audio occupies 960 kB drive space.

The PCX11+ can perform real-time mixing of numerous linear or MPEG audio files; up to eight MPEG II stereo tracks at 256 kbps can be mixed in real time.

Balanced analog connections to the PCX11+ are on a 15-pin SUB-D connector which goes to a breakout cable. An eight-pin mini-DIN connector handles MIDI/SMPTE I/O. Multiple cards can be synchronized to increase the number of simultaneous inputs and outputs.

For information, contact Digigram Inc. in Virginia at (703) 875-9100 or circle Reader Service 219.



Sennheiser Dynamic Mic

The newly debuted Sennheiser MD425 mic is suitable for live sound, broadcast and PA work.

The supercardioid MD425 offers tight directionality and a pronounced "close mic" effect, making it useful in situation where multiple mics may be used. The steel-blue body is topped by a specially engineered black steel mesh basket protecting the dynamic mic element.

An internal damping system reduces mechanical noise and a lockable on/off switch is recessed in the handle.

Suggested price of the MD 425 is \$395.

For information, contact Sennheiser in Connecticut at (860) 434-9190 or circle Reader Service 90.

Auralex Acoustic Absorber

Auralex introduced the Sunburst broadband absorber for recording studios, production rooms and on-air studios.

The Sunburst adds low-end absorption to rooms where existing acoustic treatment is insufficient in lower frequencies. Additionally, in rooms where the ceiling is 9 feet high and the acoustic foam ends at 8 feet, the Sunburst can fill the 1-foot gap that remains.

Several Sunbursts can be glued together to create a gobo or glued to a hinged panel to vary acoustic response in a room. The male/female nested configuration allows two Sunburst panels to be accurately cut in half.

Auralex Sunbursts are available in 10 colors.

For information, contact Auralex in Indiana at (317) 842-2600 or circle Reader Service 116.

Steinberg 'Dance Pac'

Steinberg North America, maker of music and recording software, has combined several popular programs to create The Steinberg Dance Pac, a state-of-the-

art dance music creation package for Mac or Windows machines.

The programs include ReBirth, a virtual analog bass synthesizer and drum machine that uses physical modeling (rather than sampling) to recreate the sound of 1980s-vintage music hardware; ReCycle, which analyzes and "slices" drum loops into individual samples; and Cubase Audio VST, a combined MIDI sequencer and 32-channel digital audio recorder.

The Steinberg Dance Pac is available only at Steinberg dealers at a suggested price of \$649.

For information, contact Steinberg North America in California at (818) 993-4161 or circle Reader Service 64.

Apogee 24-bit Converter

Apogee Electronics Corp. has the AD-8000, an eight-channel digital audio converter for modular multitrack recorders and DAWs.

The AD-8000 includes true 24-bit conversion, optional D/A and interface cards, and Apogee's Soft Limit process, a proprietary technology that emulates analog tape compression. Dynamic range is better than 114 dB, with THD+Noise in excess of -108 dB.

The AD-8000 also includes the

Apogee UV22 process, which translates the 24-bit output to 16 or 20 bits for CD production. Onboard S/PDIF and AES/EBU inputs are provided for external signal processing.

The six-mode lightbar metering system offers simultaneous peak and average ballistics. With an optional video card, the AD-8000 can synchronize to video reference signals.

Recommended retail price of the Apogee AD-8000 is \$6,000.

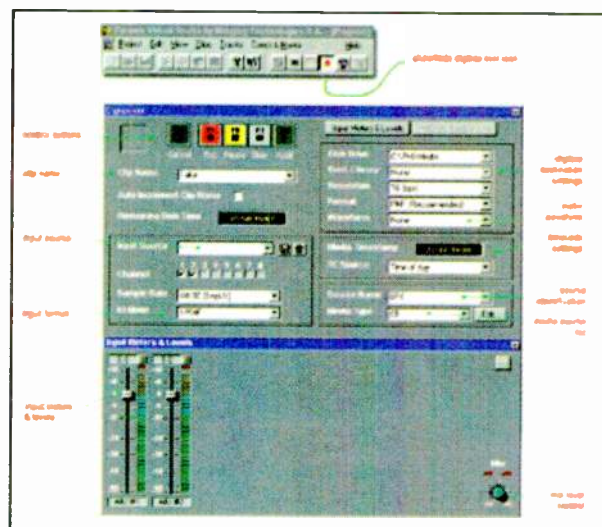
For information, contact Apogee Electronics in California at (310) 915-1000 or circle Reader Service 12.

Merging Technologies File Conversion Software

Designed to work under both Windows 95 and NT, Audio Magic Ring from Merging Technologies is an audio file format conversion tool for anyone who must work with a variety of digital formats and devices.

Audio Magic Ring allows drag-and-drop simplicity of converting files and can run in the background while the computer is running another program. A file is dragged directly onto a specific icon representing the desired conversion process.

High-quality sample rate conversion from 8 kHz to 96 kHz is possible. A normalizer function performs DC offset correction and a word-length converter in-



cludes dithering and noise shaping.

Audio Magic Ring currently supports WAV, OMF, AIFF, AU/SND and the Broadcast Wave Format. Other formats are expected to be added soon.

Audio Magic Ring is available for \$99.

For information, contact Merging Technologies in California at (619) 675-2247 or circle Reader Service 38.

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DIGITAL DOMAIN

Audio via Ethernet Gets a RAVE

Mel Lambert

As our industry transitions more completely towards an all-digital broadcast environment, the cost of interconnecting various on-air control rooms and production studio can prove daunting.

Dual-channel AES/EBU interconnections may be the standard format on a number of systems, but they require a lot of cabling and involve complex (read expensive) I/O routing systems.

Multiplexed systems provide high bandwidth capacities, but involve additional complexity in router design. And if you need to interconnect multiple sources



Digital audio is routed as easily as office e-mail with QSC RAVE.

to multiple destinations, costs can spiral alarmingly.

But wait ...

Recently, I came across a potentially cost-effective alternative from a firm well-known in the analog industry, an alternative that is making significant inroads into the digital control of various system components.

Based in Costa Mesa, Calif., QSC Audio Products offers a range of power amplifiers and accessories in addition to PC-based remote control/monitoring systems for large-scale sound systems. What has caught my attention, however, is a new line of components — code named RAVE — that accept analog or digital sources and multiplex the data onto standard 100 Mb Fast Ethernet systems. Complementary decoding units are available for converting Ethernet data back into analog and digital signals.

Using conventional twisted-pair or coax/fiber Ethernet wiring and hub routers, multiple channels of digitized audio bit streams can be passed between different environments with the same plug-and-play simplicity now found in office components such as printers.

In a nutshell, the new signal transport system from QSC can dramatically reduce cabling costs, simplify installation, increase routing flexibility and improve audio performance.

Of course, conventional wisdom has it that Fast Ethernet connections cannot, by themselves, provide sufficient guaranteed bandwidth and dedicated throughput; once a destination has requested and is receiving the relevant data from the source, there must be some assurance that it will not be interrupted.

This is not an unreasonable requirement for on-air broadcast systems. Repeated dumping of commercial playback due to high traffic requests on a network is likely to put your station out of business real fast.

Cobra in the net

Developed in conjunction with Peak Audio, RAVE is the first product to incorporate CobraNet Technology which, the firm states, is a proprietary transmission protocol that "enables the deterministic transmission of up to 64 channels of 48 kHz, 20-bit digital audio over a standard, dedicated 100 Mb Fast Ethernet network."

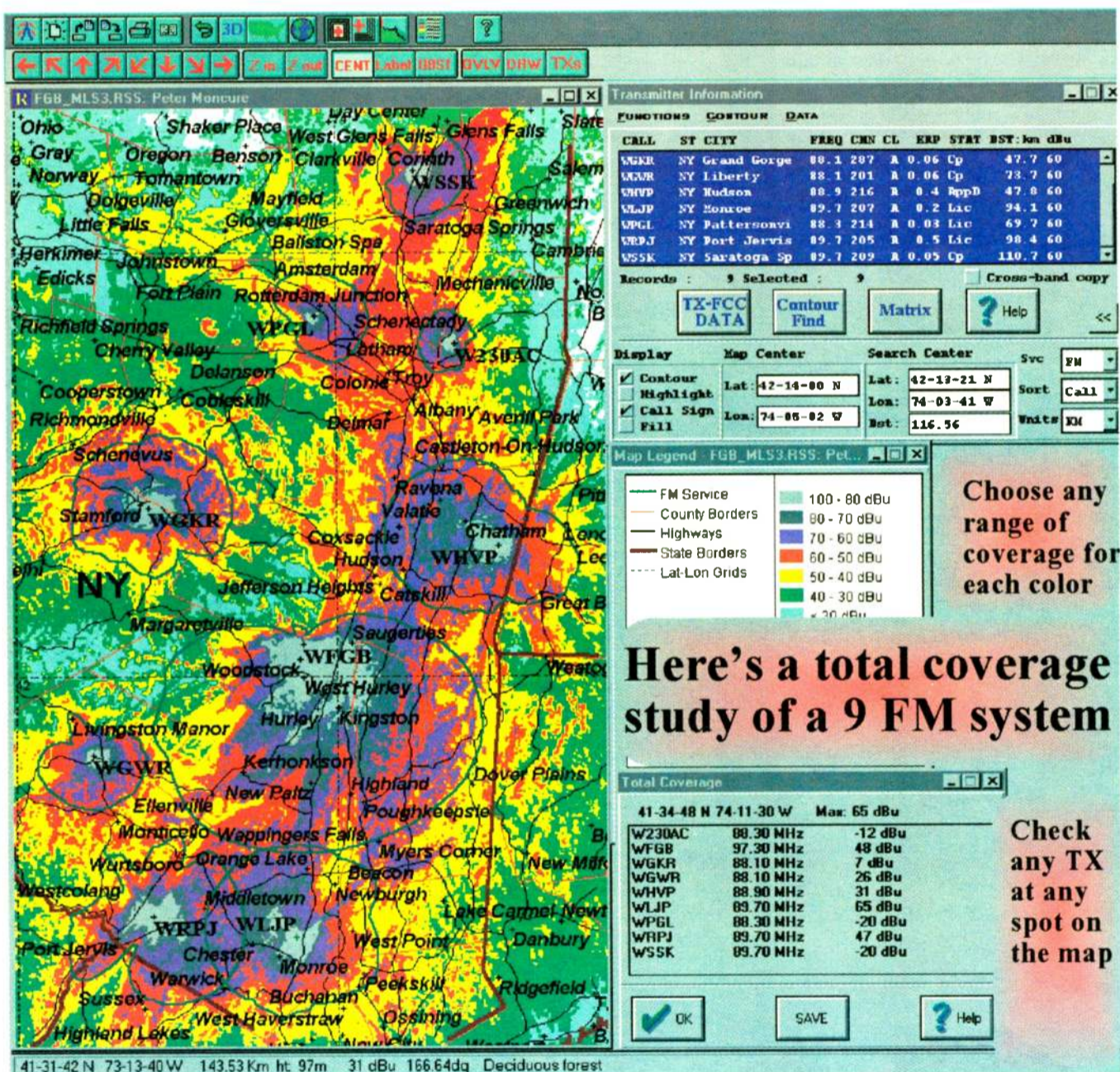
While UTP-only networks accommodate distances of over 600 feet, CobraNet also supports digital audio distribution distance of over 1.25 miles on networks utilizing multimode Star or distributed-Star fiber-optic links. Large, multipoint audio systems consisting of hundreds of channels can be constructed using RAVE products and standard Ethernet peripherals.

CobraNet allows sophisticated routing flexibility. Any input or group of inputs can be routed to any output or group of outputs in any combination in a facility. This allows a system to be reconfigured for different requirements and allows for expansion without rewiring an existing facility. In its current form, group assignments can only be done in clusters of eight; individual addressing is in the works.

A number of other pro-audio companies, including Rane, Peavey, LCS, EAW and Crown, have licensed Peak Audio patent-pending technology for use in a variety of audio distribution and routing applications.

See ETHERNET, page 59 ▶

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Fine Print: Any order mentioning this ad and "fine print" will receive a 50% discount on US 3" Terrain data, value up to \$500, expires 06/98

► ETHERNET, continued from page 58

Each RAVE unit from QSC is 1RU high and is equipped with a rear-panel RJ-45 connector for hooking up to 100BaseTX Category 5 (CAT5) network cable. Audio I/Os are also located on the rear panel, along with an RS232 port that can be used to transmit additional serial data over the network.

Stacking channels

Individual RAVE units are capable of handling up to 16 channels of audio input or output. A front-panel switch on each RAVE unit selects blocks of eight audio channels that can be shipped or accessed at any point on the network.

A full 64 channels of audio can be operating simultaneously via a dedicated audio network with less than 7.6 ms delay to any point within the network. An array of four, 16-position rotary switches on each RAVE unit provide unique network address assignments for each digital bit stream.

Compared to conventional wiring techniques, creating a RAVE system can prove economical. According to QSC, "Realistic savings of 15 to 75 percent can be achieved through reductions in cabling, termination, conduit and installation labor costs."

Furthermore, with both analog and digital I/O models available, it is easy to interconnect a wide range of analog and digital equipment without additional converters. Being Ethernet-based,

RAVE easily supports system reconfiguration and expansion, utilizing off-the-shelf media and network devices.

Currently available from QSC are the RAVE161, which accepts 16 analog inputs; RAVE160, which delivers 16 analog outputs; RAVE188, which accommodates eight simultaneous analog inputs and outputs; RAVE81, which handles 16 AES/EBU-format digital sources; RAVE80, which delivers 16 AES/EBU-format digital outputs; and RAVE88, which accommodates eight simultaneous AES/EBU-format digital I/Os.

Analog input sensitivity is jumper-selectable at +24, +18, +12 or +6 dBu. Output levels can be jumpered to +24, +18 or +12 dBu.

All digital transmission throughout a RAVE network is at a standardized

sampling rate of 48 kHz. Each AES/EBU-format port is equipped with sample rate converters that can handle a wide range of input sources.

Specs

Both digital and analog I/Os within RAVE are set at 20-bit resolution. Quoted distortion is less than 0.007 percent and under 0.004 percent at 1 kHz. The signal-to-noise ratio, -100 dB.

Typical pro-user prices range from \$2,700 for the RAVE80, to \$4,000 for the RAVE162. By way of example, a radio facility could set up a dedicated bi-directional, 16-channel routing and interconnect system between analog sources located in a production and air studio for around \$17,000.

A larger-format system, with four

nodes capable of generating and receiving 16 simultaneous analog/digital channels, would cost around \$35,000, including router, hubs and cabling. This is worth checking out.

More information is available from QSC Audio Products Inc., 1765 MacArthur Blvd., Costa Mesa, CA, 92626; (714) 754-6175; fax (714) 754-6175; e-mail Info@qscaudio.com

To learn more about patent-pending CobraNet and Ethernet-based networks; access the Peak Audio Internet site at www.peakaudio.com

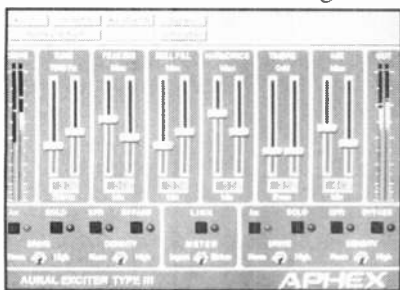
■ ■ ■

Mel Lambert has been involved with production and broadcast for several decades and is now principal of Media&Marketing in Los Angeles. Reach him at (818) 753-9510 or via e-mail at mediapr@earthlink.net

SHORT TAKE

Aphex Aural Exciter Now In Software

The Aphex Aural Exciter now is available on a Mac near you. The Type III Aural Exciter box, released in 1985, is available in software form as a TDM Plug-in.



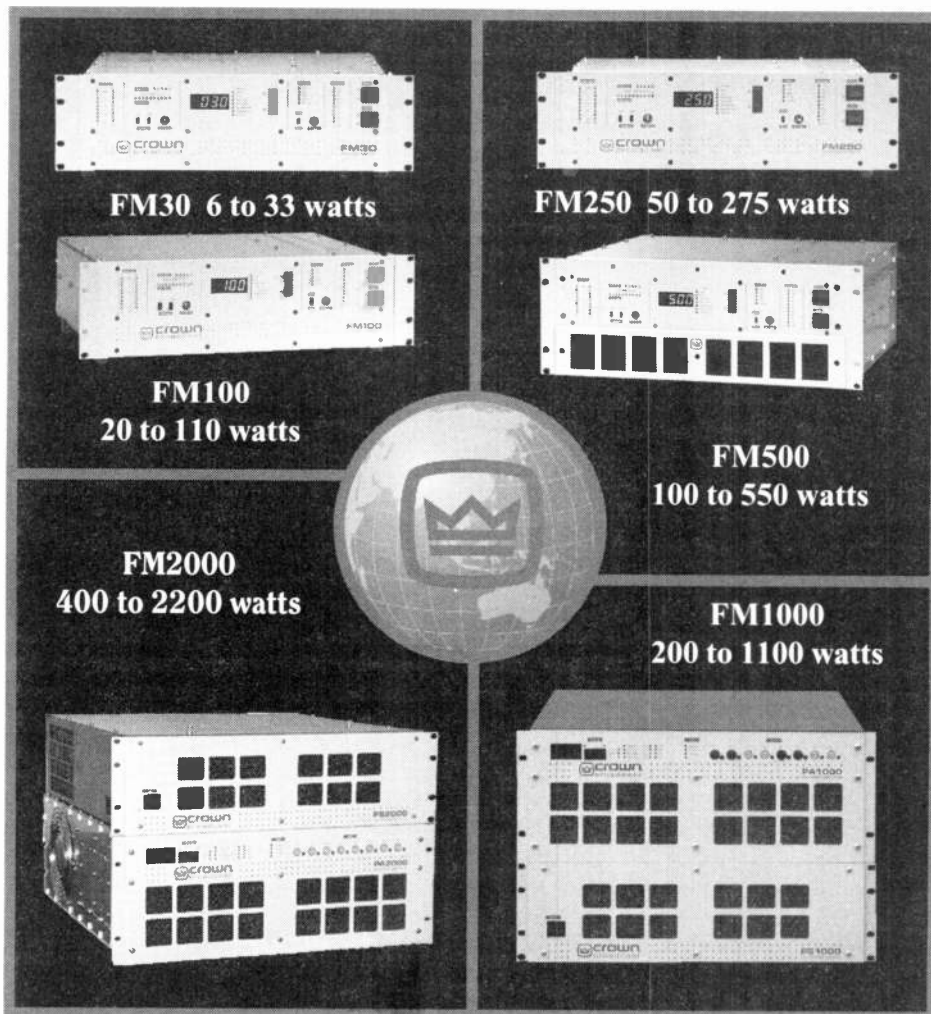
The Aural Exciter Type IIIpi recreates and restores missing harmonics. It runs on a NuBus or PCI-based 68040/ Power PC Macintosh computer with ProTools or other TDM compatible system, running under Apple's OS version 7.1 or later.

On-screen tuning controls set the bandwidth of the harmonic enhancement, number and order of harmonics and the density of enhancement. A VU meter indicates actual peak level before and after the harmonic generator.

The Aural Exciter IIIpi has a suggested price of \$495. For information, contact Aphex Systems in California at (818) 767-2929 or circle Reader Service 142.

— Alan R. Peterson

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Buyer's Guide



Which is
the best
mic for
the job?

Page 71

Radio World

Microphones & Headphones

February 18, 1998

SPECIAL REPORT

Mics: Evolution, Not Revolution

Mike Sokol

Radio field production microphones lead a pretty lonely existence. Most of the time, radio folks do not think about them until a moment or two before an interview. Engineers plug them in, and as long as they work, nobody complains. Soon after finishing the assignment, they often are dumped unceremoniously back into the bottom of the production bag.

But everything eventually evolves — albeit sometimes slowly — and microphones are no exception. “The times, they are a changin’.”

What does the future hold for field production microphones? Because application drives the industry, new production techniques and professional preamplifier interfaces push the microphone manufacturers to strive for new levels of sophistication.

More RF microphones

Consider the wireless mic.

Do not assume because they are not visible through the radio like they are on TV, that RF mics are not useful. Bruce

Jones at Lectrosonics gives a few examples of utilizing an RF microphone. “You can liven up your morning crew on (a wireless) remote, such as broadcasting from a hang glider or a hot air balloon. With the new UHF technology, you don’t have to sacrifice fidelity for convenience. You can plug any field microphone into an RF transmitter and get a superior sound to the standard cell phone remote.” (Editor’s note: use of a cellular telephone while in flight also is illegal.)

Consider another option. IFB is an acronym for Interruptible Fold Back, which is basically an RF mic in reverse. Lectrosonics is beta-testing a unit called the IFBT1 and IFBR1.

“It’s basically a wireless headphone talkback system that can be used in conjunction with an RF mic to give your remote personnel the ability to really mix with the crowd,” said Jones. “By hooking

it up to your remote studio link, you can literally work the crowd from any point in the room, even up and down the street or across the parking lot without any sonic penalty.

“Your talent gets a perfect headphone mix just as if they were sitting in the studio,” said Jones.

Hanging an omnidirectional mic in front of the crowd used to be good enough. Not any more.

According to Cindy Garland, on-air talent for WARX(FM) in Hagerstown, Md., and teacher

of a radio production class at a local college, “Radio stations tend to be a step behind television in audio production. Many home sound systems include not only stereo, but Dolby Surround as well, and a lot of listeners are getting used to really good stereo audio from their regular television programming.

“You can’t expect them to put up with inferior sound of a mono radio remote done on a tape deck with a lot of



In This Issue

Sometimes neglected but thoroughly essential, headphones and microphones star in this month’s *Buyer’s Guide*. We look at old and new microphones and why radio folks seem reluctant to deviate from proven models. We also clue you in on how to maintain your hearing health while using headphones.

Sallie Sauber and Benjamin J. Schneider are two broadcasters whose very careers depend on microphones. They investigated studio microphones and asked why microphones, unlike other equipment in the radio station, haven’t changed much in recent years.

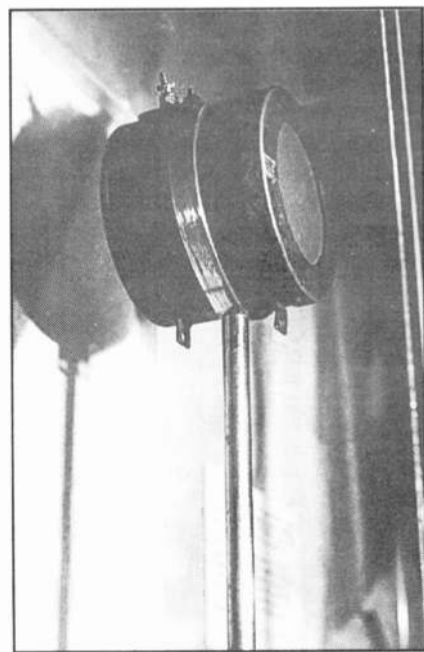
Do you know what tinnitus is? You should, especially if you wear headphones a great deal and use them at high levels. Headroom Corp. graciously allowed *Buyer’s Guide* to reprint an adaptation of its headphone safety report.

For a special photo feature called the Mic of the Era, *RW* Technical Editor, Alan R. Peterson photographed some microphones, displayed at the Museum of American History at the Smithsonian Institution, that are typical for the early decades of radio.

— Susan Kreis
Buyer’s Guide Editor

Mic of the Era: 1920s

The first microphone used at the first radio station, KDKA(AM) in Pittsburgh, in the 1920s, this “tomato can” mic (shown below) is a carbon button-type, much like what has been used for years in telephony.



Another carbon button-type mic, the classic Western Electric double-button carbon (shown right) had two mic elements inside a “watch case” enclosure. Carbon mics were affected by moisture, and tales are told of mics that have been baked in ovens overnight to burn off the moisture that collected in the granules.

The carbon button consists of two metal plates with carbon granules in between. As the announcer speaks, the plates compress the granules, varying resistance as a function of amplitude. Because radio was still new, it adopted a great deal of technology already proven in telephone communications.



background hiss. They’re getting too sophisticated for that,” she said.

Many major-market radio remotes produce stereo ambiance tracks for “on the street” interviews. Listen to the production on National Public Radio for some good examples of background ambiance used effectively. Better portable recording decks are becoming available with professional stereo inputs.

Of course, a pair of traditional cardioid mics get stereo, too, but to hear the extra punch, use a stereo microphone for field recording without a bunch of extra accessories.

For example, Shure makes the VP88 model, a high-quality single-point MS (mid-side) mic that also works well in the field with the addition of a pop filter. It provides a nice stereo spread between the subject and interviewer without a lot of setup hassles. The single-point source MS capsule allows the user to sum the stereo to mono in post-production without any phase cancellation problems.

What’s here, what’s not

With digital technology, many people in broadcasting wonder about digital microphones. Sorry to disappoint, but they are not available yet. Building a microphone that would eliminate analog at the source would seem like a good idea, especially for recording directly to a computer sound card.

The cost, however, is still quite high — in the \$3,000 range — for the few studio-grade microphones with direct digital outputs available, and none of them are marketed for radio broadcasting. Do not look for them anytime soon for field production, but in a few years, anything is possible.

Most field production boards, such as the popular Mackie 1202, have phantom power, allowing you to use professional powered microphones without the hassle of internal batteries or external power supply boxes. Many portable DAT recorders now utilize XLR connectors with real balanced inputs and 48 V phantom.

Also, many “prosumer” DAT decks provide battery power at the microphone connectors. While usually limited to an internal battery voltage of 1.5 or 3 VDC, many modern miniature electret mics can be wired to run off this limited voltage.

Some engineers already are searching for higher-quality remote recording than can be achieved with traditional dynamic mics. In the future, look for more electret field production mics that run off phantom power.

A few upgrades have been made to the basic design of field microphones in the last year or two. Some interview mics, including a version of the popular Electro-Voice 635A, have a longer handle, allowing the interviewer to get closer without reaching too far. Improved shock mounts mean less handling noise, which becomes noticeable when recorded on a

See FIELD, page 62 ▶

SPECIAL REPORT

High-End Mics: Who's Not Buying

When It Comes To Mics, Broadcasters Tend to Stick With Proven, Affordable and Familiar Models

Rich Rarey

Are broadcasters spending their hard-earned money on high-end, excellent-quality microphones that cost more than \$1,000?

"No," said three distributors interviewed by *RW*. Instead, broadcasters continue to use proven, modestly-priced microphones and add devices that enhance the transmission capabilities.

"People are spending their money on ISDN codecs, POTS cassettes and even analog cassette recorders," said Bradley Broadcast General Manager Art Reed. "No microphones were in our top-25 sellers for last year.

"The high-end, expensive microphone business has lagged for the last few years. When broadcasters buy, they buy condenser microphones in the \$500 to \$1,000 range."

Experience counts

A more experienced engineer may recognize the versatility and options available with a high-end microphone and be more inclined to buy one.

"Microphones are musical instruments," Reed said. "There's the cheap instrument that will make a noise, then there are instruments that exercise your talent. If you don't know how to use an

expensive microphone — your instrument — your sound won't be better."

Klay Anderson, president of Klay Anderson Audio in Salt Lake City, agreed that high-end mic revenue has

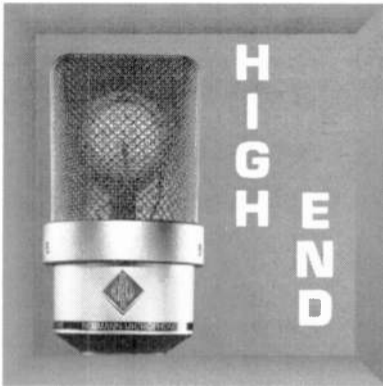
lagged. "There has been a drought for the past year-and-a-half in high-end microphone sales. Broadcasters have opted for microphones in the \$300 to \$600 range, but the Audio-Technica AT4050 and Neumann TLM 103 have brought back the interest in the high end. The Shoeps and

B&K products are starting to get more interest too."

When a microphone sticker price exceeds \$1,500, the buyer — not surprisingly — is more critical about its sound, Anderson said. Stations buy the RE20, Shure SM5 or the Sennheiser MD421 because they stand up to physically harsh environments — control rooms — which are remarkably noisy environments as well."

Best buys

He also said that operators of basement studios are upgrading their microphone collections, as are the music recordists, and that 20 percent of his total microphone



tolerance between mics of the same model are much greater. More expensive microphones have tighter tolerances between each other."

Matching is critical when choosing two microphones for use as a stereo pair. Lipp said that, among his customers, recordists are buying mics, and radio stations do not buy them often.

Lipp said he believes that the AKG C414 is the best buy in a large-diaphragm mic, and he is intrigued with the Microtech Gefell mics, made in the former East Germany. "It's a classic capsule with modern electronics."

■■■

Rich Rarey is technical director of NPR's "Talk of the Nation" and author of the "Public Domain" series in RW.

sales are for stereo pairs for music recording. Even so, "There's always a place for the EV 635A, though the Shure VP64 is a serious contender."

The better selling high-end microphones reported by Anderson were the Sennheiser MHK series, the Neumann TLM 103, and the Neumann TLM193.

Jonathan Lipp, CEO of Full Compass Systems, said, "The differentiation between top-of-the-line microphones and lower-cost microphones isn't necessarily sound quality. It is consistency within the same model, from microphone to microphone.

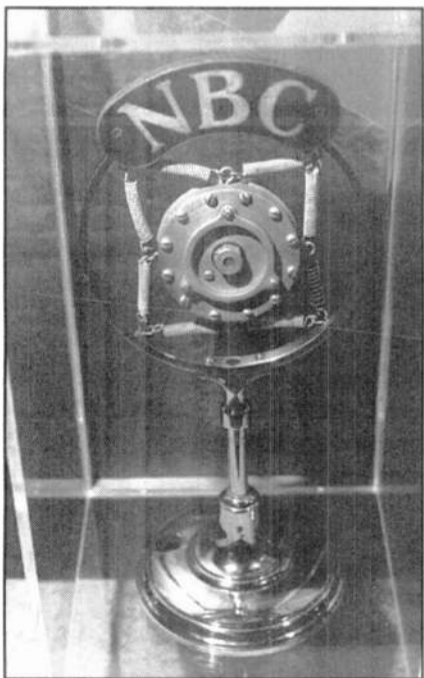
"In lower-cost microphones, the

Money Doesn't Grow On Trees,

Money grows on phone lines.

MIC OF THE ERA: 1930s

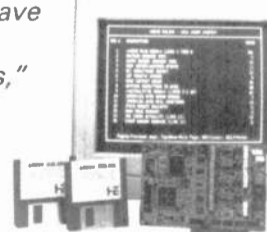
Besides lending a distinguished appearance to the mic's own silhouette, the classic "ring and spring" construction seen at left debuted in 1924 and was an early attempt at suspending the microphone, thereby making it immune from mechanical noise and handling. It was in use through the '30s.



The dynamic mic, right, is a variant on the Western Electric 618, which debuted around 1931. Robust contacts behind the mic handled several amps of current and the delicately turned pedestal lent an air of sophistication.

General Douglas MacArthur can be seen in photographs of World War II speaking into a 618 aboard the USS Missouri when the Japanese signed surrender papers, thus dating usage of the mic well into the mid-1940s.

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SPECIAL REPORT

If It Ain't Broke, Don't Nix It

**Sallie Schneider Sauber
and Benjamin J.
Schneider**

Computers replacing cart machines, LPs shrinking into CDs and single-owner stations selling out to huge corporations are just a few of the rapid changes that have taken place within the last 20 years in radio. But when talking to radio people about microphones, one philosophy remains constant: If it ain't broke, don't nix it!

Radio on-air and production mics have remained relatively unchanged for years. According to Neumann Product Manager Karl Winkler, refinements to products already available take precedence over creating something new.

Steve Dupaix, RF products director for Electro-Voice, agreed. "The fundamental physics of how a microphone works aren't going to change. The new frontier for microphone production is in the materials from which they are made, how the acoustic energy is extracted, and the cost of producing all the elements."

Over the years, certain microphone models have become entrenched in the industry, including the Electro-Voice RE20; the Shure SM-5B, which is no longer made, but still in use; the Shure SM-7; and the Sennheiser MD-421.

Passion for mics

Their users are passionate. Joe Stack, acting director of engineering for ABC Radio, said, "When I worked at WATH(AM), Athens, Ohio, I had someone in the Columbus market call and offer me 10 RE20s for the three SM-5Bs we had. I turned him down." Other users interviewed for this story were equally faithful to the RE20 and other models.

According to some industry manufacturers, established microphones are not necessarily better than any others. Those

manufacturers cite several reasons that these models are difficult to unseat once established.

One reason, noted Greg Beebe, microphone production manager for Sennheiser: "You're dealing with history. People are used to using what they're using."



Soundelux Microphones Managing Engineer David Bock said, "You're facing a lot of educational issues that keep products where they are. People are basically too busy to learn new techniques, so they stick with what works. On the other hand, those who have gone to find better products have been very satisfied."

The continued popularity of these established microphones is due in part to engineers and producers who want to keep their jobs, said Sandy Schroeder, director of microphone products for Shure.

"The boss expects quality — that mic's got to work. And when you're used to something that you know works, it's just not worth taking the chance," Schroeder said.

Engineers and producers, however, are not the only people to convince. Manufacturers must persuade distributors and dealers to supply new microphone models. Budd Johnson, Fostex marketing communications manager, said it is often easier to convince a

microphone user to try a new, improved product, than to convince a distributor.

"It takes a huge amount of marketing resources to break the perception of a 'standard,'" he said.

'Sticking with it'

According to Dupaix, "We've even tried replacing our RE20 with a new and better microphone, the RE27, which is a far superior mic. But people have come to know the RE20 and that's why they stick with it."

"People have a comfort zone and unless there is something driving them from that comfort zone to something new, it's very hard for them to make that change. Although the RE27 was truly an innovative product, there was no driving force to get the industry to move beyond the RE20. Our goal now is consistency, but (we're) also working toward a more cost-effective means of producing the RE20 so we can offer a more reasonable price to our customers," Dupaix said.

"Microphones are an automatic purchase," said Tim Derwallis, national product manager for Sony Corp. He noted stations are focused more on rapidly changing technology and long-term decisions — such as transiting from cart machines to hard drives — so most stations budget for certain models that engineers appear comfortable with.

One characteristic common among the majority of standard radio mics is the dynamic element, as opposed to a condenser capsule.

"The dynamic mic is a very forgiving microphone in terms of environmental factors," said Broadcast Supply Worldwide Sales Representative Tom Roalkvam. "They are more durable and rugged. Talent tends not to destroy them quite as easily."

But not every radio station uses the same models. Other mics come on the market every year, and some establish a foothold.



WATH(AM) Program Director Doug Franz won't part with his Shure SM-5B.

"Despite the standards," Roalkvam said, "I'm seeing more people asking for models like the Neumann TLM-170, 193, and the 103, the Audio-Technica 40-50 and the AKG 3000."

Winkler said although condenser microphones may offer a better representation of the actual voice,

See STUDIO, page 66 ▶

Everything Old Is New Again

Alan R. Peterson

What is this old-time classic mic doing in the middle of all this new technology? Holding its own, thank you. This is the SML-1, a brand-new electret condenser microphone from Standard Microphone Laboratory of Mill Valley, Calif.

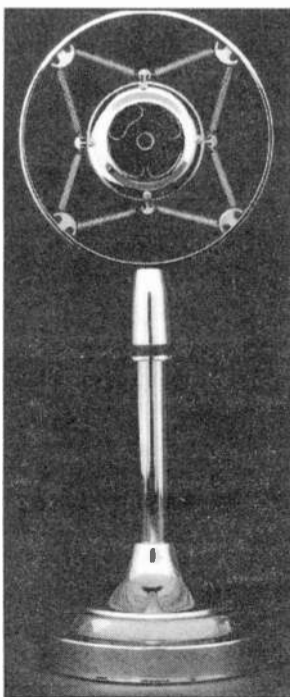
The mic is a handmade, limited-run product designed to resemble the famous ring-and-spring mics of the 1930s, but equipped with contemporary electronics that sound as good as most pro-quality, small-diaphragm electret microphones made today.

The solid brass and bronze construction is heavily plated with a nickel finish; the element is a contemporary electret condenser with an internal lithium battery. The mic boasts a typical response range of 30

Hz to 18 kHz. A set of stainless steel springs suspends the mic capsule inside a 6-1/4-inch outer ring. The company has been working on a phantom-powered version of the mic, called the SML-2.

The art deco design of the SML-1 makes it appropriate for adult standards-formatted stations and looks great at live appearances. The SML-1 sells for \$825 and comes with stand, cable and quarter-inch or XLR output plug.

Marketing and rentals of the Standard Microphone Laboratory SML-1 mic are being handled by Bob Kearns of TCS Sales in California. For more information, contact Kearns at (800) 874-7240 or circle Reader Service 86.



Mics for the Field

▶ FIELD, continued from page 60

noiseless medium such as DAT tape.

Because most radio technology is fairly mature, any new improvements tend to be evolutionary rather than revolutionary. According to Garland, "It seems that most of the manufacturers of microphones go by the philosophy, 'If it ain't broke, don't fix it.'"

Garland notes a lot of radio engineers reach a basic comfort level with certain brands and models of equipment and resist change until it's forced upon them. "Unfortunately," he said, "most radio talent has no choice in their gear selection, and just grab what's in the bag and go with it."

The attitude of familiarity-based selection is in other parts of the industry, as well. That is one reason why the ubiquitous Shure SM58 has survived as is for decades; only recently, an upgraded Beta 58A has been made available.

The same is true for the EV 635A and its newer cousin, the RE50. The basic design of a rugged, omni-directional microphone that can take multiple drops to the floor without damage is pretty hard to beat. It has been used in countless interviews all over the world for decades, and with great success. Who can argue with success?

Some manufacturers, though, look at the industry with an eye for changing the way equipment works and looks,

even to the point of "removing" a piece of equipment, without removing its link to radio. When is a microphone really not a microphone? When it exists as an acoustic modeling algorithm.

Laura Tyson of Roland Corp. said a lot of radio stations are using the Roland DM800 and VS-880 digital multitrack recorders in the field instead of DAT or cassette recorders.

"Not only are they handy for editing in the field while on remote assignment," said Tyson,

"but with the addition of a hardware card, the VS-880 allows you to select what kind of microphone you would like Roland's DR-20 mic to sound like."

Tyson said the VS-880 add-on can emulate anything from a classic Neumann mic sound to Electro-Voice and Shure recreations.

"You can even virtually select how far the microphone is from the source after the recording was done with a combination of proximity boost and room coloration algorithms," Tyson said.

The ability to make an inexpensive mic sound like a classic high-priced microphone sure is tempting.

■ ■ ■

Mike Sokol has completed his first book, "The Acoustic Musician's Guide to Sound Reinforcement and Live Recording," published by Jerome Headland's Press and Prentice Hall. Contact him at jmsokol@intrepid.net

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TECHNICAL TERMS

Common Mic Terms, From A to Z

Bruce Bartlett

Here's a rundown of some common microphone terms, provided by Bruce Bartlett, microphone engineer, writer and recording engineer.

Bass Rolloff Switch: A switch that rolls off the low-frequency response of the mic, used to compensate for proximity effect (See *Proximity Effect*).

Bi-directional Microphone: A mic that is most sensitive to sounds arriving from two directions — in front of and behind the microphone. Rejects sounds approaching from either side of the mic.

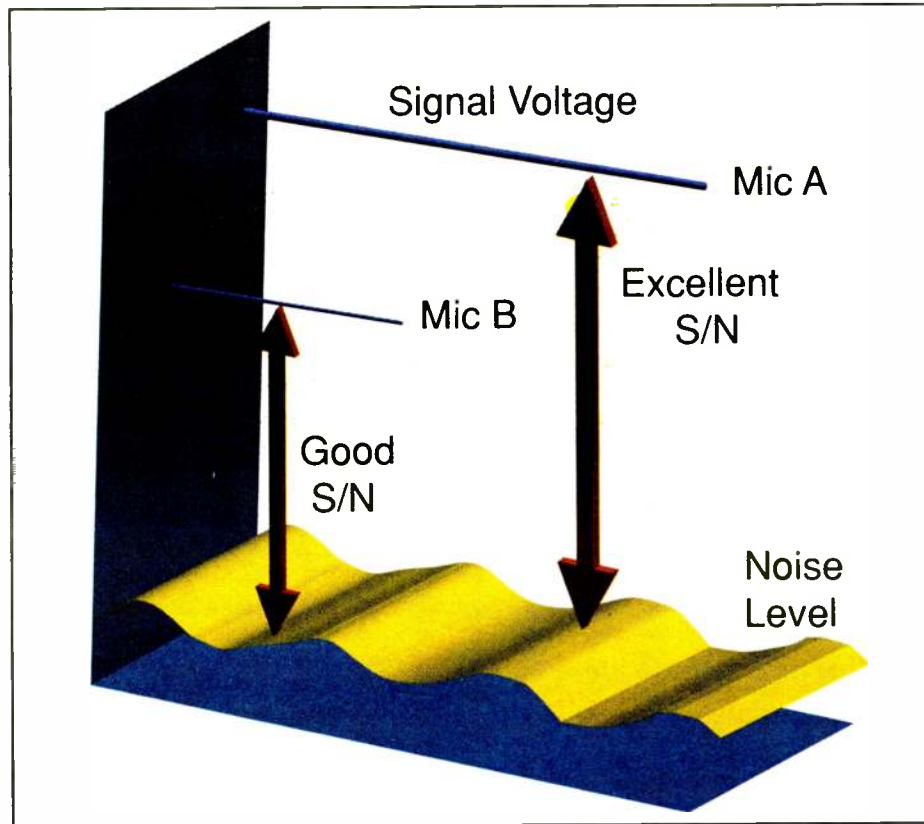
Boundary Microphone: A microphone designed to be used on a boundary, a hard reflective surface. The mic capsule is mounted very close to the boundary so that direct and reflected sounds arrive at the microphone diaphragm in phase,



Cardioid Pattern

or nearly so, for all frequencies in the audible band. An example is a PZM.

Cardioid Microphone: A unidirectional microphone with side attenuation



Signal-to-Noise: Mic A has a high S/N, Mic B has a lower S/N.

of 6 dB and maximum rejection of sound at the rear of the microphone, 180 degrees off-axis. The microphone has a heart-shaped directional pattern.

Condenser Microphone: A microphone that works on the principle of variable capacitance to generate an electrical signal. The microphone diaphragm and an adjacent metallic disk, called a backplate, are charged to form two plates of a capacitor. Incoming sound waves vibrate the diaphragm, varying its spacing to the backplate, which varies the capacitance, which in turn varies the voltage between the diaphragm and backplate.

Directional Microphone: A microphone that has different sensitivity in different directions.

A unidirectional or bidirectional microphone.

Equivalent SPL: See *Self Noise*.

Dynamic Microphone: A microphone that generates electricity when sound waves cause a conductor to vibrate in a stationary magnetic field. The two types of dynamic microphones are moving coil and ribbon (See entries for both).

Electret-condenser Microphone: A condenser microphone in which the electrostatic field of the capacitor is generated by an electret — a material that permanently stores an electrostatic charge.

Filter: A switched circuit in a mic that sharply attenuates frequencies below a certain frequency. A low-cut filter reduces room rumble below the frequency range of an instrument or voice.

Frequency Response: The range of frequencies that the mic will reproduce at an equal level — within a tolerance, such as ± 3 dB. In general, the wider the frequency response and the smaller the dB variation, the more accurate the mic sounds.

Hypercardioid Microphone: A directional microphone with a polar pattern that has 12 dB attenuation at the sides, 6 dB attenuation at the rear, and two nulls of maximum rejection at 110 degrees off axis. It is like a very tight cardioid pattern with some pickup in the rear.

Impedance (Z): The opposition of a mic circuit to the flow of AC at 1 kHz. Low impedance is 150 to 600 ohms; high impedance is 150 to 600 ohms; high See GLOSSARY, page 65 ▶

Message-Board Controller:

The MBC-1 Message-Board Controller, combined with a locally-purchased off-the-shelf electronic message-board, results in a versatile and attractive studio display system. The MBC-1 monitors up to 15 control-room devices and can display a unique, prioritized message for each one. It's a great way to improve the appearance and efficiency of your broadcast and production studios.



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Mic of the Era: 1940s



The mic that all but boasts "beautiful downtown Burbank" is the RCA model 44, shown above. A fragile piece of engineering, the dynamic ribbon element inside the mic limited it mostly to indoor studio use, but gave the voice "warmth." Collectors still seek these microphones, and only a handful of people know how to rebuild and maintain them.

In the NAB Broadcasting Hall of Fame in Washington, radio personality and "Laugh-In" announcer Gary Owens is shown cupping his ear in trademark style, standing before an RCA 44.

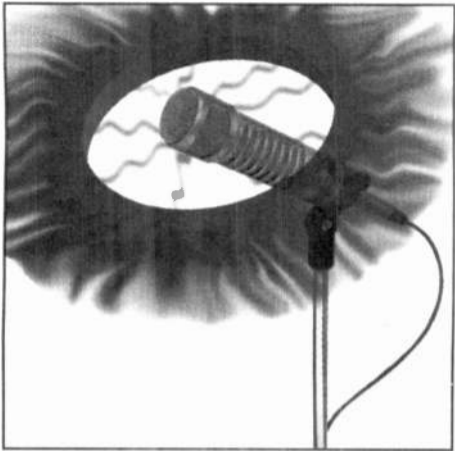
Known as a "bullet" condenser mic, the boxy looking microphone (below) functions the same as any condenser mic with which we are familiar today. A charged condenser capsule is coupled to a preamplifier inside the case.

The mic survived into the '40s, but the preamplifier circuit was touchy. Better condenser mics soon would arrive from Europe.



► GLOSSARY, continued from page 64
impedance is approximately 10,000 ohms.

Maximum SPL: The SPL at which a mic starts to distort by 1 percent, or 3 percent THD. Acceptable SPL is 120 dB, 135 dB is very good and 150 dB is excellent.



Omnidirectional Pattern

Moving-coil Microphone: A dynamic microphone in which the conductor is a coil of wire moving in a fixed magnetic field. The coil is attached to a diaphragm which vibrates when struck with sound waves. Usually called a dynamic microphone.

Omnidirectional Microphone: A microphone that is equally sensitive to sounds arriving from all directions.

Phantom Power: A DC voltage, usually 12 to 48 volts, applied to microphone signal conductors to power condenser microphones.



Figure 8 Pattern

Polar Pattern: The directional pickup pattern of a microphone. A plot of microphone sensitivity plotted vs. angle of sound incidence. Examples of polar patterns are omnidirectional, bidirectional, and unidirectional. Subsets of unidirectional are cardioid, supercardioid and hypercardioid.

Pop Filter: A screen placed on a microphone grille that attenuates or filters out breath "pop" disturbances before they strike the microphone diaphragm. Usually made of open-cell plastic foam or silk, a pop filter reduces pop and wind noise.

Proximity Effect: The bass boost that occurs with most directional mics when they are placed a few inches from a sound source. The closer the microphone, the greater the low-frequency boost due to proximity effect.

Ribbon Microphone: A dynamic

microphone in which the conductor is a long metallic diaphragm — ribbon — suspended in a magnetic field. An example is the classic RCA 77 DX.

Self Noise: A measure of the noise that a mic produces. The SPL that would produce the same output voltage as the mic noise in an absolutely quiet environment. An A-weighted self-noise spec of 20 dB SPL or less is excellent, while a spec around 30 dB SPL is good, and that of 40 dB SPL is fair.

Sensitivity: The output of a microphone in volts for a given input in sound pressure level. Mic sensitivity is specified in millivolts per Pascal, where one Pascal —Pa— is 94 dB SPL.

Signal-to-noise Ratio (S/N): The ratio in

decibels between signal voltage and noise voltage. A mic with a high S/N has little background noise accompanying the signal; a mic with a low S/N is noisy. For an SPL of 94 dB, a S/N spec of 74 dB is excellent, 64 dB is good. The higher the S/N, the cleaner or more noise-free the signal.

Stereo Microphone: A microphone containing two mic capsules in a single housing for convenient stereo recording. The capsules usually are coincident.

Supercardioid Microphone: A unidirectional microphone that attenuates side-arriving sounds by 8.7 dB, attenuates rear-arriving sounds by 11.4 dB, and has two nulls of maximum sound rejection at 125 degrees off-axis. It is like a tight cardioid pattern with some pickup in the rear.

Transducer: A device that converts energy from one form to another, such as a microphone or loudspeaker. Three mic transducer types are condenser, dynamic and ribbon.

Unidirectional Microphone: A microphone that is most sensitive to sounds arriving from one direction — in front of the microphone. Examples are cardioid, supercardioid and hypercardioid.

Windscreen: See Pop Filter.

■ ■ ■
Bruce Bartlett is the author of "Stereo Microphone Techniques," published by Butterworth-Heinemann, and "Practical Recording Techniques," published by Howard Sams. He can be reached via e-mail at bbartlett@crowntel.com

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TARGET: HEADPHONES

Hear What the Listeners Hear

Headphones may not be an actual part of the air chain, but they are found in every station and definitely have an effect on what goes on the air. They allow talent to hear accurately what the listeners hear, and let them concentrate on the show by isolating their performance inside their heads. Headphones also allow production people to "magnify" sound and hear the overall balance during editing and mixdown.

People sometimes disregard the importance of headphones, but if you are conscientious, you will appreciate what good headphones can do for you.

Beyerdynamic

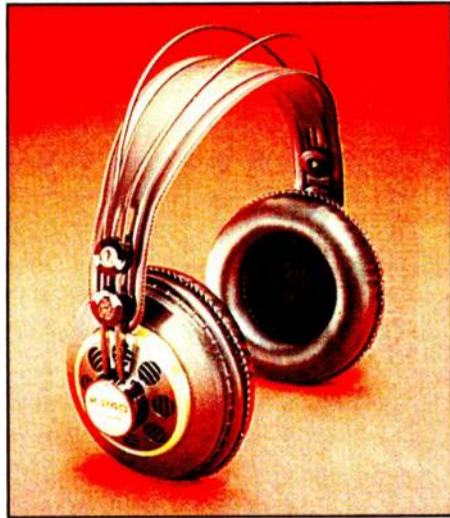
Comprised of four headphone models, DT100 series headphones from **beyerdynamic** are used for audio recording and monitoring applications. The DT 100 model is a wide-frequency response dynamic headphone; the DT 109 is a wide frequency response dynamic headset with a dynamic boom microphone. Both headsets feature dual muffs.

The DT 102, identical in specifications to the DT 100, is a single-muff headphone; the DT 108 is the single muff version of the DT 109 (shown). Both are suitable for



AKG

Weighing 8-1/2 ounces, the K240M Professional Headphones from **AKG** feature an "integrated semi-open air" design that incorporates an accurate dynamic transducer and an acoustically tuned venting structure behind the element to produce a natural, open sound quality.



Designed to be worn for long periods of time, the headphones feature circumaural pads for a snug but comfortable fit around the ear. The headband is made of steel cable and is self-adjusting. The audio interconnect is single-sided.

The frequency range of the K240M headphones is from 15 Hz to 20 kHz, the sensitivity level is 88 dB per mW. The rated impedance is 600 ohms.

For more information, contact **AKG in Tennessee** at (615) 399-2199; fax: (615) 367-9046 or circle **Reader Service 112**.

DJ cueing and when a single-ear monitor is desired.

The modular construction permits infield serviceability, while the foam-filled padding ensures comfort during wear. The DT 100 series headphones are available in light gray and matte black non-reflective finishes.

For more information, contact **beyerdynamic in New York** at (516) 293-3200; fax: (516) 293-3288 or circle **Reader Service 138**.

Fostex

The T-series headphones from **Fostex** cover a range of uses from everyday use to a closed ear pad design for performers and engineers. There are four headphones in the series.



The T-5 and T-7 headphones can be used for general purposes and have the same physical characteristics. They feature a new contoured adjustable headband

design that stays in place and does not bind. The transducer is a standard dynamic, and the semi-open ear "can" reduces ambient room sounds while allowing the wearer to hear important timing cues.

The T-5 features an impedance level of 44 ohms at 1 kHz and a sensitivity level of 96 dB. The frequency response ranges from 40 Hz to 20 kHz, ± 3 dB, the SPL output is 116 dB and the maximum input power is 100 mW.

The T-7 design offers greater sensitivity, at a level of 98 dB and SPL output of 118 dB.

Models T-20 and T-40 feature the **Fostex Regulated Phase Design**. The specifications of the T-20 set include an impedance of 50 ohms at 1 kHz, sensitivity of 96 dB, a frequency response ranging from 50 Hz to 30 kHz, ± 3 dB, and a maximum input power of 200 mW.

The T-40 model design is useful when a studio performer is near an open mic, as the headphones prevent leakage and extend bass response. The T-40 impedance is 50 ohms and the sensitivity is 98 dB. The frequency response ranges from 30 Hz to 40 kHz, ± 3 dB, and the maximum input power is 200 mW.

For more information, contact **Fostex in California** at (562) 921-1112; fax: (562) 802-1964 or circle **Reader Service 164**.

Koss

Designed to enhance small and intricate details, the Auditor Stereophone line of headphones from **Koss Corp.** offers three models: the Auditor 250, the Auditor 200 and the Auditor 130.

The A/250 model features computer-optimized neodymium iron boron magnetic structures that deliver a frequency response of 16 Hz to 25 kHz. Two-layer free-standing oxygen-free copper voice coils reduce the moving mass of the diaphragms for enhanced signal transmission, lowering the distortion level to less than 0.1 percent. The ear cups are open and acoustically transparent; circumaural ear cushions retain the bass frequencies.

The A/200 model delivers 18 Hz to 25 kHz response. This model also has the two-layer, free-standing oxygen-free copper voice coils and open ear cups. The circumaural ear cushions are made of velvet fabric-covered foam and the adjustable, padded headband and pivoting ear cups allow the user to wear the headphones for long periods of time.

With neodymium magnet structures, the A/130 delivers a frequency response of 16 Hz to 23 kHz. Oxygen-free copper voice coils lower the moving mass of the Titanium Nitride-coated diaphragms. Featuring closed ear cups and circumaural ear cushions, the A/130 isolates sound with an emphasis on deep bass.

The headband on all three models detaches from the ear cups for transportation and storage.

For more information from **Koss**, contact the company in Wisconsin at (414) 964-5000; visit the Web site: www.koss.com or circle **Reader Service 190**.

Same Mics, Different Year

► STUDIO, continued from page 62

dynamic mics are better at eliminating background noise. Condenser microphones also are considerably more expensive and require a power supply.

Perhaps radio people tend to resist changing mics because "old habits die hard." Radio producers and personalities are accustomed to familiar methods of processing and production. Yet those same professionals cope daily with new radio technology, computers and other changing equipment. Somehow, microphones are different. They don't change as fast.

Digital mics?

With the rest of the radio airchain going digital, the question arises: Should radio expect the advent of a digital microphone anytime soon? That depends, said Winkler. "At what point do you consider the microphone digital?"

A few companies already have what they call "digital microphones" that have an analog-to-digital converter in the mic body. But as far as all-digital transducers are concerned, "We may see digital microphones being used for voice recognition or digital communi-



WXTQ(FM) Program Director Lander Rose, like thousands of other radio people, uses the RE20 from Electro-Voice.

cation before we see them in high-end audio production," Winkler said.

According to beyerdynamic Product and Application Specialist Bob Lowig, "You would need computer software to work in conjunction with the microphone

to tell it to determine everything from polar pattern and frequency response to output level and sensitivity. Using laser optical technology, (the digital microphone) could become any microphone that exists."

Industry caution

Derwallis said, "Aside from the fact that the FM bandwidth is limited, once digital broadcasting becomes more of a reality and less of a hysteria, it may happen."

"Personally, I'm not convinced," said Mike Edwards from Audio-Technica. "But from an industry standpoint, the technology will drive that way whether it really sounds better or not."

"We still see a need for refinement in the analog world," Bock said.

Apparently, the radio industry should not expect new transducer science to revolutionize microphones anytime soon.

■■■
Sallie Schneider Sauber is production/traffic director for WATH(AM)/WXTQ(FM), Athens, Ohio. Benjamin J. Schneider is the audio supervisor for Ohio University.



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PACIFIC RESEARCH & ENGINEERING

Circle (188) On Reader Service Card

World Radio History

Isolate Your Sound

► HEADPHONE, continued from page 66
Sennheiser

A closed dynamic compact professional monitoring headphone, the HD 25 from Sennheiser offers high attenuation of background noise.

It is capable of handling high sound pressure levels and performing well in high noise environments. The HD 25 headphone features supra-aural ear coupling with a contact pressure rating of approximately 2.5 N.

The frequency response ranges from 16 Hz to 22 kHz, -3 dB, and the nominal impedance is 70 ohms. The characteristic SPL at 1 kHz is 120 dB and the load

rating is 0.2 W. THD is 0.3 percent.

The headphones weigh approximately five ounces without the cable.

For more information, contact Sennheiser in Connecticut at (860) 434-9190; fax: (860) 434-1759; or in California at (818) 845-7366; fax: (818) 845-7140; visit the Web site: www.sennheiserusa.com or circle Reader Service 216.

Sony

With folding construction, the MDR-7506 headphones from Sony become compact for storage and transportation.

The headphones feature a 40 mm driver unit that reproduces sound clearly and a closed-ear design that allow the user to hear the sound without interference from external noise.

The frequency response of the MDR-7506 headphones ranges from



10 Hz to 20 kHz and the stereo unit-match plug fits quarter-inch and eighth-inch jacks.

The signal connection and transmission remain reliable and stable through gold connectors and OFC cord.

The headphones come with a soft case for protected storage and transportation.

For more information from Sony contact the company at (800) 686-SONY or (800) 686-7669; visit the Web site: www.sony.com/proaudio or circle Reader Service 9.

SPECIAL REPORT

Keep Your Eyes on Your Ears

People listen to music on headphones at much louder levels than they would on speakers. To stave off permanent hearing damage, avoid listening at extremely loud levels or for too long at moderately loud levels.

Visual indications, such as the pointer of a volume control, should not be used as a listening standard.

The most common hearing damage caused by prolonged or excessively loud sound is called *tinnitus*. It manifests itself as a sustained ringing in the ears and can become a permanent condition.

Generally speaking, when you are listening to headphones, listen at a comfortable level. If you find that your ears are ringing or that there is a sensation of pressure or fatigue, give them a rest for a couple of days or until they feel fresh. These are symptoms of your body telling you that your ears need a break. Should you ignore these symptoms, you are risking permanent hearing damage.

As a rule, sound pressure levels under 70 dB will not damage hearing. On the other hand, anything over 120 dB may quickly cause permanent damage. Sound pressure levels anywhere in-between can also cause damage.

Remember this: *The louder the sound, the shorter the exposure time needed to cause permanent damage.*

Although you can get a slight case of *tinnitus* — for example, you might only notice your ears ringing in bed at night — once you have it, your ears are much more susceptible to further damage. Be more careful about exposure to loud sounds.

If you have any questions about hearing damage and the current condition of your own hearing, talk to your doctor. Years of good music and broadcast longevity require ears in top shape.

■■■

This article was adapted from "Warnings About Ear Damage," originally published in the 1997 Headroom Corp. headphone catalog and used here with permission.

For more information from Headroom, contact the company in Montana at (800) 828-8184; visit the company's Web site at www.headphone.com or circle Reader Service 35.



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Our new TLM 103 gives you the full, rich sound and natural presence Neumann is famous for. Utilizing a large-diaphragm capsule derived from our world-standard U 87, it has the lowest self-noise of any condenser mic in the world — important in today's low-noise and digital broadcast environments.

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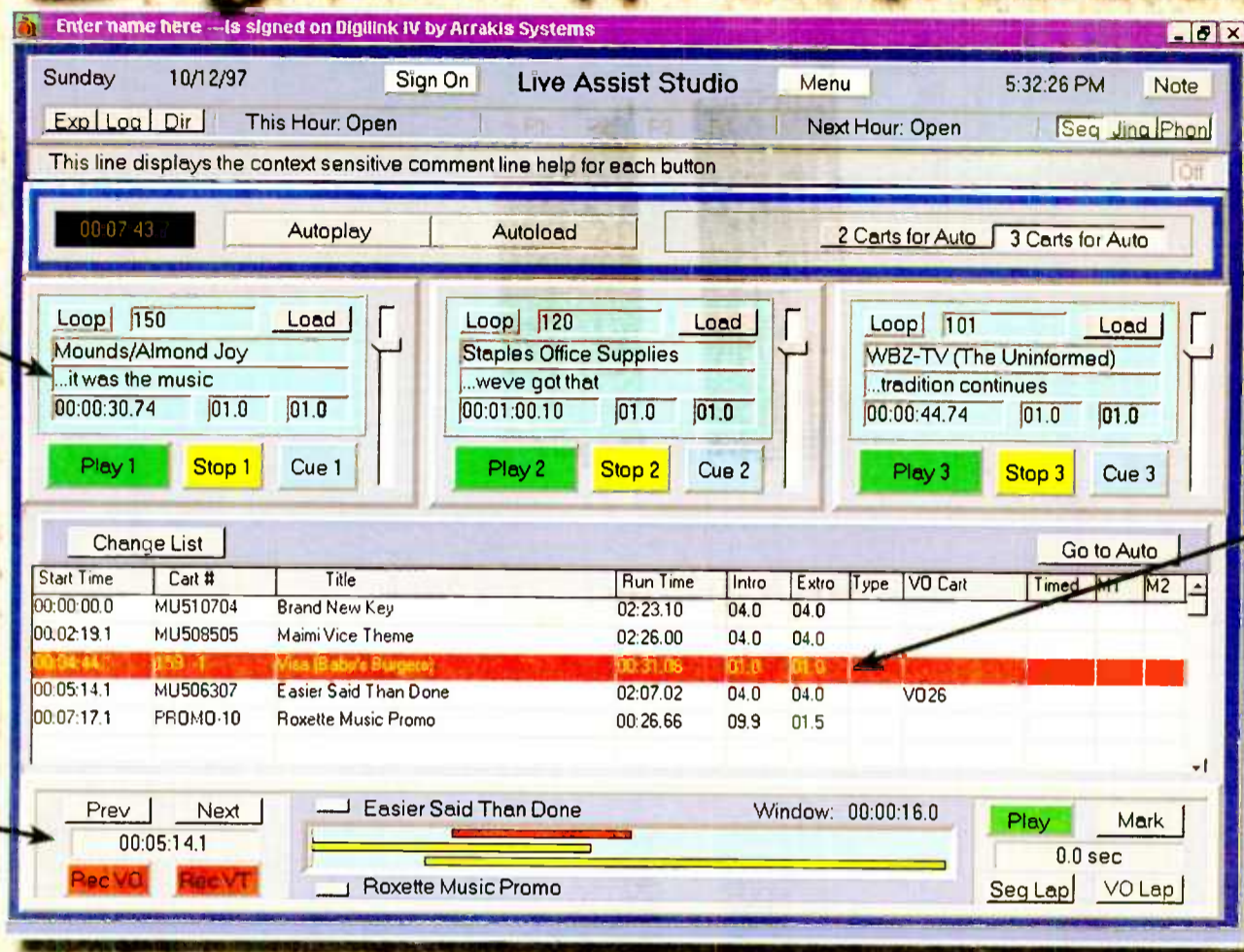


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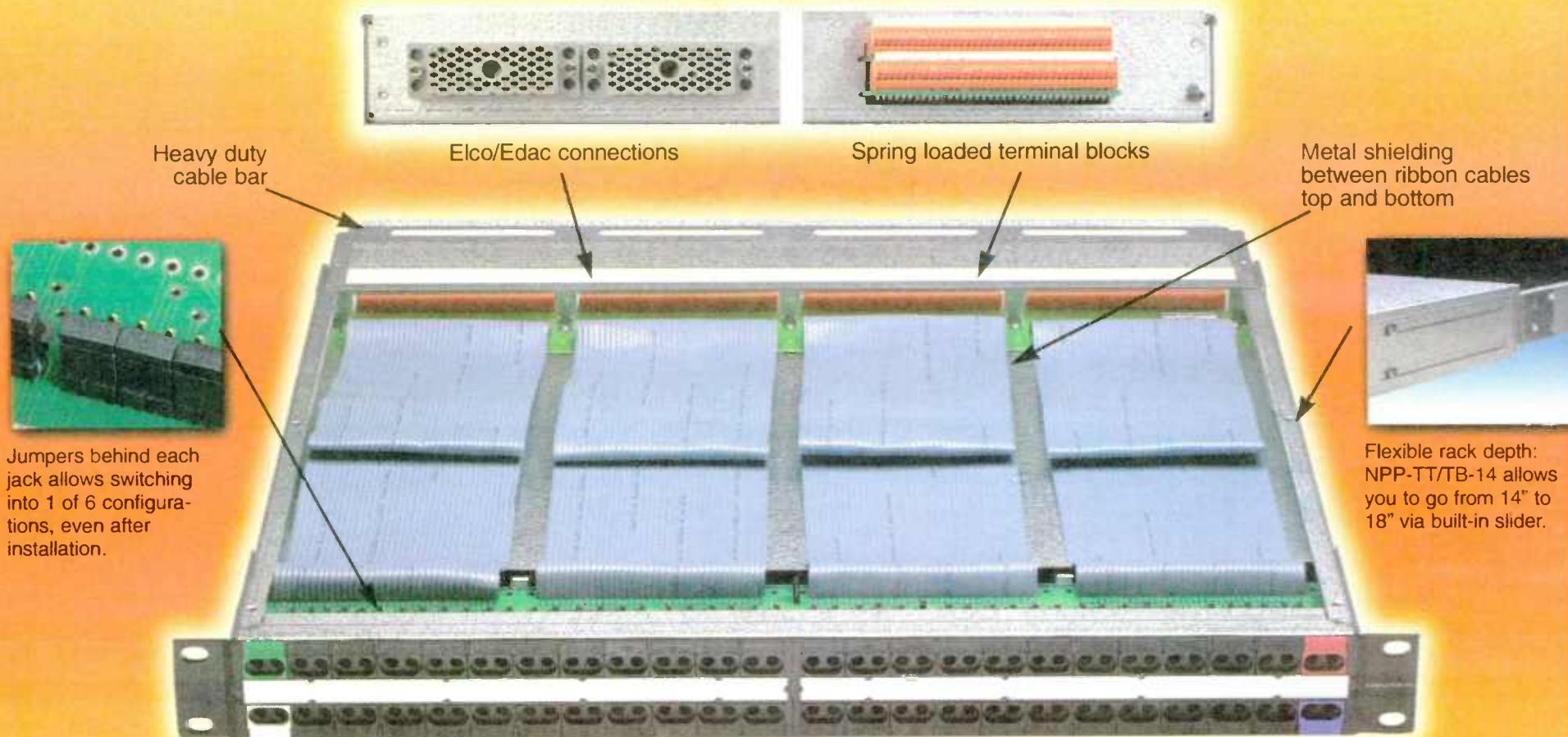
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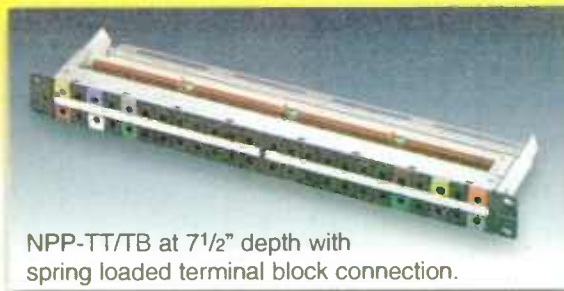
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Circle 63 on Reader Service Card



TARGET: MICROPHONES

From Your Mouth to Their Ears

With all the changes taking place at radio stations, the presence of a familiar microphone can be comforting. But despite our tendency to stick with known quantities when we choose our mics, manufacturers work constantly to make them better.

Here is a selection of some of the best.

AKG

With the polar patterns of both a cardioid and hypercardioid mic, the C 3000 microphone from AKG offers small- and large-diaphragm condenser capsules. Three switches allow users to tailor the mic for multi-pattern use, bass rolloff and -10 dB pre-attenuation for close-mic techniques.



The C 3000 has a frequency range of 20 Hz to 20 kHz and an impedance level of 200 ohms. With a sensitivity level at 20 mV per Pa in cardioid pattern and 15 mV per Pa in hypercardioid pattern, the microphone has an equivalent noise level of 18.5 dB-

A and a maximum SPL for 0.5 percent THD at 137 dB.

For more information from AKG, contact the company in Tennessee at (615) 399-2199; fax: (615) 367-9046, visit the AKG Web site: www.akg-acoustics.com or circle Reader Service 87.

Audio-Technica

Recently introduced, the AT3525 microphone from Audio-Technica features a cardioid polar pattern and a fixed-charge back plate permanently polarized condenser. The AT3525 is recommended for radio broadcast, on-air vocals and production.

The frequency response of the AT3525 is 30 Hz to 20 kHz. Impedance is 100 ohms and the nominal maximum input sound level is 156 dB SPL, with the 10 dB pad engaged. The typical dynamic range is 124 dB, 1 kHz at maximum SPL and the S/N ratio is 72 dB.



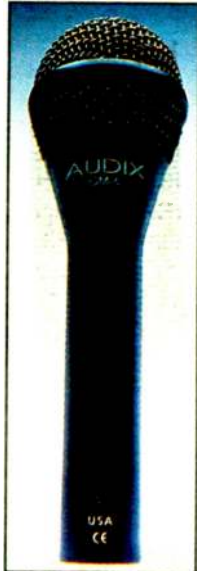
For more information from Audio-Technica, contact the company in Ohio at (330) 686-2600; fax: (330) 686-0719, via e-mail: pro@atus.com visit the Web site: www.audio-technica.com or circle Reader Service 61.

Audix Corp.

Within an eight-inch proximity of the OM-6 hypercardioid dynamic microphone from Audix Corp., the user can move off-axis without losing the signal. This ability allows the user more freedom. The OM-6 utilizes the Audix Very Low Mass and sub-impulse technology and has a flat overall frequency response.

The sensitivity rating of the OM-6 is -69 dB and the frequency response ranges from 48 Hz to 19 kHz. The off-axis rejection is greater than 30 dB and the impedance is 200 ohms. The maximum SPL is greater than 144 dB and the microphone weighs 10.5 ounces.

For more information from Audix, contact the company in Oregon at (503) 682-6933 or (800) 966-8261; fax: (503) 682-7114 visit the Web site: www.audixusa.com or circle Reader Service 139.



beyerdynamic

With a lightweight, low-profile design and cushion systems, the new DT 280 and DT 290 headset and microphone series from beyerdynamic uses a closed headset design that features ambient noise isolation and a gooseneck-mounted dynamic microphone.

The headphone transmission range is 10 Hz to 30 kHz with a nominal impedance of 80 ohms; a special model available features nominal impedance of 250 ohms. The nominal SPL at 1 kHz is 100 dB SPL at 1 mW equal to 0.28 V to 80 ohms; and the nominal power rating is 100 mW equal to 120 dB equal to 2.8 V to 80 ohms.

The dynamic microphones on both headsets feature an hypercardioid polar pattern and have a transmission range of 40 Hz to 12 kHz. With a distance of approximately 2 inches, the output voltage of the DT 280 and DT 290 is approximately 3 mV. The nominal impedance is 200 ohms and the nominal output impedance is less than 1,000 ohms.

For more information from beyerdynamic, contact the company in New York at (516) 293-3200; fax: (516) 293-3288, via e-mail: beyerUSA@aol.com or circle Reader Service 113.

Brüel & Kjær
Tannoy/T.G.I. North America
Inc.

Using an omnidirectional pre-polarized condenser microphone capsule with a flat frequency response, the Headset Microphone Type 4035 from Brüel & Kjær and distributed through Tannoy/T.G.I. North America Inc. mounts on almost any type of headphone and can be used for broadcasting applications and for live and studio vocals.

The microphone frequency response

on axis ranges from 40 Hz to 40 kHz and the A-weighted equivalent noise level is 24 dB. The sensitivity at 250 Hz is nominally 9 mV per Pa and the maximum sound pressure level is 143 dB SPL peak.

The mounting system fits almost any headphone type; fold the strap around the headbrace and tighten it with a screwdriver.

For more information from Tannoy/T.G.I. North America, contact the company in Canada at (519) 745-1158; fax: (519) 745-2364 or circle Reader Service 165.

Crown International

Designed for broadcasters, the CM-311AHS from Crown International Inc. is a head-worn microphone that mounts on the Sony MDR-7506 or MDR-V6 headphones. The microphone uses the Differoid technology patented by Crown. It has a cardioid pick-up pattern.

The microphone is an electret condenser type, powered by phantom power or by the 9 V battery in a belt pack included with the microphone. The frequency response ranges from 50 Hz to 15 kHz and the impedance level is 75 ohms balanced. The S/N ratio is 68 dB at 94 dB SPL and the maximum SPL is 148 dB SPL produces 3 percent THD.

For more information from Crown International Inc., contact the company

Earthworks

With a front-half pickup pattern like an open cardioid mic with rejection at 90 degrees, and a rear-half pick-up pattern like a hypercardioid microphone, the Z30X from Earthworks has a polar pattern known as "enhanced cardioid" by the company.

The on-axis frequency response is flat from 30 Hz to 30 kHz with a mild bass proximity effect. The bass balances with the high end at approximately 6 inches. The sensitivity level of the microphone is 10 mV per Pa or -40 dBV per Pa and the maximum acoustic input is 145 dB SPL with a 5,000 ohm load.

The peak output voltage is 3 V into 1,000 ohms and 10 V into 5,000 ohms; the output is on an XLR, intended to drive a balanced input.

For more information from Earthworks, contact the company in New Hampshire at (603) 654-MICS or (603) 654-6427; fax: (603) 654-6107, visit the Web site: www.earthworks.com or circle Reader Service 217.

EVI Audio/Electro-Voice

Created especially for recording, broadcast and sound-reinforcement applications requiring flat response over a

See MICS, page 72 ▶

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Lots of Mic Choices

► MICS, continued from page 71

wide frequency range, the RE20 dynamic cardioid microphone from **Electro-Voice** (part of EVI Audio) offers greatest rejection at 180 degrees off-axis — directly to the rear of the microphone. It features a "bass tilt down" switch that corrects spectrum balance.

An integral blast and wind filter covers each acoustic opening. Part of the filter also shock mounts the internal microphone element, reducing the transfer of vibrations from external sources.



The frequency response ranges from 45 Hz to 18 kHz with an impedance of 150 ohms. The open circuit voltage sensitivity level is 1.5 mV per Pa at 1 kHz, while the power level sensitivity is -57 dB at 1 kHz.

For more information from **Electro-Voice**, contact the company in Michigan at (616) 695-68312; fax: (616) 695-1304 or circle Reader Service 10.

Event Electronics

Created by Freedman Electronics of Australia and distributed by **Event Electronics**, the RØDE Classic Valve (Tube) Studio Microphone puts "that Sonic Feeling" into recordings.

The tube is an internally shock-mounted 6072. A hidden stock of the 6072 tubes was discovered and used to create the RØDE Classic.

The Classic features nine polar response flexibility for flexibility. The mic also features two frequency selections for high-pass filter, and -10 and -20 dB pads which are selected at the power supply.

The 10m high-grade multi-core cable helps eliminate RF and other interference.

The frequency response ranges from 20 Hz to 20 kHz, ± 3 dB, and the noise level is 32 dB. The sensitivity level is 13 mV per Pa and the maximum SPL is 130 dB. The output impedance is 250 ohms.

For more information from **Event Electronics**, contact the company in California at (805) 566-7777; fax: (805) 566-7771, visit the Web site at www.event1.com or circle Reader Service 36.

G Prime Limited

Utilizing a M 7 large-diameter dual membrane capsule, the MT 711S cardioid studio condenser microphone from **G Prime Limited** features a hybrid amplifier with phantom power and actively balanced transformerless output.

The MT 711S features a frequency range from 40 Hz to 18 kHz and a sensitivity level of 13 mV per Pa. The impedance level is 150 ohms and the maximum SPL for THD less than or equal to 0.5 percent is 134 dB. The total dynamic range of the

microphone amplifier is 120 dB. A low frequency roll-off switch reduces the proximity effect when close mic-ing.

For more information from **G Prime Limited**, contact the company in New York at (212) 765-3415; fax: (212) 581-8938, visit the Web site: www.gprime.com or circle Reader Service 62.



Lawson

Featuring cardioid, omni-directional, figure 8 and infinite intermediate polar patterns that are selectable at the power supply, the L47MP tube condenser microphone from **Lawson** is based upon classic mic designs. It is manufactured from hand-lapped solid brass and plated with 24 karat gold.

The L47MP microphone features three-micron gold-sputtered diaphragms and a 6072A vacuum tube. The capsule is shock-mounted internally and the microphone features a Jensen transformer and MIT Multicap capacitor.

It covers a frequency range of 20 Hz to 20 kHz and has a sensitivity level at 1 kHz of 11-1/4 mV per Pa. The maximum SPL at 1 kHz, 3 percent is 128 dB and the equivalent noise level is 22 dB SPL. The microphone has a rated impedance of 150 ohms.

For more information from **Lawson**, contact the company in Tennessee at (615) 269-5542; fax: (615) 269-5745, visit the Web site: www.lawsonmicrophones.com or circle Reader Service 88.

Neumann

By utilizing the transformerless circuits found in other **Neumann** microphones, the company developed the TLM 103, a large diaphragm microphone. The capsule was derived from that used in the U 87 and has a cardioid pattern.

The capsule has a flat frequency response to approximately 5 kHz, and above that, a wide flat 4 dB presence boost. The large wire mesh grille protects the capsule from plosive sounds and prevents pop noises.

Self-noise of the TLM 103 is

low, and the microphone can handle sound pressure levels as high as 138 dB without distortion. In the "transformerless microphone," the output transformer is replaced by an electronic circuit.

The frequency range reaches below 20 Hz and reproduces very low bass signals. The sensitivity of the TLM 103 is 21 mV per Pa at 1 kHz into 1 ohm; the rated impedance is 50 ohms, while the rated load impedance is 1,000 ohms.

For more information from **Neumann**,



contact the company in Connecticut at (860) 434-5220; fax: (860) 434-3148 or circle Reader Service 114.

Roland Corp.

The DR-20, a unidirectional cardioid microphone from **Roland**, features a special wind screen. It also has a talk switch that allows for immediate on/off switching, which can be useful in unexpected feedback situations.

The DR-20 has a frequency range of 60 Hz to 15 kHz and a sensitivity level of -74 dB ± 3 dB. The maximum input SPL is 130 dB with distortion less than 0.5 percent at 1 kHz. The output impedance of the DR-20 is 330 ohms ± 30 percent at 1 kHz.

For more information from **Roland**



Corporation, contact the company in California at (213) 685-5141; fax: (213) 722-9233, visit the Web site: www.rolandus.com or circle Reader Service 140.

Schoeps

The CMXY 4V X-Y is a stereo microphone from **Schoeps**. The mic is constructed in three sections. The first consists of two rotatable cardioid microphones with lateral sound pick up, the second consists of a swivel in which the two microphones are held and tilted and the third contains the output connector.

X-Y is a coincident technique. The Schoeps differs from conventional X-Y microphones in that the capsules are not positioned one above the other.

Also unlike conventional X-Y microphones that have one fixed capsule and one rotating capsule, the angle of the CMXY 4V mic can be adjusted without affecting the main stereo axis. This is done with a gearing arrangement at the base of each element that causes the microphones to rotate equally in directions opposite to the main axis.

The CMXY 4V has a two-times cardioid polar pattern with a lateral pickup. The maximum SPL is 132 dB with an equivalent noise level of 26 dB. The maximum output level is approximately 1 V through an XLR-5 or five-pin miniature connector.

For more information from **Schoeps Microphones**, contact the Jerry Bruck of **Posthorn Recordings** in New York at (212) 242-3737; fax: (212) 924-1243, visit the Web site: www.posthorn.com via e-mail: jbruck@tiac.net or circle Reader Service 168.

Sennheiser

Recently debuted, the eight new Evolution Series dynamic microphones from **Sennheiser** consist of four handheld and four instrument mics. The handheld microphones were designed with a variety of patterns for use with different kinds of vocals. The four instrument microphones were designed for percussion, wind and stringed instruments. In each set of four, two

have cardioid polar patterns, while the other two have super-cardioid polar patterns.

Three mics — the E825, the E835, E845 — are available with an on/off switch.

For more information from **Sennheiser**, contact the company in Connecticut at (860) 434-9190; fax: (860) 434-3148 or circle Reader Service 194.



Shure

A single-point stereo condenser microphone designed for professional stereo applications in ENG and studio broadcasting, the VP88 from **Shure** is an integrated microphone system. The microphone can be run by battery or phantom power.

The VP88 has built-in left/right stereo matrix and mono capability. The cartridge is shock-mounted to the microphone and low stand noise, and the microphone has a built-in "pop" screen. The microphone can be hand-held or mounted on cameras, floor stands, fishpoles or on booms.

The output impedance of the VP88 is rated at 150 ohms, with a recommended minimum load impedance of 800 ohms.



The maximum SPL with a load of 800 ohms is 129 dB; with a load of 150 ohms, the maximum SPL is 119 dB. The hum pickup is -4 dB; equivalent sound pressure levels is 24 dB, weighted per DIN 45405.

For more information from **Shure**, contact the company in Illinois at (847) 866-2200 or circle Reader Service 220.

Sony

The C-48 condenser mic from **Sony** functions as a unidirectional, bidirectional or omnidirectional unit. It contains a capsule with dual diaphragms made of thin gold-covered polyester film, built to withstand humidity and other environmental conditions.

The C-48 also features a drain follower amplifier circuit composed of low-noise, high-gain FETs. The mic has a 10 dB pad switch and a two-position low-cut switch; it operates via battery or external power supply.

The frequency response is 30 Hz to 16 kHz and the output level is -41 dB at a reference of 0 dB equals 1 V per Pa. The output impedance at 1 kHz is 150 ohms, ± 20 percent, balanced. The dynamic range is better than 106 dB and the signal-to-noise ratio is more than 72 dB.

For more information from **Sony**, contact the company at (800) 686-SONY or (800) 686-7669; visit the Web site: www.sony.com/proaudio or circle Reader Service 13.

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Circle (234) On Reader Service Card

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WE KS-20159 EQ amp (2), BO. C Boswell, Boswell Bdcg, POB 1546, Orangeburg SC 29116. 803-536-1710.

60 W FM RF amp, excel cond, \$1500/BO; (2) 200 W Spectra Acoustics audio pwr amps, \$200 ea/BO. L Brent Oliphant, KMXE, POB 1678, Red Lodge MT 59068. 406-446-1199.

Radix DA1600 dist amp, \$200. J Coursolle, WPKR, 2401 W Waukau Ave, Oshkosh WI 54903. 920-236-4242.

Soundcraftsman 5002-A, 250 W/ch @8 ohm, 400 W/ch @ 4 ohm, class H, full LED pwr display, protection, 19" rack mount, excel cond, \$275 +shpg; Soundcraftsman PE 2217 preamp/EQ, 10 band/ch, excel cond, \$175 +shpg. R Cobb, 1044 Lightfoot, Winauma FL 33598. 813-634-1940.

Want to Buy

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Dynaco, Marantz, etc, 6550, 6CA7, 5AR4 vacuum tubes, etc; also broken SAE amplifiers. R Cobb, 1044 Lightfoot, Winauma FL 33598. 813-634-1940.

Rane MA-6, 6 chnl pwr amp for spare. R York, Jewel Records, 1594 Kinney Ave, Cincinnati OH 45231. 513-522-9336.

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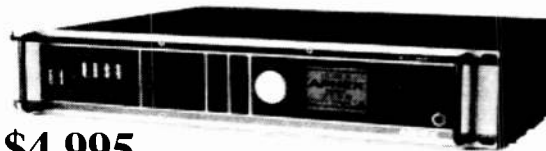
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ITC triple deck, \$900; ITC Delta, \$875; (3) SMC 712, \$200 ea; Dynamax ESD-10 splice locator, \$500. E Swanson, WPKR, 2401 W Waukau Ave, Oshkosh WI 54903. 920-236-4242.



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Sony ECM 33-P electret condenser mics (2), like new, \$125 ea or \$225/both. D Meyer, D Meyer Prods, 1123 Del Mar, Santa Barbara CA 93109. 805-962-8273.

EV RE20 mic, \$295; EV 309A shockmount, \$65; Popless wind screen, \$25; Telex V220 sportscaster headset w/cord, XLR plug, \$145; OC White M2MDUR mic arm/R, \$65; Symetrix 528E mic processor, \$285; Atlas deck mic stand, \$25. J Coursolle, WPKR, 2401 W Waukau Ave, Oshkosh WI 54903. 920-236-4242.

Shure SM7 (2), \$165; (2) Mike crane light duty, \$20 ea. E Swanson, WPKR, 2401 W Waukau Ave, Oshkosh WI 54903. 920-236-4242.

Sony C-37A condenser tube mics (2), excel cond, \$950/pr. G Garnes, 9 Quail Run, Hackettstown NJ 07840. 908-850-3826.

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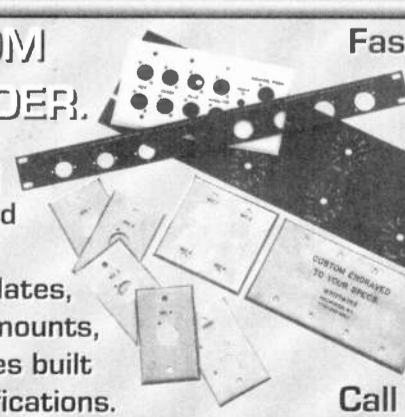
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Tek 585A o-scope w/type, B. 53/54G, (2) 82, 81A, 1A4 plug-in's & plug-in adapter, various probes & access, 202-1 scope cart, excel cond, manuals, \$4000/BO. R Chrysatis, C&M Comm, 809-1/2 Mulberry St #1, Williamson WV 25661. 304-235-2292.

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ACTION-GRAM

EQUIPMENT LISTINGS

Radio World's Broadcast Equipment Exchange provides a FREE listing service for radio stations and recording studios only. All other end users will be charged. Simply send your listings to us, following the example below. Please indicate in which category you would like your listing to appear. Mail your listings to the address below. Thank you.

Please print and include all information:

Contact Name _____
 Title _____
 Company/Station _____
 Address _____
 City/State _____
 Zip Code _____
 Telephone _____

I would like to receive or continue receiving Radio World FREE each month. Yes No

Signature _____ Date _____
 Please check only one entry for each category:

I. Type of Firm

D. Combination AM/FM station F. Recording Studio
 A. Commercial AM station K. Radio Station Services
 B. Commercial FM station G. TV station/teleprod facility
 C. Educational FM station H. Consultant/ind engineer
 E. Network/group owner I. Mfg. distributor or dealer
 J. Other _____

II. Job Function

A. Ownership G. Sales
 B. General management E. News operations
 C. Engineering F. Other (specify) _____
 D. Programming/production _____

Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a paid basis. Line ad listings & display advertising are available on a per word or per inch basis.

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*Closing for listings is every other Friday for the next month's issue. All listings are run for 2 issues unless pressed for space or otherwise notified by listee.

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Gates BC-250-GY 250W AM, \$900/BO; Harris BC-10H 10 kW AM, \$14,000; Gates FM-1-C, 1 kW FM, \$1000/BO. T Toenjes, KWIC, 800 SW Jackson, Topeka KS 66612. 785-437-6549.

Gates TE-3 FM exciter on 104.1 w/Orban card, \$450; Harris MX-15 FM exciter on 106.1, \$1300 +shpg. J Bahr, WVIS, Box 6556 Loiza Sta, San Juan PR 00914. 787-728-0364.

Marti M-30b RPU tuned to 161.730 w/spare 6252 tube w/receiver (tube type), cond unknown on rcvr but xmtr works fine, \$400. JL Gill, Autumn Hill Studios, POB 316, Otto NC 28763. 704-524-9602.

QE1 3500W xmtr on 92.1 MHz, used 8 yrs old, in storage, BO. K Diebel, KTJC, 1707 Louisa St, Rayville LA 71269. 318-728-5852.

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| | 5 KW AM 1980 Collins 828E-1 |
| | 5 KW AM 1982 Continental 315F |
| | 5 KW AM 1982 Continental 315R-1 |
| | 50 KW AM 1978 Continental 317C-1 |
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| Audio Production (Other) | Limiters | Satellite Equipment | Training Services |
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| Computers | Receivers & Transceivers | Tapes, Carts, Reels & CD's | Help Wanted |

Classified Advertising Rates Effective January 1, 1998

1-9 col inch (per inch)	1x	3x	6x	13x
10-19 col inch (per inch)	\$75	73	70	63
Distributor Directory	\$70	68	65	58
Professional Card	\$115	113	110	99
Station/Studio Services	\$80	78	76	68
Classified Line Ad	\$175			
Blind Box Ad			\$2.00 per word	\$16 additional

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To compute ad costs: Multiply the number of ad inches (columns x inches) by the desired rate schedule for your per unit cost. Example: a 3" ad at the 1x rate is \$225, at the 3x rate \$219, at the 6x rate \$210, at the 12x rate \$189, etc.

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QE1 3500 W on 92.1, used 8 yrs, in storage, BO. K Diebel, KTJL, 1707 Louisa St, Rayville LA 71267. 318-728-5852.

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Harris MW-50 50 kW AM xmtr or plate modulated rig. A Weiner, WEGP, 3 State St Pl, Presque Isle ME 04769. 207-985-7547.

McMartin AM/FM xmtr, any model, exciter or stereo modules. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

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Table with 4 columns: Page No., Advertiser, Reader Service No., Page No., Advertiser, Reader Service No. Lists various companies and their corresponding page numbers.

Table listing staff members and their roles: Production Director (Lisa Stafford), Production Manager (Lisa Hoagland), etc.

Table listing advertising sales representatives: U.S. East: Skip Tash, U.S. West: Dale Tucker, U.S. Midwest: Sandra Harvey-Coleman, etc.

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Table for Reader Service numbers: Columns include Type of Firm, Job Function, Purchasing Authority, Equipment/Services, and Equipment Budget. Includes a grid of numbers for selection.

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