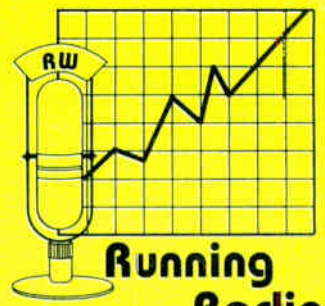


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# Radio World



Running  
Radio  
See pp. 28-39

Vol 19, No 3

Radio's Best Read Newspaper

February 8, 1995

## FCC Lays Groundwork for Satellite Radio

by Alan Haber

**WASHINGTON** With the FCC's decision to allocate spectrum in the 2310-2360 MHz (S) band for satellite digital audio radio services (DARS), delivery of widespread compact disc-quality audio by satellite to consumers across the country seems a step closer.

Terming its action as "consistent with the 1992 World Administrative Radio Conference, which allocated the band to the U.S. for the broadcast satellite service," the FCC said that the allocation is the first step toward providing the American public with new multichannel, multiformat digital radio services with sound quality equivalent to compact discs on a nationwide or regional basis. Predictions are that satellite DARS will be broadcasting by 1998.

In the satellite DARS services proponents' camp, the reaction was as expected. "It's a significant milestone," said Lon Levin, vice president of American Mobile Radio Corporation (AMRC), a subsidiary of American Mobile Satellite Corporation, and one of the four system proponents that has an application before the FCC.

Proponents have been waiting for FCC action on the satellite DARS for nearly a year.

The National Association of Broadcasters (NAB), however, sees satellite digital broadcasting as a grave threat to local radio, and issued a statement that downplayed the FCC action.

Other industry segments, such as the Electronic Industries Association, do not see satellite DARS as a threat to existing radio because eventually the broadcasters will have their own digital services.

In its decision, the commission noted satellite DARS's potential for offering "an increased choice of over-the-air audio programming," and said that "satellite DARS will provide continuous radio service to all communities, regardless of size or remoteness" and "make it possible to serve segments of the United States which are currently unserved or underserved."

Although the FCC laid the groundwork for eventual satellite DARS, no timetable was given as to when the proposed systems would be given the go ahead. Service and licensing rules will be taken up in a subsequent rule-making. The commission's international bureau will be taking the lead on developing service rules, according to an FCC spokesman.

### Commission support

The commission also noted a need to preserve local broadcasting during its satellite DARS proceeding.

Commissioner Andrew C. Barrett said that his support of the FCC's decision to allocate spectrum for satellite DARS was "not without reservation."

Noting that "For years, terrestrial radio broadcasters have contributed valuable community-based programming at no cost to listeners," he said that he was "concerned about the potential adverse impact on localism and the possible economic harm to these broadcasters that may result from the introduction of (satellite) DARS into the marketplace."

Barrett expressed concern that satellite services offered on a subscription basis might not be accessible to people constrained by economic factors. (Two of the four current satellite DARS proponent systems are subscription-based; another could be either subscription- or advertiser-supported; and the fourth is designed to be advertiser-supported.)

### A necessary step

Commissioner Susan Ness called the allocation of spectrum for satellite DARS "a necessary step." She said that she supports "our current local broadcast system" and hopes that the FCC's action "will expedite the radio broadcasting industry's move to digital technologies."

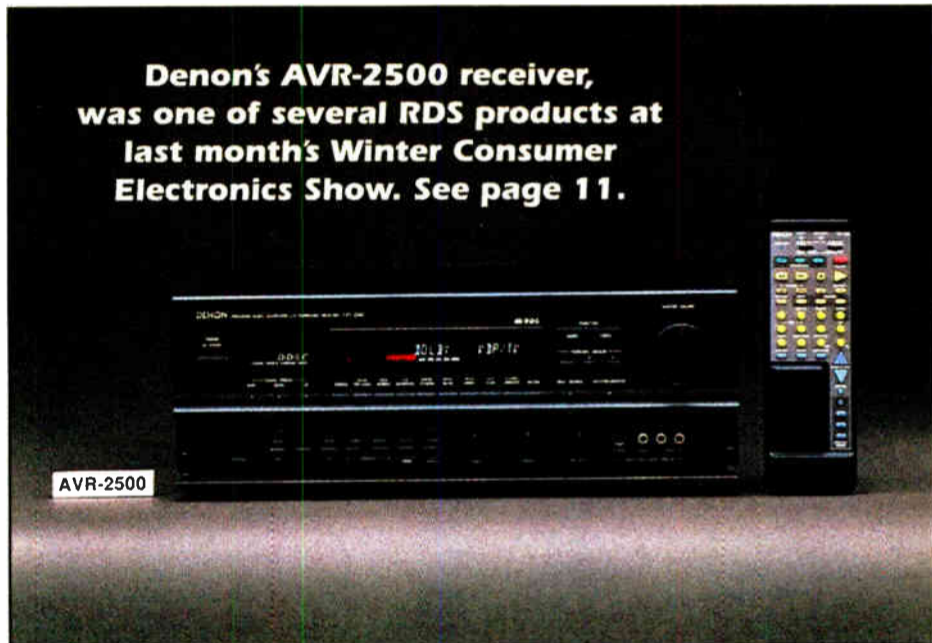
Ness said that "expanding the audio broadcast market to include programming delivered by satellite, as well as terrestrial broadcasting, has the potential to greatly enrich the programming choices available to the public. I look forward to both services competing with a variety of local and national digital quality programming."

When the FCC considers service and licensing rules, Ness said that "the impact—little or large—of national, satellite-based broadcasting upon our existing and highly competitive free, over-the-air AM and FM broadcast service" should be addressed.

Commissioner Rachele B. Chong also

continued on page 12 ►

Denon's AVR-2500 receiver,  
was one of several RDS products at  
last month's Winter Consumer  
Electronics Show. See page 11.



## NEWSWATCH

### Pressler Takes Over As Commerce Chairman

**WASHINGTON** Promising to rewrite the antiquated 1934 Communications Act before July 4th, Senator Larry Pressler (R-S.D.) last month took chairmanship of the Senate Committee on Commerce, Science and Transportation, which sets communications policy.

"The law now governing telecommunications was written in 1934 when state-of-the-art in media meant crowding around a big wooden box to hear the fireside chats of Franklin Roosevelt," Pressler said.

Pressler said a new communications act would create American jobs by opening overseas sales opportunities, ending regulatory barriers that prevent communication companies from entering different communication markets and would seek to minimize

continued on page 2 ►

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World Radio History

# NEWSWATCH

► continued from page 1  
government regulations.

"Ordinary consumers and the creative and business people of the communications industry can serve one another best without the heavy hand of bureaucratic control," he said.

Pressler already plans to introduce sweeping communication legislation this month along with House Commerce Chair Tom Bliley (R-Va.), House Telecommunications Chairman Jack Fields (R-Texas) and Senate Majority Leader Robert

Dole (R-Kan.).

Next month, communication deregulation bills should be discussed in different congressional committees. Final reform passage could come as early as April even though Pressler's goal for reform is July.

The Senate Commerce Committee was previously chaired by Democratic Senator Ernest F. Hollings (S.C.), who lost his chairmanship when his political party was voted out of power in last November's election.

## Foreign Ownership Clause Examined

**WASHINGTON** Representative Michael Oxley (R-Ohio) last month introduced legislation to repeal the anti-foreign-ownership clause of the Federal Communications Act.

"The U.S. always wins when it leads the way on free trade," he said.

Oxley argues that dropping the clause will eventually create more jobs in this country because it will open overseas

markets to U.S. telecommunications carriers and U.S. equipment providers.

## NAB Petitions FCC To Relax Duopoly Rules

**WASHINGTON** The National Association of Broadcasters (NAB) recently filed another set of comments before the FCC, urging the commission to give small market stations additional ownership opportunities.

Current FCC rules prevent most small market station owners from entering into new duopolies or time "brokerage-type" agreements.

## NAB Temporarily Moves

**WASHINGTON** The National Association of Broadcasters (NAB) begins operating out of its temporary quarters this month.

The NAB's move from its 1771 N Street N.W. location will allow the association to rid asbestos from its permanent site and make new renovations.

The NAB's mailing address for billing and other postal service correspondence is still 1771 N Street, NW; Washington, D.C. 20036-2891. But the NAB's address for couriers, special delivery packages and walk-in is now 2001 Pennsylvania Ave., NW; Washington, D.C. 20006. ☎

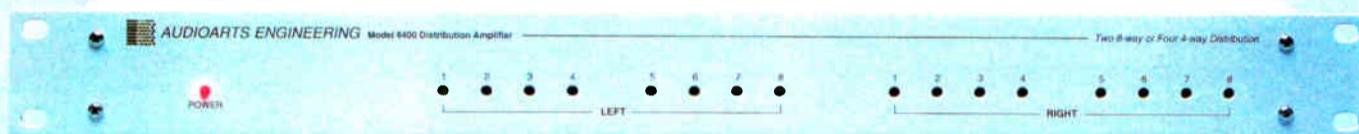
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# ISDN's Availability Increases

by Thomas Pear

**MORRISTOWN, N.J.** The seven different regional Bell operating companies (RBOCs) are not going to have as many Integrated Services Digital Network (ISDN) lines by the end of the year as they originally anticipated.

Bellcore recently released the latest set of RBOCs' ISDN line projections, and they revealed a sharp decrease in the number of anticipated ISDN-available lines from an earlier set of 1994 projections.

The ISDN service is still proliferating, but in lieu of creating additional ISDN-available phone lines, many companies opted for more cost efficient "ISDN Anywhere" programs, where they hook customers to the nearest local phone office with an ISDN conversion switch—instead of bringing ISDN switches into every local Bell phone office.

Although customers may receive phone numbers with different local-exchange code prefixes, in most cases customers will not have to pay extra for extended-line hookups.

"Some companies have said if you want an ISDN hookup, by God, we'll get it to you," Bellcore Media Relations Manager Ken Branson said.

Some companies will even connect customers to out-of-town phone offices in some cases, giving their customers out-of-town phone numbers.

"It's where(ever) the nearest ISDN-capable switch is," Branson said.

## Specific examples

Bell Atlantic, for example, previously projected that 90 percent of its lines would be ISDN-available by the end of '95, but dropped that figure to 77 percent in its latest projections. The company predicted only 82 percent of its lines will be ISDN-available by the end of next year.

"I think it's really because we did the ISDN Anywhere program," Bell Atlantic ISDN Product and Application Manager Pat D'Innocenzo said. "We spent less money equipping the analog equipment of central offices, and we extended the reach of the digital switches we already deployed."

In another cases, Pacific Bell previously reported that 87 percent of its lines would be ISDN-ready by the end of '95. But Pac Bell's projections were modified to 83 percent, and only 86 percent of its lines will be ISDN-available by the end of next year.

But with the exception of a few isolated pockets within its regional territory, Pacific Bell is also offering 100-percent ISDN accessibility, according to Pacific Bell Spokesman Scott Smith

NYNEX, which previously predicted 76 percent of its lines would be ISDN-available by the end of this year, now says that only 50 percent will be ISDN-available by the end this year.

But even that company is also experimenting with a type of ISDN-anywhere program called "Virtual ISDN."

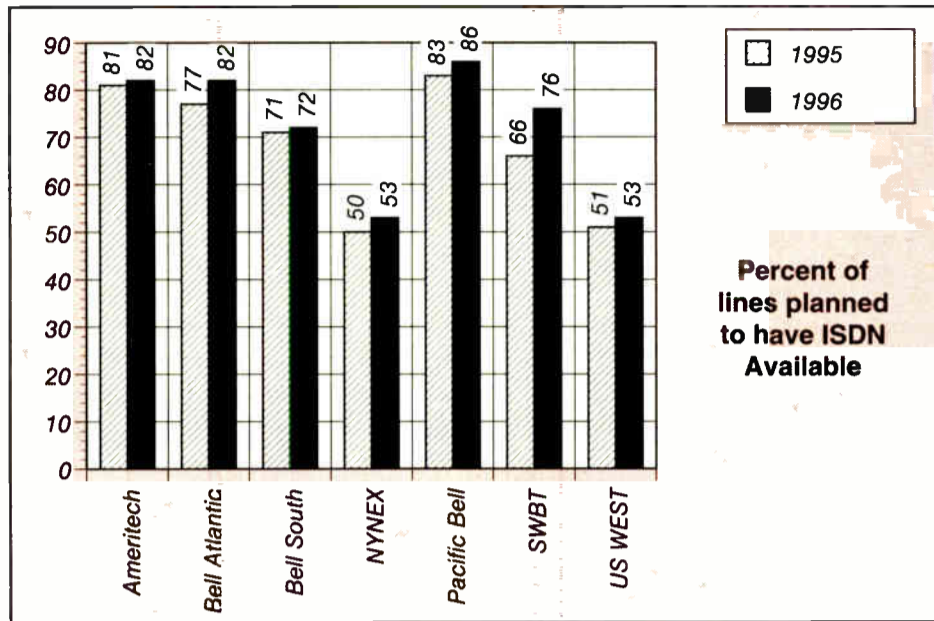
With "Virtual ISDN," NYNEX promises extended-ISDN-line hookups to its Eastern Massachusetts and New York territories where direct ISDN lines from local phone offices are not available. The program makes NYNEX about 70 percent ISDN-accessible, Bellcore ISDN Product Manager Bobbi Rentko said.

U.S. West, which tied NYNEX for having the least amount of ISDN-available

lines, predicted 59 percent of its lines would be ISDN-available by the end of this year. But U.S. West dropped that prediction to 51 percent, and predicted 53 percent of its lines will be ISDN-avail-

and Columbus, Ohio, according to Judith Myers, an Ameritech Spokesperson.

"We're offering 100-percent availability in those six major metropolitan areas," she said.



able by the end of next year.

But like its other Bell counterparts, U.S. West offers ISDN "extended availability" in various localities in Arizona, Colorado and South Dakota.

Also, U.S. West promises to bring ISDN to states within its territory where ISDN is currently unavailable.

"We plan to speed up and get more aggressive," U.S. West ISDN Market Manager Len Burres said.

The company already plans to file petitions before the Minnesota and Oregon public utilities commissions, requesting permission to bring in ISDN switches, Burres noted.

## Increasing lines and access

Some Bell companies, including Bell South, Southwestern Bell and Ameritech are going ahead with both increasing their ISDN-available lines and increasing extended-line access programs.

"It's a two-pronged approach," Bell South Media Relations Manager David Storey said.

Bell South previously reported it would have 64 percent of its lines ISDN available by the end of this year. But the company increased that prediction to 71 percent by year's end, and 72 percent of its lines will be ISDN-available by the end of 1996. And on top of that, the company is providing ISDN hookups to customers whose local phone offices are not equipped with an ISDN switch.

Southwestern Bell's projections of having 66 percent of its lines ISDN-available by the end of this year stayed the same, but the company reports that figure will increase to 76 percent by the end of next year. In the meantime, Southwestern Bell is also going ahead with extended line ISDN hookups.

Ameritech also slightly increased its ISDN projections and is offering ISDN-anywhere programs. The midwestern Bell company previously reported that it would have 80 percent of its lines ISDN accessible by the end of '95, but that figure rose one percent in the latest set Bellcore projections. Ameritech's 1996 projection stayed at 81 percent.

Ameritech offers ISDN-anywhere in six metropolitan areas: Chicago, Detroit, Indianapolis, Milwaukee and Cleveland

much as 53 times faster than typical phone line.

The main difference between ISDN lines and analog lines is that ISDN lines carry digital information instead of analog signals.

A codec on the transmitting end of an ISDN line converts analog signals into digital 1s and 0s, sends it through the line to another codec on the receiving end, which converts the digital signals back into analog.

The technology was originally built to transfer, data, graphics, video and photos, allowing phone customers to have phone conversations, computers and faxes all running at the same time on the same line.

But broadcasters added another niche to the ISDN market when they discovered ISDN line B channels' ability to provide enhanced audio quality in their 15-kHz bandwidths.

"ISDN has probably advanced enormously within the last year or two and it now a major means of providing all kinds of communication," Pacific Bell Spokesman Scott Smith said.

The enhanced-audio voice channels allow professional promo-announcers to telephone voice-overs directly into station recording equipment, saving time and money as they no longer rent time at nearby studios and rely on carrier services to deliver voice-overs to stations.

The technology is also opening new markets for professional promo-announcers. In the event of a breaking radio or television news story, professional announcers can use ISDN hookups to create "teases"

continued on page 14 ▶

In addition to the Bell companies, GTE reports that it offers 100-percent ISDN in a number of territories located in Florida, North Carolina, Indiana, Ohio, Illinois, Kentucky, Pennsylvania and Michigan.

## ISDN capabilities

ISDN lines use a high bandwidth to transfer vast amounts of information as

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# Early Radio Pioneer and Adventurer

**WASHINGTON** One of the most interesting aspects of radio is its relatively short but incredibly interesting history. I have often heard it said that radio is a people business—in fact—that people are radio's most valuable assets. This is as true today as when the medium was in its infancy.

Think of the names: Sarnoff, Marconi, Armstrong, de Forest... and some of the forgotten ones: Charles Herrold (whom I recently wrote about) and Commander Eugene F. McDonald.

Commander Eugene F. McDonald Jr. was a naval officer, an explorer, a giant of industry, an inventor and an innovator. But if you were to peruse the pages of Tom Lewis's "Empire of the Air," you'd only find one mention of McDonald, during the settlement of a lawsuit between Zenith and RCA. Zenith was founded and headed by McDonald for years. What he did not share with Sarnoff, however, was the latter's penchant for public relations.

I did not really know anything about the man until a recent conversation I had with Dr. Harold Cones, professor of biology and chairman, Department of Biology, Chemistry and Environmental Science at the Christopher Newport University in Newport News, Va.

So what is a Ph.D. in environmental science doing talking about radio? "I have always been interested in the history of technology," he told me. "My dad was a radio engineer and we listened to shortwave radio when I was a kid."

Cones remembers his father having a friend who owned a Zenith Trans-Oceanic radio that, in Cones' words, "were too expensive for mere mortals."

Fast forward to the late 1980s. Cones, now an adult with all the stresses of adult life, turned to radio as a hobby. "I found shortwave again," he said.

As part of his hobby, he hooked up with

another professor, John Bryant, from Oklahoma State University. Bryant is a professor of architecture. They shared a mutual interest in the Zenith "T-O" and what started for them as weekend lark to find out about the old shortwave line of radios, culminated in their discovery and permission to unseal and read all of Commander Eugene F. McDonald's personal files.

The commander's files, sealed since 1958, were contained in 138 "rusty old file drawers," said Cones. The duo transferred the information into 285 document storage boxes and indexed the stuff to tape.

As of now, Bryant and Cones have permission to use the files and note any seemingly sensitive materials. Eventually, the files will be made public and put on record in a library.

Cones' and Bryant's first end-product from their research should be rolling off the presses any day now. "The Zenith Trans-Oceanic: The Royalty of Radios." Cones and Bryant

are also working on a biography of McDonald, to be published later.

But Cones was generous enough to share with me some of the neat stuff he found out, so that I could pass it on to you.

For example, McDonald was one of the founding members of the National Association of Broadcasters in the 1920s. In addition, McDonald served as the NAB's first president, according to the association's early history.

McDonald should be famous for many firsts he pioneered. Zenith, not RCA as is widely credited, had the first plug-in radio.

In 1925, McDonald joined Admiral Donald B. MacMillan's expedition to the Arctic as second in command and as skipper of the Peary. Pictured on this page is McDonald (standing right) with a group of singing eskimos who were there to help him demonstrate (rather dramatically) the

potential of shortwave frequencies to the world's navies. The navies heard the singing, loud and clear in Tasmania.

He was among the first to use shortwave on airplane expeditions as well. The special gear, of course, was designed and built by Zenith.



Singing Eskimos help Commander McDonald prove the power of shortwave.

But the reason McDonald had the "T-O" built in the first place is quite a story itself. You see, he had a 185-foot yacht, The Mizpah, that he kept moored in Lake Michigan, near Chicago. His summer fishing grounds, however, were in Lake Huron, up on the Canadian shores. As the war loomed closer in the late 1930s, McDonald wanted to be able to hear the news from Europe directly. He charged his design team with creating a portable shortwave radio so that he could do so.

Twenty prototypes and two years later, the Zenith Trans-Oceanic rolled off the line.

Cones' and Bryant's intent in rebuilding the Zenith archives and writing their books is to re-acquaint many in the business (and the general public as well) with the significance of the portable radio and the commander's role in the development

of the T-O and its subsequent importance in WWII.

The book's endnotes embellish on the subject, with chapters on the industrial design and styling of the T-O, the end models manufactured and descriptions of the accessories that were available for purchase at the time.

Also, the authors have included chapters on the collection and restoration of tube models as well as solid state models.

If you are interested in ordering a copy

of the book, or if you have any relevant information or materials to contribute to Cones' and Bryant's work, write them care of: The Radio Professors, P.O. Box 592, Stillwater, OK 74706.

★ ★ ★

And just hot off the presses, the NAB announced that 150-200 of the more than 350 companies on its spring convention waiting list will be accommodated at a new hall (S6) on Desert Inn Road, across the street from the main building of the Las Vegas Convention Center.

The new hall will also be the sole site for all NAB '95 attendee registration. Taxis and shuttle buses will be routed first to the new exhibit hall, then the main convention center. A cat-walk will link the two halls and exhibitors will be able to register at either the main convention center or the new hall.

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### GUEST EDITORIAL

# Understanding the Many Possibilities of Digital

by John Abel

**LEIPZIG, Germany** The broadcasting industry is at the onset of a major digital revolution. The industry has yet to comprehend or understand what digital broadcasting means. To a large extent, radio broadcasters continue to think of "digital broadcasting" as higher quality sound through digital audio broadcasting (DAB).

But DAB is only one application of digital broadcasting; or to say it another way, DAB is simply an extension of the concept of digital broadcasting. Digital broadcasting does not necessarily mean higher quality; digital broadcasting means greater flexibility to achieve multiple purposes for the broadcast signal and certainly one of these applications is sound.

### Multiple services

Digital broadcasting means broadcasters can move to a higher level of service by providing multiple services in digital form. Once all forms of human communication become digital (if they are not already), then a digital broadcaster could broadcast all forms, including photos, graphics, text, video, audio, etc.

Digital broadcasting also provides the opportunity for both real-time and non-real-time broadcasting. Today, broadcasters are stuck with real-time broadcasting largely because the receivers are "dumb terminals" with little or no memory or intelligence in them. These receivers can only receive a single service in real time.

As broadcast receivers become more and more digital they will become

smarter and have more memory and intelligence in them. Tomorrow's digital receivers will be more like today's computers than present-day receivers.

With more intelligent receivers in use, broadcasters can begin to provide non-real-time broadcasts that are captured by these receivers for display and retrieval at the will of the consumer. We are beginning to see this with radio broadcast data service (RBDS) applications, especially a service like Coupon Radio. In fact, one of the true benefits of a service like Coupon Radio is that it permits the broadcaster to couple real-time and non-real-time broadcasting. This coupling opens up vast new opportunities for marketing, sales, programming and new services to be offered by broadcasters.

Broadcasters must understand two very important concepts surrounding digital broadcasting. First that digital broadcasting permits radio broadcasters to move to a higher level of service and to utilize the broadcast spectrum in new ways that go beyond just sound. The second is that through digital broadcasting, a broadcaster can be both a real-time and a non-real-time broadcaster, which opens up mind-boggling possibilities for new and interactive services.

### Convergence

Virtually all of the possibilities in the convergence of media, multimedia and the Information Superhighway depend on digital communications. As we transition to digital broadcasting, broadcasters will have new ways of participating as providers on the Information Superhighway.

Broadcasting is one of the most effective and efficient forms of communication known to human beings. And digital broadcasting will result in a reinvention of broadcasting. Broadcasters have the opportunity to reinvent themselves in the transition to digital—to become multimedia broadcasters—offering multiple services on a flexible basis.

As microcomputer technology moves into more and more consumer devices, we must realize that radio and television receivers will be capable of more than just pictures and sound. Broadcasters can also provide services to these microprocessor-based devices, so broadcasters should start thinking of the services that could be provided to personal digital assistants (PDAs), personal computers, pagers, "radiocomputers," etc. The potential receivers for tomorrow's digital broadcaster is limited only by our creativity of our minds, not by technology.

Digital broadcasting gives us the opportunity to use broadcast spectrum differently than we now do. By digitizing the transmission path, broadcasters will make a quantum leap over analog transmissions and gain the ability to enter multimedia broadcasting, providing multiple services within the same channel.

## Satellite DAR: A Call to Action

When "radio with pictures" came along, the one without pictures had to scramble to re-invent itself to survive. Not only did it survive, but radio went on to become a multi-billion dollar industry that eventually dealt with the onset of cable television, MTV and CDs.

Seventy-five years into its history, the pioneer service is once again facing the threat of competition from a new type of service: satellite digital radio.

Technology progresses, and so too should radio. When the FCC allocated S-band for the satellite radio services, it recognized that there is room for high-quality national radio satellite services.

The FCC should also look to its regulatory past, however, in protecting existing stations from too harsh a competition. At first glance it would seem that the 1998 timetable does just that; allowing the in-band digital audio systems to be tested, refined, completed and established so as to put terrestrial broadcasters on technical parity with the proposed satellite services.

The fact that three of the four proposed digital radio services are subscriber-supported further underlines the differences between them and local radio. Once technical parity is achieved, the success or demise of a local station depends on its programming, its localism and its commitment to excellence.

Furthermore, once terrestrial digital broadcasting is in place, stations stand to make money from non-broadcast related activity (see John Abel's *Guest Commentary*, elsewhere on this page), including the transmission of photos, graphics, text, video, audio, etc. In other words, radio, as it exists today, will be but one of many revenue-generating opportunities available to a station.

The fourth satellite digital service is already a radio group owner. Its plan is to make the service advertiser-supported. Savvy broadcasters could take advantage of ownership opportunities in satellite radio to expand their businesses this way. If ownership is not financially possible, perhaps a radio superstation is?

This latest step forward by the FCC should be a harbinger of better things to come for radio. The road won't always be easy, but radio has previously navigated this highway with innovation and style. The future will be no different.

—RW

Broadcasters are already taking steps to digitize their operations, and they also are beginning to insert information on FM subcarriers, such as RBDS. The difference is that when the entire channel is digitized, there is far greater capacity for distributing information and the digital transmission is much less error-prone than with analog transmissions.

For radio, digital broadcasting offers the possibility of embedding multiple audio signals into a digital data stream: real-time traffic updates, weather updates and other emergency announcements could be displayed/played on demand; or separate bit streams could be allocated to e-mail, paging, PDAs, signaling devices like utility load management, data transmissions, fax transmissions, differential global positioning system (D-GPS) and RBDS/RDS. Theoretically, all of these additional transmissions could be accomplished while still providing a real-time broadcast as is done now.

### Only one limit

Our creativity is the only limit. The content of these additional digital transmissions can be anything that might be broadcast to addressable receivers. That is the beauty of digital transmission and multimedia broadcasting: The configurations of bits can be changed instantly.

Broadcasters often say to me that they understand the concept, but where do they get the data they need to broadcast? A broadcast station could create many of these services on its own. Or it could distribute services packaged by others—as it does now with network services, except the networks of the future are not limited to just sound.

These services would not be unlike traditional broadcast network services or programs, except that they would be embedded in the bit stream. In fact, many of these "networks of the future" already exist, including CompuServe, America Online, Dow Jones, Prodigy, etc. The

problem is that their current distribution system is cumbersome and expensive and the data rate is quite low. If these services were broadcast, they could be provided at a much lower cost to consumers.

### Wireless

Broadcasters have the best technology and unique advantages because broadcasters are wireless.

Wireless digital broadcast transmissions can and will provide near universal coverage at extremely low cost. Wireless is mobile; wireless transmissions can be received wherever the customer is rather than the customer needing to be where the service terminates. Wireless is inexpensive. There is no need for expensive fiber, coaxial or copper cable. Digital wireless can involve a mix of support mechanisms. It can be totally free, it can be advertiser supported, it can be addressable for subscription fees or it can be encrypted for specialized rates.

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□ □ □

John Abel, executive vice president of the National Association of Broadcasters, is based in Washington, D.C. This article is adapted from a presentation Abel made at the Leipzig Radio Show in September.

# Radio World

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Next Issue of  
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# Equipment Prices May Rise with EMC Rule

by Thomas Pear

**WASHINGTON** Broadcast equipment manufacturers say they may have to inflate equipment cost in the U.S. to comply with a strict 1989 European electromagnetic compatibility (EMC) directive that will take effect early next year.

In addition to inflating equipment costs, the manufacturers said the European mandate may also decrease equipment efficiency as manufacturers adopt new wiring systems for EMC compliance, according to Bob Weirather, Harris Allied's Cambridge, England, engineering manager.

The European Union-enacted directive, set to go into effect in 1996, said that equipment should not produce excessive electromagnetic disturbance or be susceptible to it when the gear is properly installed, maintained and used for the purpose for which it is intended. This not only covers RF interference, but also spurious signals conducted along the main networks or connection cables.

## An unnecessary regulation

Harris Allied Studio Products Manager David Burns believes the directive is unnecessary and will most likely inflate equipment cost across the board as manufacturers build compliant broadcast instruments.

It is unlikely, he said, that equipment producers will selectively manufacture equipment for different geographic regions of the globe, he said.

The same EMC-approved equipment sold in Europe, then, would be sold in the U.S., and extra EMC manufacturing cost would be passed onto consumers through higher broadcast equipment prices.

"All of us will pay extra for broadcast equipment because Europe requires EMC-approved equipment," Burns said. "I think it will inflate the cost of everything that goes into the radio mix."

Telos Marketing Director Neil Glassman also agrees that equipment costs may be raised as manufacturers comply with the European directive. "The U.S. consumer may have to have things done to his equipment that may be mandated by the Europeans," he said.

On top of increased equipment prices, the EMC directive would also bring broadcasters less efficient equipment purchases, according to the companies that talked to *RW*.

Weirather noted that when constructing transmitters, for example, manufacturers mainly use transformers and rectifying diodes.

"These power supplies are extremely efficient" when converting AC power to DC power, he said.

## Increased costs

But to make transmitters EMC acceptable, manufacturers would have to use some type of switching power supply, inflating broadcaster power bills by as much as 10 percent without giving them any additional benefits, except assurance that they comply with EMC rules, Weirather said.

"All line disturbance will be virtually eliminated," Weirather said. "But the problem is, how much do we want to spend?"

Adding to the dilemma domestically, local electrical inspectors here in the U.S. are demanding Underwriters Laboratories Inc. (UL) certification on professional broadcast equipment in much the same way as EMC certification would be required for equipment shipped to Europe. The UL approval, however, concerns equipment safety instead of EM.

UL certification will involve evaluation costs that manufacturers said will most likely be passed onto broadcaster purchasing equipment. Although UL itself promises the additional cost will be minimal, manufacturers disagree and argue costs could increase by thousands (see *RW*, Jan. 25).

The EMC directive was to take effect in

1992. But the '92 time scale was found to be impractical. A transition period, then, was adopted, and the EMC directive now becomes mandatory on Jan. 1, 1996.

After that date, all products must comply with the directive and carry a EU conformity marking. In the meantime, manufacturers have the choice of com-

**The European mandate also may decrease equipment efficiency as manufacturers adopt new wiring systems for EMC compliance.**

plying with existing national regulations or complying fully with the directive, which already guarantees free trade within the EU.

## Less than a year

Eventually all new products, including new equipment designed before 1992, must comply with the directive if they are to continue to be sold from 1996, although enforcement will vary from one European country to another.

There are three ways in which manufacturers can demonstrate compliance: the first is self-declaration of conformity either in part or whole to a recognized standard. This can be done through in-house testing, renting test equipment or using a third-party test laboratory.

The second option is to create a technical construction file (TCF), which includes details like product descriptions, photos, wiring diagrams, EMC, shielding and technical explanations. The file must be submitted to a competent regulatory body for approval. The TCF could be used where no appropriate standard

exists, and is designed to help those who make large installations or systems with a large number of variants.

The third method is to use a type examination procedure, which is required for some classes of equipment, such as radio transmitters.

Telos' Glassman said he is grateful that one standard was enacted by the European Union instead of numerous different standards from the different European states.

"We're lucky it's just one European community standard," noting that in the Balkans each state has its own set of rules and regulations.

□□□

*Yasmin Hashmi in London contributed to this article.*

## New Rules Mean Fewer Antenna Change Forms

by Alan Haber

**WASHINGTON** At its Jan. 12 open meeting, the Federal Communications Commission (FCC) proposed to streamline its antenna structure clearance procedure and revise Part 17 of its rules regarding construction, marking and lighting of antenna structures.

By setting this proceeding into motion, the commission said it "seeks to significantly reduce the number of filings requesting changes to antenna structures; expedite application and notification processing; and increase safety in air navigation."

## Clearance process

The FCC proposed to simplify the current antenna structure clearance process with rules requiring registration by antenna structure owners, rather than by

licensees using the structures, as authorized by Congress. The commission also proposed that licensees continue to be responsible for complying with all tower rules, but on a secondary basis, to ensure compliance if the tower owner fails to correct any violation.

**The FCC proposes to streamline its current antenna structure clearance process.**

The Commission's current antenna clearance process requires identification of the location and height of each anten-

na structure that is either more than 60.96 meters (200 feet) above ground or that may interfere with a nearby airport runway and the obtaining of a determination from the Federal Aviation Administration (FAA) as to whether the structure is a potential hazard to air navigation.

The FCC said it had reviewed, in 1993 alone, about 17,000 such applications and notifications, many of which reported changes to the same antenna structure. As a way of simplifying the clearance process, the Commission proposed a revision of FCC Form 854 to provide a specific application for registration to be filed by the antenna structure owner, instead of each licensee or permittee.

The FCC also emphasized that antenna structure registration will not in any way constitute a commission authorization to transmit radio signals from the structure, or relieve the owner of responsibility for compliance with applicable local or state laws.

It was announced at the open meeting that a report and order is anticipated to be issued sometime later this year; the new rules would begin to be phased in around Jan. 1, 1996.

According to Robert Greenberg, assistant chief of the FCC's FM branch, a benefit of the proposed action would be a streamlining of the database structure now in place, resulting in a single, unified database that could be accessed by FCC staff, other government agencies, and the public.

The FCC also proposed a revision of Part 17 of its rules to reflect changes to two FAA Advisory Circulars regarding painting and lighting antenna structures. The Commission also said it would implement statutory language holding antenna structure owners primarily responsible for compliance with FCC painting and lighting specifications.

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## INTERNATIONAL UPDATE

# DAB Transmitters Get a Closer Look

by Mary Ann Seidler

**FREISING, Germany** As the shift toward transmitting DAB programs begins, the importance of the equipment manufacturers starts to play an even larger role.

A lot of attention has focused on the importance of DAB receivers but little has been heard from transmitter manufacturers.

Despite their low profile, at least four transmitter manufacturers said they are either ready with product or soon will be. The German companies Telefunken Sendertechnik and Rhode & Schwarz, the French company Thomcast and the

U.S.-based Harris Allied all have been closely following the market for quite some time.

## In development

Telefunken prides itself on seven years of investment in DAB, according to Wolfgang Jeremias. He said the company made the decision to explore DAB early on, counting on DAB becoming a reality. At the time, however, Telefunken knew that DAB was a very new field and it would take several years before developing into an actual market.

Jeremias said Telefunken developed its

transmitters for DAB L-band (1452 to 1492 MHz) and the company is quite proud of the product because it was developed from the ground up specifically for DAB. Thus far Telefunken has delivered systems to Switzerland, England, Germany, Canada, Deutsche Telekom and Communications Labs in Australia. The company also is quite active in Korea, Italy and Hungary, as well as in Poland.

Poland hoped to have DAB transmitters up and running in time for the 70th anniversary of Polish Radio in February 1995, but that delivery time is too tight. Instead, the Poles are likely to borrow a

system for the anniversary from a neighboring country and then accept delivery of their own system later the year.

The systems now being delivered are being used primarily for transmission tests and small scale operations. Jeremias said he feels the real market for DAB transmitters is still a few years off.

## Hard at work

Meanwhile, in the south of Germany, Rhode & Schwarz is hard at work on a group of transmission products for DAB. Reiner Steen, head of research and development, said the company has been working on DAB transmitters for two years. He believes that Rhode & Schwarz will begin making some large-scale deliveries in 1995.

For the present, Steen said most of the work being done by Rhode & Schwarz is in Europe, Australia, Canada and Mexico. As the company headquarters are in Munich, Steen said Rhode & Schwarz hopes to work closely with the Bavarian DAB transmission system project that gets underway this year. Rhode & Schwarz hopes that working on such projects will help its DAB development work.

## Harris Allied is working on transmitter systems for the Eureka-147 system.

Thomcast in France also has joined the DAB fray. It has worked on DAB transmitters for five years now. Thomcast transmitters are being used in the Canadian DAB tests. Thomcast delivered transmitters to both Toronto and Montréal. And in France a system was delivered to Télédiffusion de France (TDF), and in Switzerland a system was purchased by the Swiss PTT.

Although its headquarters are in the U.S., the land of the in-band, on-channel (IBOC) DAB system, Harris Allied is working on transmitter systems for the Eureka-147 system. According to Robert Weirather, director of TV RF products, the company is closely involved with BBC experiments and now has a system operating in the London area. Harris has signed a mutual non-disclosure agreement with the BBC for this project. The transmitters Harris uses in the project are similar to its television transmitters, just customized to meet the needs of the specific project.

## IBOC system

For the U.S. market, Harris Allied has worked closely with USA Digital Radio, one of the main groups promoting an IBOC system. In fact, a Harris DX 10 transmitter is being used to demonstrate USA Digital Radio's system.

John DeLay, Harris Allied AM product manager, said the demonstration unit is essentially the standard Harris production model sold since 1987. The main modification is a change to the Bessel filter in order to achieve a five- to 10-fold improvement in the audio bandwidth capabilities of the transmitter.

The one area that all the manufacturers seem to agree on is the unlikelihood of a single DAB transmission system for the entire world. Which systems end up being the standards remains to be seen, but whichever systems win out, the transmitter manufacturers said they will be ready. ☺



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## INTERNATIONAL UPDATE

# Euro DAB Moves to Next Phase

by Mary Ann Seidler

**GENEVA** The Eureka-147 standard for Digital Audio Broadcasting (DAB) is set. Now it is up to each European country to implement the system and move forward with DAB services.

As DAB finishes the discussion phase and enters the test trial and on-air phase in Europe, the groups involved in the original discussions will meet less regularly. However, most plan to keep in touch with their neighbors to ensure consistency and coordination on a variety of issues. To that end, a new forum has been set up to keep members talking, sharing ideas and continuing a united front for promoting product development.

## DAB support group

According to Franc Kozamernik, of the European Broadcasting Union (EBU), this group will start actively meeting in 1995 and will be known as EURO DAB. The group, said Kozamernik, should really pull together all of the different concerns involved in DAB, from the technical to the commercial. Membership is open to all existing national groups, manufacturers, service operators, broadcasters and institutes.

At the first unofficial meeting of the group, representatives from Belgium, Denmark, France, Germany, the Netherlands, Poland, Spain, Sweden, Switzerland and the U.K. were in attendance.

The first official meeting of the group is March 22, in Geneva. Although the name is EURO DAB, countries outside of Europe, such as Canada, Australia, India and China that are interested in DAB have been invited to join.

The main objectives of the group cover a variety of issues, including: marketing and strategy for introduction of DAB services, audio programming, copyright, legal and regulatory, minimum requirements and options for DAB services, future evolution towards multimedia and interactive radio, as well as future technical developments for DAB.

One issue the group has started to discuss is DAB receivers, a subject that will certainly be a large focus of activity. This is a key issue as wide-spread acceptance of DAB will hinge on the affordability of receivers as well as the list of features the public wants and ease of use. However, until enough people start buying the receivers the price cannot come down.

One of the agreed tasks of this

continued on page 14 ▶

# Denon Only Major RDS Presence at CES

by John Gatski

**LAS VEGAS** The expectations of numerous new RDS FM radios did not materialize at the 1995 Winter Consumer Electronics Show. Nonetheless, there were some significant introductions that indicate steady but slow progress of the data technology.

The Radio Data System (RDS), also called Smart Radio in the consumer industry, is a 57 kHz digital subcarrier for FM stations that can transmit text and other information to RDS-equipped radios and receivers. RDS features transmission of call letters, scrolling messages, display of artist and song title, stations scanning by format and automated override for emergency messages and traffic alerts.

More than 200 U.S. stations are broadcasting RDS—a number of them are National Public Radio Stations and global positioning services that utilize RDS at FM stations. The RDS technology was developed in Europe in the 1980s.

Although there have been predictions that more companies would have RDS receivers at WCES by now (the U.S. standard, Radio Data Broadcast System or RBDS was adopted in 1993), the higher profile companies, such as Sony, Panasonic, Pioneer and JVC did not have any receivers at the show, although Pioneer said it does have several models in the works.

Other companies, however, did have products at WCES. Denon continued its commitment with 10 RDS products in its line, including car receivers, home AV receivers and home tuners. The biggest attention-getter for Denon is its 80-watt-per-channel home audio/video Dolby Pro-Logic receiver, the \$1,000 AVR-2500, which not only puts scrolling RDS text on the receiver screen but on your TV as well. Denon's DCR-530 is the company's entry RDS car cassette receiver listing at a reasonable \$350.

By the way, Denon had a RDS billboard

on top of the Tropicana hotel—expounding the virtues of buying a Denon RDS product. Las Vegas is a good showcase city for RDS with about 10 stations on the air.

working model of the Audi Delta, which will be its first U.S. OEM product to be installed in Audis later in 1995. Philips, Bang and Olufsen also displayed RDS radios at their booths. Philips' lineup

**RDS is going to need the OEM market to succeed, and there were positive signs that manufacturers are introducing a few RDS models.**

Onkyo had its T-450 RD home tuner at WCES, which lists for \$350. Later in 1995, the company will introduce a lower-priced tuner at \$210.

Because RDS is going to need the OEM market to succeed, there were positive signs that manufacturers are introducing a few RDS models. Delco announced a toll-free number for General Motors car customers to call and order the RDS/cassette receiver that has been around in prototype form for two years (RW reviewed the radio last fall).

The toll-free number, 1-800-748-0422, is for customers who want to retrofit an RDS receiver into their GM cars. The introductory offer is \$450. "Customers wishing to purchase an RDS unit when buying a new vehicle can have the dealer place the order and install the systems," a Delco press release said.

Blaupunkt, which has shown RDS receivers at past WCES shows showed its

numbers five including a Digital Compact Cassette version.

Also, in combing the floor at WCES, we found Grundig showing its line of RDS shortwave receivers, and as a sign of RDS infiltrating the multimedia world, Advanced Digital Systems from Cerritos, Calif., displayed its FM stereo/RDS card for PCs.

The card works with any 38-or-better PC with 4MB RAM, and will offer screen display of RDS text, stationary or scrolling, and can offload the information onto the hard drive for later retrieval. Along with the RDS, the FM stereo circuit features five-band EQ and the Hughes-aircraft developed Sound Retrieval System that improve stereo width and depth. If you have a sound card, the Radio on Demand feature allows you to preset a station and record the audio for later playback. For more information, contact ADS at 310-926-1928. ☐

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# Spectrum Allocated for Satellite DARS

► continued from page 1

noted her support for satellite DARS, although she said that her support "in no way diminishes my support for terrestrial broadcast service.

"I view satellite DARS as a complementary service to terrestrial broadcasting that will increase the diversity of programming available to the public and increase radio listenership in general," she said.

She made it clear that her support was contingent on satellite service having "a nationwide or regional audience base"

and offering "a broad panoply of channel choices."

Chong said she recognized that some people feared "the advent of satellite DARS" and that those people predicted "that it will diminish the viability of local broadcasters."

Chong said she hoped they would "have continuing faith in their success

pany does "recognize NAB's concern."

Satellite radio will be another choice for listeners, Levin said. "Ultimately, I think that's what the conclusion will be by the FCC. And that is that local broadcasting will not be affected—it's just another choice for American consumers."

William M. Caldwell IV, president of system proponent Digital Satellite

people will listen to local radio for local news, weather, sports, (and) personalities. There is no way that satellite radio can provide that."

As to how subscription-based services would fare versus those that would be advertiser-supported, and therefore free

continued on next page ►

## NAB Nixes SAT DARS

by Alan Haber

**WASHINGTON** In reaction to the FCC's move to allocate spectrum for satellite digital radio services (DARS), National Association of Broadcasters (NAB) President/CEO Edward O. Fritts said the NAB is "disappointed" by the decision, but that the allocation was expected since the spectrum was set aside for such purposes at the World Administrative Radio Conference (WARC '92).

In a press release issued immediately after the FCC's Jan. 12 decision, Fritts insisted the action was "not an authorization of a satellite radio service."

"The fact that the FCC has waited three years since WARC to allocate spectrum is in itself an indication of the uncertainty about the need for satellite radio in the United States," Fritts said. "The question of whether such a service should be authorized and licenses granted will be fully explored in a future FCC proceeding."

Fritts added that the NAB will show that "a satellite radio service is unwise" and noted the association believes "that the commission should rely on the local radio broadcasting system to bring digital, CD-quality radio to the American public."

Fritts's blunt statements about satellite DARS were bolstered by a recently released report titled "The Truth About Satellite Radio," in which it noted that the satellite DARS "would fragment radio audiences so that, over time and beginning in the smaller markets, local radio would no longer be profitable." The report concluded that "There is...no need for a national radio service, and no need for more competition in radio service.

The Electronic Industries Association, that represents the receiver manufacturers, disagrees with the assessment that satellite DARS and local radio cannot co-exist. Gary J. Shapiro, group vice president of the EIA's Consumer Electronics Group, said "There will always be a demand for local broadcasting," he said, "but, at the same time, public interest demands a national satellite service."

Shapiro also said the EIA has not yet endorsed any digital radio system, satellite or terrestrial. "We are awaiting the test results before we can make any recommendation to the FCC."

**In its decision, the commission noted satellite DARS's potential for offering an increased choice of over-the-air audio programming, and said that satellite DARS will provide continuous radio service to all communities.**

in the marketplace and will not give into their fears. Incumbent broadcasters have many strengths that will allow them to compete with satellite delivery systems.

"Terrestrial broadcasters' primary strengths have always been their devotion to the needs of the local community and their many public service achievements," Chong said. "They will continue to receive the support of local sponsors if they capitalize on their strengths."

### Proponents speak

On the issue of preserving localism, AMRC's Levin said that he agrees the issue should be addressed in the service rules, and added that "it's always been our feeling that we just don't think it's as serious an issue as has been portrayed by the NAB." He did note, however, that his com-

Broadcasting Corporation (DSCBS), said, in a press release, that "The FCC's action... is a very encouraging sign. It sends a positive signal to the telecommunications industry, equipment manufacturers, the financial community, and the public that this new service is on the horizon."

David Margoliese, chairman and CEO of CD Radio Inc., another of the four satellite system proponents, called the FCC's action an "enormous step forward toward the inauguration of a third radio band in the U.S."

### The effect

Addressing the issue of the effect that satellite radio would have on terrestrial broadcasting, Rob Briskman, president of CD Radio Systems, a division of CD Radio Inc., said he thought that satellite radio "would appeal to niche markets and

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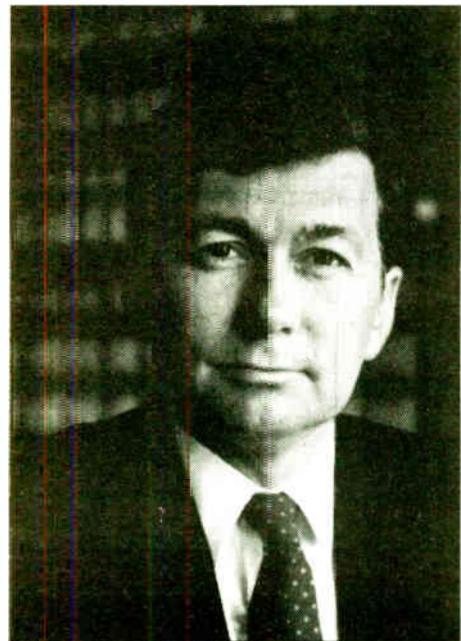
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to listeners. Briskman noted that people already "pay considerable sums a month for cable and other services."



FCC Chairman Hundt

AMRC's Levin said "Nothing is free." He added: "It is our view that at this time we should not be constrained as to how the service should be provided. There are hundreds of millions of dollars that it's going to take just to get these systems up,

and it is AMRC's view that we should be permitted to provide services on any basis that we wish." Levin also said that AMRC wants "consumers to use our system, and if a lot of consumers say it's too expensive, we're going to lower the price, because that's what the market demands."

DSBC's Vice President of Business Affairs Douglas J. Minster said that offering DSBC's service by subscription is "a business choice for us. Commissioner Barrett is dead on—we have to find a price point where people are willing to pay for the service. It took some time for people to become accustomed to paying for satellite TV. We have to find the point where people are comfortable paying for additional services such as satellite radio."



FCC Commissioner Chong

Although only four companies originally filed for the satellite DARS, the FCC's Spectrum Engineering Division said another licensing window could open up "some time down the road" and more applications could be accepted. The action would depend on how much spectrum is used by the current batch of proponents and other factors.

**Terrestrial DAB**

In addition to allocating spectrum for satellite DARS, the FCC noted that its proceeding also took notice of terrestrial DARS and the "experimental technologies designed to permit implementation of digital broadcasting within the AM and FM bands." The commission

stated its support for the in-band developments that will help promote the future viability of local broadcasting and noted that "when the experimental results indicate the feasibility of implementing such systems, it will act expeditiously to consider any appropriate changes to its rules."

Ralph Justus, director of engineering for



FCC Commissioner Barrett

the Electronic Industries Association's Consumer Electronics Group, predicted that lab testing of terrestrial DARS, or digital audio broadcasting (DAB) as it is known in broadcasting circles, will be completed by April of this year, which is about four months behind the EIA's original schedule.

Justus added that subjective assessments of impairments to the proponent systems, co-channel noise and multipath performance, and complete AM and FM compatibility assessments, will follow the lab tests and be completed by around June. He said that field testing looks to begin in April or May.

**INTERNATIONAL UPDATE**

# Europe Embraces Its Pay Radio Services

*Author's note: This spring, millions of homes in Western Europe will gain access to multichannel music packages featuring CD-quality stereo sound via the Astra satellite system. At the same time, pay audio providers hope to reach more cable households in the region. A pay radio industry is about to emerge in Europe.*

by **Andrea Dieker**

**BIELEFELD, Germany** It took the Luxembourg-based Société Européenne des Satellites (SES) only six years from the launch of its first Astra spacecraft to become the uncontested leader in Europe's satellite TV market. Now, the private satellite operator is poised to become number one in a new market as well: pay radio in Europe.

Under the name Astra Digital Radio (ADR), SES/Astra plans to launch a new digital audio service in the first quarter of 1995. "We used German public radio programming for the testing and are happy to announce that the system works," said SES spokesman Yves Feltes.

After the successful launch of the Astra 1D satellite in November 1994, the company now has four operational spacecraft in orbit with a total of 64 TV transponders. With up to 12 new digital channels to be accommodated per audio subcarrier, this would allow for the distribution of more than 700 radio and pay audio services. The ADR channels will provide for simultaneous transmission of pay radio programming to virtually any household in Europe equipped with a small satellite dish and an inexpensive receiver.

**Competition poised**

Meanwhile SES/Astra's main competitor, Eutelsat, is getting ready to launch its own digital radio service. In the past, the European consortium of PTTs and semi-private companies from 42 countries clearly lost out to SES/Astra with the majority of consumers and broadcasting companies opting for the purely private system. However, with its new generation of high-powered direct broadcast satellites (Hot Bird 1 was launched in December 1994), Eutelsat will be well-equipped to take up competition with Astra.

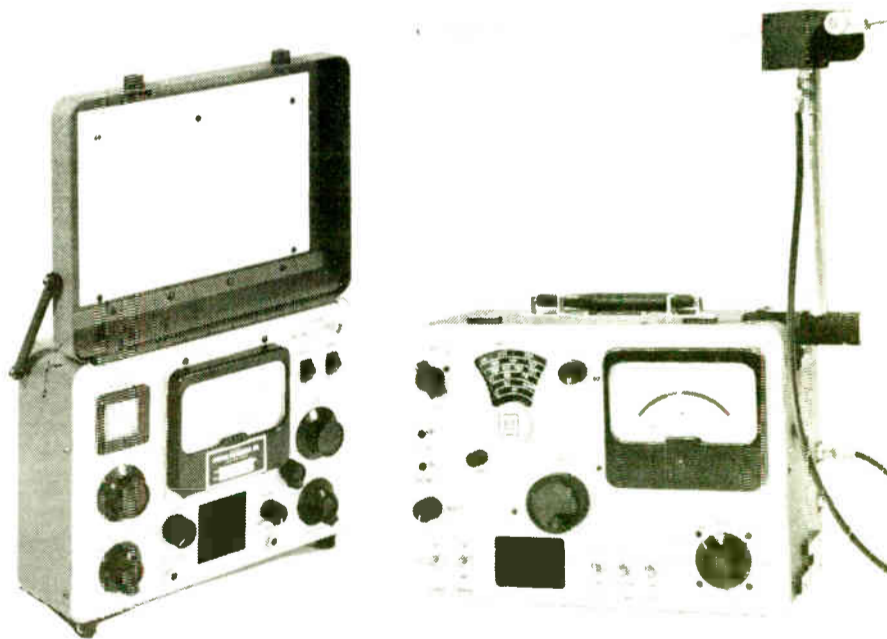
"We will consider introducing a digital audio service within the next few months," says Christian Zippel, spokesman at Eutelsat headquarters in Paris. "We have been testing successfully for quite a while and our Single-Channel-Per-Carrier system will be superior to subcarrier solutions," he said.

According to Zippel, it will make radio broadcasters independent from TV program providers, thus allowing for cost-effective pan-European distribution of audio signals.

One pioneer in satellite-based digital radio, Germany's Deutsche Telekom,

continued on page 19

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## INTERNATIONAL UPDATE

# Poland Is an Early DAB Proponent

by Mary Ann Seidler

**FREISING, Germany** By the time Polish Radio celebrates its 70th anniversary in February 1995, it hopes to have joined the rather elite club of state broadcasters that have started DAB transmissions.

This move would make Poland the only former Eastern bloc country to come on board with such a system. Also, Poland would be much more advanced in this respect than many other western European countries that have not implemented a DAB system yet.

## Leading the way

The plan to start DAB transmissions is one of many undertaken lately by Polish Radio in an effort to implement the latest in broadcast technology. In fact, Poland is the only old Eastern bloc country interested in DAB, according to Franc Kozernik of the European Broadcasting Union.

Although all Eastern European broadcasters are concentrating on integrating new technology, Poland is the only state broadcaster from the former communist bloc countries that has definite plans, according to Kozernik.

Those plans are quite specific. The DAB system used will be Eureka-147, keeping in line with DAB plans by all other European state broadcasters. The first test transmissions will take place in Warsaw.

Marek Borzykowski, Polish Radio chief engineer and DAB project leader, said the plans for transmission include six different audio programs. Four channels will be standard Polish Radio programs. Three channels will operate on a 24-hour basis.

Channel one will transmit Polish Radio's main radio station. This station broadcasts news, pop music and public service programs.

The programs on channel two will include music and literature. The third channel will be geared toward a 20- to 40-year-old audience, with emphasis on

music and "fast news." The programs on the fourth channel will include science and education. The other two channels will be used on an occasional basis.

## Warsaw area

Where you will be able to hear DAB reception in Poland has not been decided. However, the draft includes an innovative plan to have one of the first parts of the system installed in part of the Warsaw subway system, according to Borzykowski.

Other planned locations may include a site very near the Polish parliament, if not inside of the parliament building itself.

Borzykowski said he would like to see some sort of mobile transmission system, such as a bus demonstration unit. The plans for beginning DAB tests in Poland were proposed by Polish Radio, which worked on the project along with the PTT and the technical university.

However, all of the plans for DAB and Polish Radio depend on receiving funding from the government. Borzykowski said he finds the government to be supportive of the advances made by Polish Radio and has expressed a great deal of interest in DAB as well.

If all the approvals are received and funding is in place for the 70th anniversary, Borzykowski said he would like to set up the first transmitter at the Government Palace of Culture building in Warsaw. In fact, all the plans for DAB in Poland are in the Warsaw area. Although there will be expansion, Borzykowski said it is too early to look at expansion of other sites outside of Warsaw.

Probably the largest obstacle to DAB becoming a success in Poland is the price and availability of receivers. According to Borzykowski, the price of the receivers has to be reasonable for the public to want to make the switch.

Poland certainly is not alone in hoping

that the price of receivers is affordable and availability is widespread. That is something that every broadcaster that is investing in DAB is hoping.

The BBC, for example, expressed that concern several times. Certainly, the cost of receivers is something of concern for the success of the English system as it now enters the next stage of DAB. However, there is already work underway by a group of English companies to develop a low cost receiver.

It is hoped that by the time BBC is ready, receivers also will be ready in

mass quantities. DAB in Poland is getting started in the test phase and the BBC just announced specific plans for the next phase, normal broadcasting of programs.

BBC said it will begin network transmission of programming next September in the London area. The plans call for 60 percent of the U.K. population to be able to receive DAB within three years. The coverage would include the larger cities in England, along with the major motorways.

This timetable should mean the BBC will be the first broadcaster to start regular program transmissions. However, both Sweden and Canada are working very hard toward this goal as well, and it remains to be seen still who will claim the title of the first on the air. ☺

## Next Phase for Europe

► continued from page 11

group according to Kozamernik, is to monitor the standardization activities on receivers and evaluate the characteristics of the consumer receivers that are on the market. Along these lines, the group also hopes to coordinate with receiver manufacturers on user interfaces and user friendliness.

The hope of Mr. van Lier of Philips is that this group will be a good place to develop a list of the minimum receiver requirements necessary for the start of DAB. Van Lier stated that Philips already has test receivers on the market.

As far as consumer receivers are concerned, these are expected to hit the market in mid-1996 according to Mr. Luetke of the European Association of Consumer Electronics manufacturers. He

based his estimates on a period of about 20 months for the receivers to come on the market after a decision by a major broadcaster to really start DAB services. Just such an announcement came from the BBC in December of last year.

As with so much equipment on the market from competing manufacturers, the question of standards arises. The situation is already being looked into by the EACEM (European Association of Consumer Electronics Manufacturers), according to Luetke.

EURODAB also wants to help ensure the growth of DAB in other countries. In order to do this, it has agreed to set up conferences, seminars, and symposiums on DAB, with the hope that this will encourage all European countries to move towards such a system. For example, in Spain there are no plans for the introduction of DAB; however, a seminar is being organized in Santander, Spain, in July and will be accompanied by an on-air DAB demonstration.

## ISDN and Its Markets

► continued from page 3

for upcoming newscasts for stations located thousands of miles away from them.

Stations like WXTR in Washington, D.C., which does a morning remote from the infamous Watergate hotel, are using the technology for enhanced remotes.

"All I know is you cannot tell the difference in us being here and us being in the studio," said Bobby Bennett, one of the morning co-hosts.

ISDN codecs run about around \$4,000, and on top of that, RBOCs' user fees vary from phone company to phone company. Bell Atlantic charges \$131 to install ISDN, assesses a monthly \$20 charge to the standard business-line monthly costs and then charges 10 cents for each minute of use.

Bell Atlantic customers can, however, purchase an ISDN package that will reduce the user fee to as low as four cent per minute.

In Indiana, Ameritech offers an ISDN monthly flat rate of \$84.21 after users pay an installation cost of \$139.

Each phone company determines its own ISDN usage fee in accordance with state public utilities commissions. ☺

## Terrestrial and satellite

A potential hot topic for the group could be the relationship between terrestrial and satellite radio. Satellite-delivered services, such as ADR (Astra Digital Radio) and the Eutelsat SaRa system, are becoming increasingly popular. The question arises as to whether these are competition to DAB, or complementary services. While the two types of service may compete for home and stationary use, in the mobile market DAB is still alone in being able to deliver audio. The ADR system is not suitable for mobile or portable reception.

One last area that was reported in the first unofficial meeting, and is certain to remain a topic for a long time, is the status of alternative systems.

Kozamernik told the group that the European DAB system has become the recommended transmission digital sound system worldwide, for both satellite and terrestrial broadcasting, according to the results of an ITU-R meeting held late last year.

The ITU-R decided that because the in-band systems under development in the U.S. are not yet fully specified, tested or proven, it would be premature to recommend them at this stage. However, the door was left open for the possibility of standardizing further system developments when, and if, they reach technical maturity. □ □ □

Mary Ann Seidler writes regularly for Radio World International on digital audio broadcasting from Germany. ☺

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## GUEST COMMENTARY

# .WAV Format: A Useful Digital Link

by Len Lewis

**ALDERMARSTON, England** One big problem facing digital audio systems in the coming years is resolving the complete lack of file standards.

Nowadays, a reporter might record an interview on MiniDisc using ATRAC digital bit-rate reduction (BRR), edit it on a computer and then transfer it via ISDN using ISO/MPEG Layer II BRR to the home office. There, it might be stored to an apt-X BRR hard-disk system and then converted back to analog prior to transmission.

**Extra complexity**

Adding extra complexity are Digital Audio Broadcasting (DAB), which is digital transmission using ISO/MPEG Layer II, and equalized stereo landlines, like the British Telecom EPS84, which may actually be some sort of exotic digital link.

After factoring in several tape machines for capturing and transferring, probably via ISDN, the audio conceivably could undergo up to 11 or 12 discrete analog-to-digital/digital-to-analog transformations in the course of the above example. It also might encounter four or five different BRR algorithms along the way.

Aside from theoretical—and with some coding schemes very real—concerns about cascading algorithms and multiple coding passes, broadcasters must consider the equipment investment needed to transport audio from a source to listeners. There also is the certain knowledge that periodically, incompatibility problems will arise.

It would be nice if a single analog-to-digital conversion could be made at the source. The digital file could then pass easily through the chain, straight to the transmitter.

But at the moment, the best we can hope for is that computers become fast enough for all these code standards and compression algorithms to end up as mere filters in parallel-processing, 32-bit RISC computers. While such machines are currently just a figment of my imagination, surely time will provide such hardware.

**Common file standard**

The bottom line is that a common file standard that systems like the Audio Systems Components (ASC) DAVE-2000 newsroom editing system can easily convert to exists—the .WAV file format. .WAV files are most commonly used in SoundBlaster-type multimedia applications throughout the computer industry.

Two days before SBES '94, we successfully tested our DAVE-to-WAVE (.WAV) conversion utility. This utility now will be bundled with all new DAVE2000 systems, and it will be sent to current users as an update.

Why is DAVE-to-WAVE an important utility? Because Computer Concepts, Studio Audio and ABC-Digital have all expressed an earnest desire in conforming/offering conversion to this standard.

ASC has already begun discussions with ABC-Digital, expanding on the natural relationship between the DAVE2000 and the ABC-Digital D-Cart. The structure and cost of DAVE make it suitable for standalone or small network use at

external news bureaus, suboffices, etc. D-Cart, on the other hand, is a centralized, multi-user, simultaneous-access system designed for large, integrated operations.

**Modern wonders**

With the wonders of e-mail, ISDN and the Internet, foreign correspondents working on localized DAVE systems need the ability to dump files directly into a D-Cart central file source for hungry editors at the head office.

With the Computer Concepts DCS system, DAVE-to-WAVE lets the DAVE-2000, which is highly developed for

newsroom applications, deposit files

**Standardizing to a .WAV format starts to eliminate needless analog-to-digital conversions.**

directly onto a DCS files server for scheduling and playback.

Either of the above applications could be said to offer the best of both worlds—however, I only want you to consider the DAVE2000 part of the

equation—but, I am biased.

By far the biggest bonus is that standardizing to a .WAV format starts to eliminate needless analog-to-digital conversions. And your children can playback files on the multimedia PC you bought

with absolute impunity as a legitimate business expense.

□□□

*Len Lewis is president of Audio Systems Components Ltd. (ASC) and is based in Aldermaston, England.*

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## FACILITIES SHOWCASE

# West Virginia Studios on the Leading Edge

by Dee McVicker

**CHARLESTON, W.Va** Talk about air traffic control. The folks at West Virginia Radio Corporation's new four-station studios in Charleston, W.Va., have more than their share of signals up in the air, and it takes some pretty smooth moves—and studio engineering—to keep things that way.

Consider the studio's complex switching network which West Virginia Radio's Director of Engineering James Murphy installed not long after his group purchased two AMs and two FMs

(WCHS(AM), WKWS-FM, WCAW (AM) and WVAF-FM) in the Charleston area within a year and a half of each other. He gutted the building on Virginia Street that had housed WCHS and at one time a local TV station, and started from scratch to build a duopoly infrastructure that would put to air just about any studio, console or airplane in the building.

## Routers first

He started with an Arrakis 16-input, eight-output router. Connecting the inputs to both the main program and

alternate program output of every console, and connecting the router's outputs to DCS intelligent switchers for each station, he was able to route any of the four programming services to any air channel and/or audition channel from any console. The DCS intelligent switchers, part of the DCS hard disk system in use in all four stations, are fed directly off the consoles to send out programming to the transmitter as well as bring in sources from other studios.

"We can put any console on the air, and we can run split boards on two radio

stations," Murphy explained. "WCHS can run the Reds on WCAW while it's running Rush (Limbaugh) on WCHS. Or, let's say the Oakridge Boys come in and want to do an interview with KIX 96 (WKWS-FM), the country station that is 50 yards away. They can put them in the new talk studio, and they can route that room's microphones grouped via program two of the board into the WKWS console. There's a lot of flexibility here."

The setup will also come in handy come EBS alert time—especially because WCAW is the primary control station for EBS alert in the area. With WCHS' studio designated the control point, announcers will be able to simply "push one button on WCHS and put EBS tones on all four stations, as well as (put) the WCHS console on all four stations to do an EBS emergency announcement," Murphy said.

**We can put any console on the air, and we can run split boards on two radio stations.**

—Jim Murphy, West Virginia Radio Corp.

Trafficking the incoming satellite sources for all four stations also required some studio engineering on Murphy's part. Each station requires source feeds from various satellite sources at various times of the day. WCHS, for example, has been a CBS affiliate since 1963, plus takes in a dozen other feeds during the course of a day. All primary services such as CBS and ABC are brought through the studio's new console, the Pacific Recorders & Engineering (PR&E) 20-channel Radiomixer, on dedicated SEDAT cards.

## Multiple sources

Because WCHS has the most source feeds and does most of the taping and interviewing as a talk station, its studio is considered by the two other studios as an incoming source. The two FM studios are able to bring up the AM studio feed directly into their Radiomixer boards as a channel position much like a microphone or CD player. Secondary feeds to the studios are brought through the consoles using multiple input switching by PR&E LS10 and LS20 line selectors, which are directly connected to tape machines in order for studio operators to record onto tape without tying up consoles.

Similar line switcher modules that came with the consoles were then configured as output switchers in order to drive tape recorders or cassette decks and to bring in the LS10 or LS20 inputs.

Murphy explained: "Whatever is selected as input on the LS20 is routed directly to the tape recorder, bypassing the console. Also, the off-line mix of the telco is on the LS10 or LS20, so all you have to do to record your telephone conversation is punch down the off-line mix on the

continued on page 44 ►

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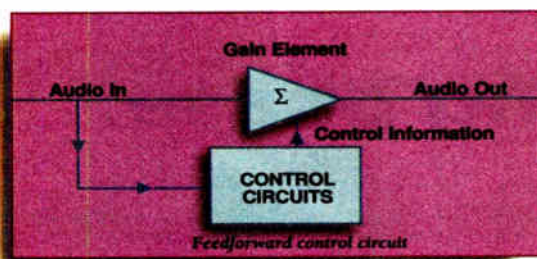




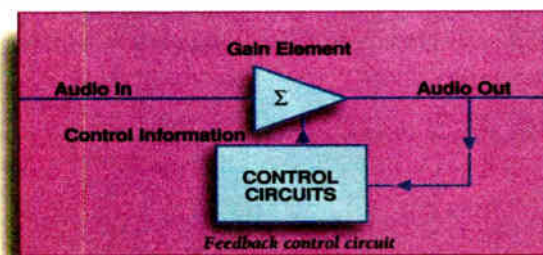
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World Radio History

# Europe to Pay for Radio

► continued from page 13

which has been broadcasting a package of 16 digital radio channels via its Kopernikus satellite since 1989, has decided not to offer satellite-based pay audio services. Through its control of the German cable network, however, Deutsche Telekom, privately organized on Jan. 1, 1995, will be involved in the transmission of pay audio services via cable.

Up to now, pay radio programming has been an option only for a few million subscribers of select TV cable networks in Europe. Most of these services have been operated in secondary markets such as Belgium, Denmark, Norway, the Netherlands and the Czech Republic. The only major market has been Britain where some metropolitan areas such as Birmingham are being served.

## Satellite over cable

The lack of a pan-European or even nationwide means of distributing pay radio through cable in Europe's major markets will give new satellite-based services a clear competitive edge. In order to receive audio programming transmitted via the Astra system, users will need a home receiver that can be connected to domestic hi-fi equipment.

The ADR tuner, used in conjunction with a smart card, is expected to be affordable to a wide audience. TechniSat, one of the leading manufacturers of direct-to-home equipment, has already announced that it will offer a digital tuner by March 1995 at a price of \$350 to \$500. Alternatively, some pay audio providers plan to supply subscribers to their services with a receiver free of a down payment. This solution would raise the industry's initial investment considerably. At the same time, users would need to overcome less of a financial hurdle as they would only pay a one-time installation charge in addition to the

monthly fee of \$10 to \$15.

By May 1995, San Francisco-based International Cablecasting Technologies (ICT) plans to offer a 90 channel digital audio service to Astra homes through its subsidiary ICT Europe. Official testing of its flagship product Digital Music Express (DMX) has already begun on Astra as well as on a small cable network near Munich, Germany. As early as the end of 1994, ICT Europe had booked

subcarriers from the pay TV operator British Sky Broadcasting (BSkyB) and other Astra users such as United Artists and MTV as well as directly from SES/Astra.

"Satellite-based distribution is very important to us because it gives us the means of reaching 16.5 million households with Astra dishes throughout Europe," said Richard Hurd-Wood, director of sales and marketing at ICT Europe. According to Hurd-Wood, penetration might turn out to be low. However, due to the large satellite footprint, the company still expects 15,000 subscribers to sign up each month by September of 1995.

ICT Europe plans to invest heavily in a widespread marketing and promotional campaign for the product in early spring 1995, focusing on TV advertising.

## Heavy investment

In addition to direct-to-home distribution, ICT Europe will continue to use cable. According to Hurd-Wood, negotiations are currently underway with private cable operators all over Europe. The company is also engaged in talks with

Deutsche Telekom over access to Europe's largest cable network, which is capable of reaching nearly 15 million homes in Germany.

The heavy crowding of most European cable TV networks will not cause problems, said Hurd-Wood, citing technological solutions. DMX would be accommodated at the ends of the TV bandwidth, thus allowing for efficient use of the available capacity, he explains. ICT Europe sees commercial outlets such as hotels and retail chains as a major source of revenue. At the same time, they are also aiming at a general audience. "The

largest markets will be the U.K. and Germany," concludes Hurd-Wood.

## Another choice?

Another established pay radio provider, London-based Music Choice Europe (MC Europe), is equally "pondering the option of using Astra subcarriers," said Nick Hopewell-Smith, director of marketing. "But, in any case, we would not start the service before the end of 1995." MC Europe, which is controlled by leading companies in the music industry, such as EMI Music, Sony and Time Warner, started business in Europe in October 1993. The 50-plus channel service is currently delivered to 16 cable systems in eight European countries.

At the end of March 1995, MC Europe plans to expand its services to 64 channels that will be uplinked from its new facility in Winchester, England. MC Europe is keen on demonstrating its European commitment by adding Euro-specific material to its program line-up currently available in the US. "This makes us different from ICT which simply uplinks its program material to

Europe," said Hopewell-Smith.

In contrast to its major rival in the European market, MC Europe still focuses on cable. "DTH might gain in the beginning. But, in the long run, cable will be the winner," said Hopewell-Smith. For the future, he expects terrestrial Digital Audio Broadcasting (DAB) to outdistance cable and satellite technologies in the distribution of pay radio. By the late 1990s, Western Europe will have digital radio systems using its own frequencies rather than the American In-Band On-Channel FM DAB System, thus providing enough capacity to distribute pay audio services terrestrially.

## The cars

"The biggest step for pay radio will be mobile applications for car radio as provided by DAB," said Hopewell-Smith. Fritz Groothuis, Head of Strategic Development at BBC World Service, shares this view: "It is only after full implementation of terrestrial DAB in Europe that pay radio will become attractive to most Europeans in terms of a mass market, that is in combination with data services such as traffic information."

Indeed, it remains to be seen whether European consumers will be willing to pay monthly fees for new audio services. In many European countries, citizens are already charged monthly fees for receiving conventional radio in their homes or cars. In business, however, a clear demand for pay audio services can be detected. "I definitely would pay \$15 a month for a high-quality service in order to do without CDs, regardless of whether it was delivered via satellite or cable," said Ursula Streitbörger, managing director of the Spree Hotel in Bautzen in the very eastern part of Germany who would use pay audio for background music in the hotel's restaurant and lobby.

□□□

Andrea Dieker is staff writer at *TEXTTRANSFER*, a German news service specialized in European media and telecommunications based in Bielefeld. ☺

**Up to now, pay radio programming has been an option for only a few million subscribers.**

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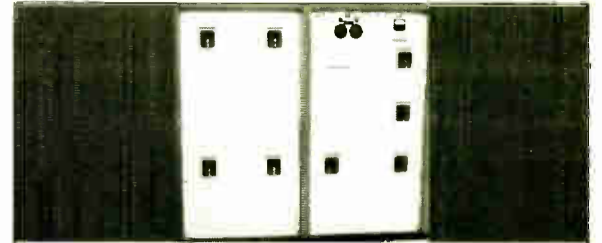
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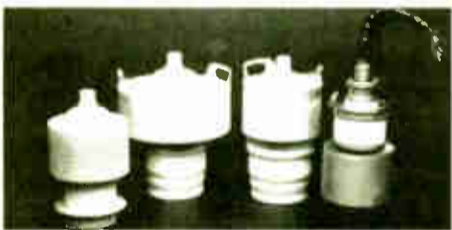
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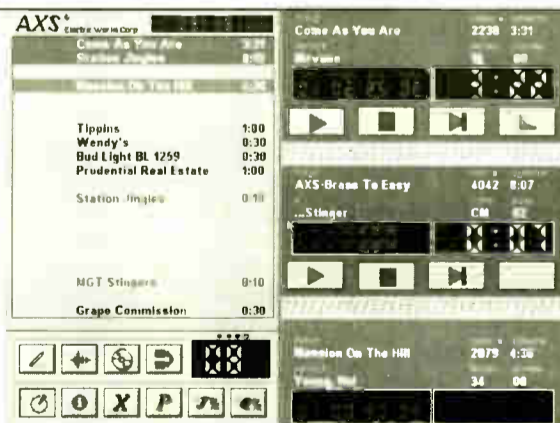
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# WORKBENCH

## Small-Budget Items Make the Grade

by John Bisset

**SPRINGFIELD, Va.** When I first heard of the Dr. Ferd's Wall Wart Remover, I was suspicious. After having used one of Dr. Ferd's Wall Wart Removers, however, I wonder how I lived without them. These things really work.

Let's say you have a multiple outlet strip. Into this strip you need to insert one of those external power supply transformers. You know, the plastic squares that were unfortunately designed to be so large as to take up two of the AC outlet sockets, even though they plug into only one.

Well, until Dr. Ferd arrived, your only solution was to spend another 10 or 20 bucks on a second outlet strip. Dr. Ferd renamed these power supply transformers Wall Warts—they do look like warts on an outlet strip. Dr. Ferd's Wall Wart Remover consists of a short pigtail plug fastened to a plastic block.

The wall transformer power supply is plugged into the plastic block, and the zip cord umbilical is plugged into the outlet strip. The cure is that only one outlet socket is used. I can hear the comments now, "Why didn't I think of that!" Dr. Ferd's Wall Wart Removers are awaiting a patent. If you'd like more information, contact BSW at 206-565-2301; or circle Reader Service 170.

★ ★ ★

If your station handles a lot of remotes, and your department is on a tight budget, you'll want to consider John Rohwer's GO-NO GO cable tester. In addition to saving you precious time (it's so simple that anyone can use it, meaning you don't have to check remote cables), it can detect a broken wire, a short condition between conductors, and even a phase reversal.

John handles technical needs for WSDR/WSSQ/WZZT in Sterling, Ill., and his basic circuit depends on feeding the proper voltages to the emitter, base, and collector of a transistor. When a properly wired cable is plugged into the tester, the LED will light, indicating a GO condition. A cable short between pins 1 and 2 shorts out the battery. A short between pins 1 and 3 grounds the base of the transistor, shutting it off. A short between pins 2 and 3 biases the zener diode into full conduction, which shorts the battery.

In each case, the LED won't light, and you have your NO GO condition. If there is a phase reversal between pins 2 and 3, the transistor is connected improperly, and again the LED won't light. If the cable has a break in it, either the positive, negative, or bias voltage from the transistor will be removed, and the LED will not be lit.

The only complaint is the lack of a metal chassis to which the XLR jacks are mounted. Because the XLR connectors will be plugged and unplugged, these forces may wear out the walls of a plastic enclosure. Q-1 is a general-purpose NPN transistor. A 2N2222, ECG123, or 2N3904 will work. Radio Shack sells a bargain bag of the 2N3904s, plus it also stocks the zener. Radio Shack, however,

does not stock the male chassis-mount XLR connector.

John reminds readers to wire the circuit so that pin 2 is hot! Amen! As he has tested cables over the years, a number of phase reversals were found. These were usually cables wired up by other techs, and a box like this will help maintain your wiring standard. Without a cable inserted, the circuit draws no current, so the battery should last about as long as its listed shelf life.

If you are using the circuit in a high-RF field, you may want to install two 0.1MFD/35 volt capacitors. One goes between pin 1 and 2, and the other between pin 1 and 3.

If you buy that bag of 15 Radio Shack transistors, consider making up a second box with three-pin AC power sockets mounted on it. An open AC cable can pose a problem, but a shorted AC cable can be embarrassing. When testing the cables, remember to flex the entire length of the cable while watching the LED for a flicker. Cables that have been pinched in doorways may be intermittent only when stressed, so don't concentrate only on flexing the cable near the connectors.

★ ★ ★

Lewis Downey handles the technical problems for KRCL-FM, a listener-supported non-commercial station in Salt Lake City, Utah. KRCL uses Autogram consoles in both the on-air and production studios. Because the station is listener-funded, it also primarily uses the

cheaper lower-impedance headphones (typically 30 to 50 ohms).

When using these headphones, a 120-Hz AC ripple hum is audible. Measurable ripple from the power supply did not seem excessive, but replacing the power supply filter electrolytics seemed reasonable, because the consoles had seen several years of service. New filter caps didn't improve the hum/ripple in the headphones, however.

Because of the lower impedance, the gain setting for these cheaper headphones

in series on the output side of the output blocking capacitor. By choosing 600 ohms, the headphone resistance became the bottom half of a voltage divider. A couple of 1200-ohm half-watt resistors were paralleled together, and the problem was greatly reduced. Lewis Downey can be reached at KRCL at 801-363-5725.

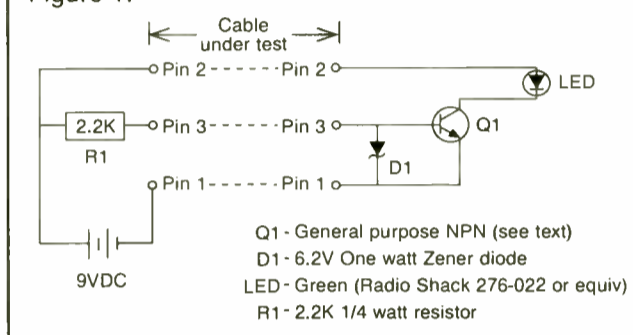
Ripple or strange AC components aren't always found on budget- or mid-range priced equipment. Lewis' story reminds me of a similar problem on a high end model of a console we used a few years back that is still produced today. It seems there was a high-frequency oscillation that occurred on certain ones of this console's regulators because they were not bypassed at the regulator. I guess to make the external power supply board look pretty, the design engineers mounted the bypass caps an inch or so beyond the regulator pins.

There were the bypass caps, all lined up, pretty in a row. And if you looked at the power supply rails at say 50 MHz, why, you were "transmittin'." My assistant at the time showed me the page in the regulator data book that stipulates that bypassing should occur at the pins of the regulator. Tack-soldering bypass caps directly to the regulator socket pins corrected the problem. I had to laugh when, months later, a tech with the company was queried about the problem. He admitted to never looking at the power supply output with a scope during final test; they simply measured the output with their trusty Simpson 260. If you're looking for clean audio, check that power supply, and use a scope; you may be in for a surprise.

□ □ □

John Bisset is a principal with Multiphase, a contract engineering and special projects company. He can be reached at 703-323-7180. Faxed submissions can be sent to 703-764-0751, and when printed by RW, qualify for SBE certification credit.

Figure 1.



was much less than that required by the 600 ohm variety, so it seemed that the lower-impedance headphones required less power to drive them to a useful sound pressure level. There is a small, but significant 120-Hz hum component in the amplifier output that does not change with gain setting. Lewis knew he could add further filtering, or perhaps regulation to the headphone circuit, or require the amplifier gain be turned up higher than before to get the same SPL, and to get the program audio higher above the hum level.

Lewis chose the cheaper, easier, and more expedient solution by inserting a resistance

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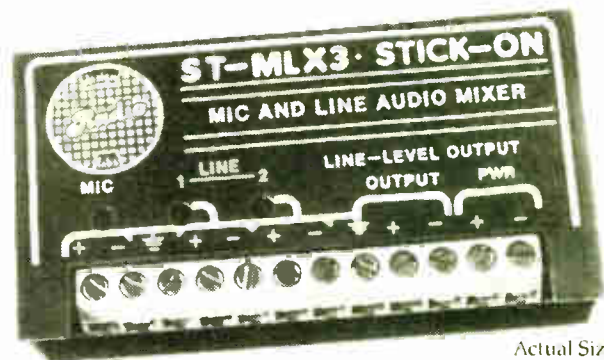


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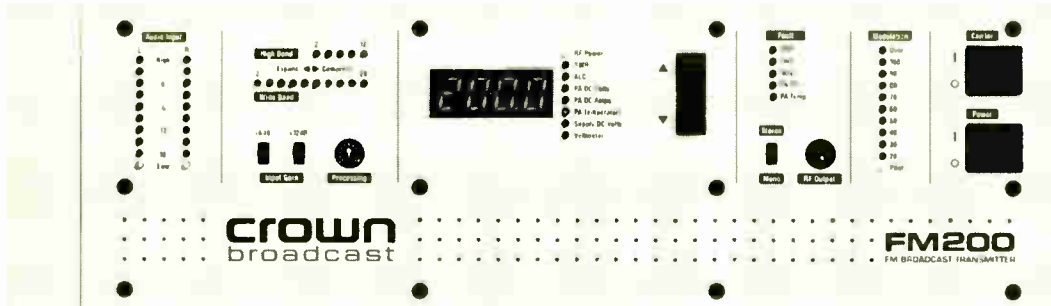
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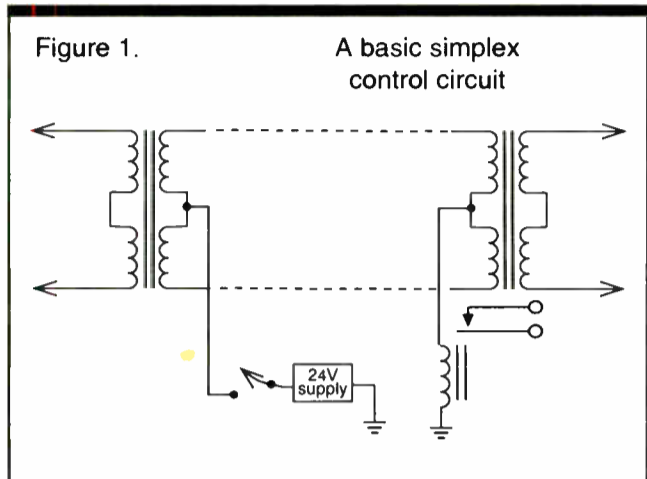
# Control, Monitoring of Leased Lines

by Tom Vernon

**HARRISBURG, Pa.** The last two installments of Station Sketches examined leased telephone lines: how to equalize and test short runs, and why you need loading coils (and the cooperation of the

this may require the use of sensitive relays. These are readily available from numerous surplus catalogs.

A slightly more elaborate scheme involves a latching circuit. With this arrangement, it isn't necessary to maintain control voltage continuously.



phone company) for longer distances.

This month I'll wrap up the topic with a description of some schemes for control and monitoring over a leased pair. This type of activity generally comes under the heading of simplex and phantom circuits.

Simplex control has many applications. Virtually anything that can be controlled with a relay and monitored via an AC or DC sampling voltage is fair game. Cart machines may be started from remote broadcast sites. Program audio may be fed from the studio back to a remote site where nighttime reception is poor. College AM stations have long used simplex to control and monitor carrier current transmitters. Access to boiler rooms in dormitories can be difficult, and this is

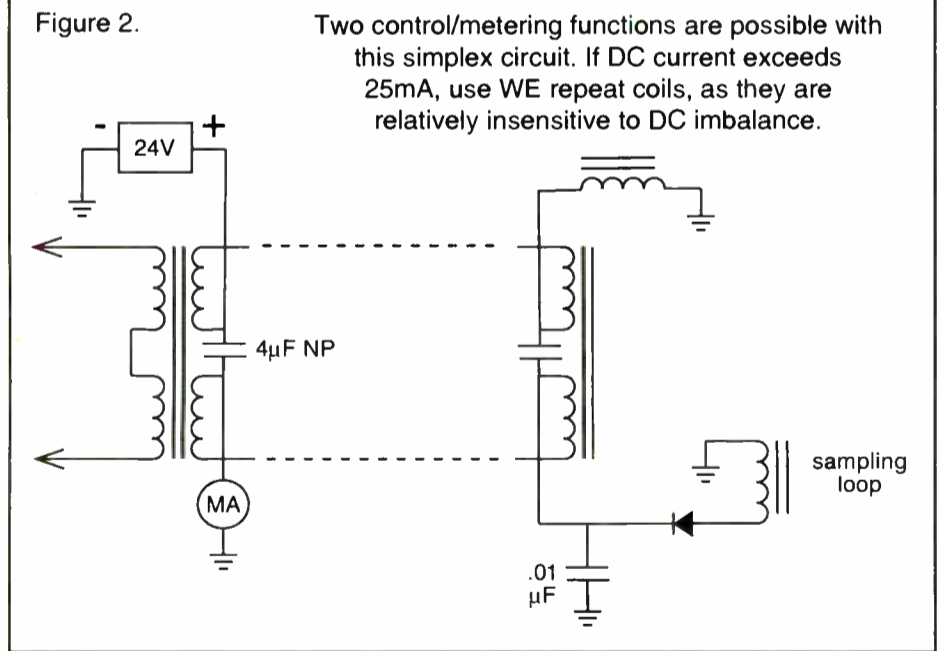
More elaborate schemes allow simultaneous control and metering, as illustrated in Figure 2. Note the need for non-polarized capacitors. These provide continuity for audio while isolating DC between the two lines. In this arrangement, both wires are used individually against ground. While one wire carries a rectified sample of transmitter RF output gathered from a sampling loop.

Following the basic principles outlined here, more elaborate schemes are possible. Four circuits can be controlled over one pair with polarity-sensitive relays. By using relays with different coil resistances, two or three relays can be controlled by increasing the control voltage.

Audio also may be sent over the simplex path, but it is limited to voice-grade, as the ground return path can be rather noisy. Nevertheless, it is a useful method for continuous talkback to a remote site using sound-powered phones.

**Repeat coils**

If the relay control current exceeds about 25 mA, telco repeat coils such as



an easy way to monitor multiple off-air signals and shut down transmitters at the end of the semester.

**Simplex diagram**

The simplest form of simplex is a basic DC control circuit, as shown in Figure 1. Typically, a 24-volt supply is connected between ground and the center tap of the repeat coil on the drop side. At the other end, a relay is connected in a similar manner. There are some restrictions you need to be mindful of when simplexing over leased lines. The DC control voltage should be less than 50 volts, and current should be limited to 350 mA. Note that

the 111C or 94H should be used, as these are immune to DC unbalance in their windings. Homebrew circuits often use UTC A20 transformers, and these are more easily disturbed.

Note that the illustrations show 600-ohm circuits. While simplex control works with 125-ohm lines, it's very difficult to find repeat coils with the necessary split 75-ohm windings to provide a center tap. Thus, coil equalization and simplex are mutually exclusive in the real world.

If you're using unequalized lines or your own pairs for simplex, getting the necessary DC continuity is not a problem. Telco-equalized lines on the other hand,

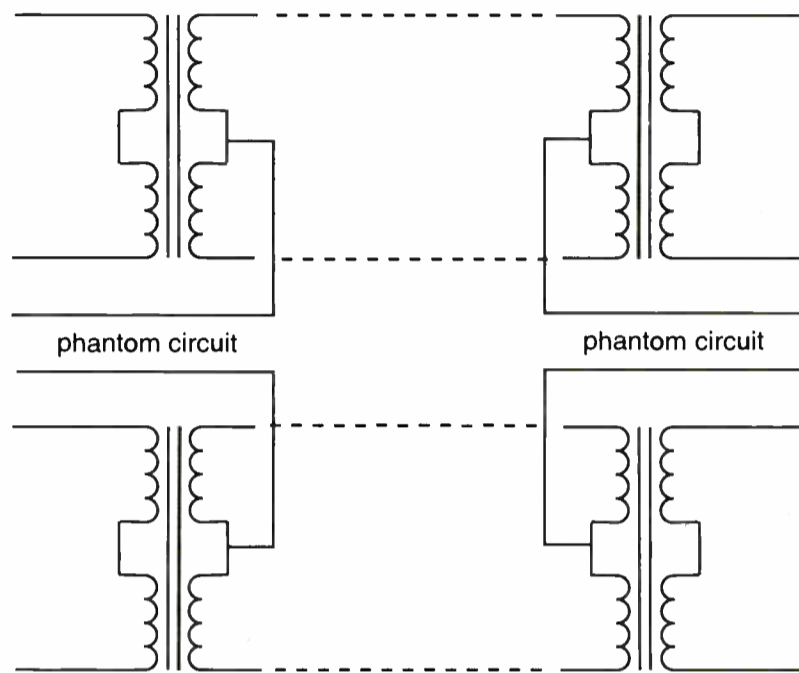
have equalizers and line amps that will break the DC path. If this is the case, you'll have to inform telco personnel of your needs. They can usually provide a

have to experiment.

If you have two pairs available, a phantom circuit can be derived for a third pair, as shown in Figure 3. This circuit can then be simplexed, giving two quality audio lines, one mediocre audio pair, and DC control or a bad audio pair.

The phantom technique has the poten-

Figure 3. Two pairs can be made to do extra duty with a phantom arrangement.



DC path around their equipment, although an additional charge may be involved.

Simplex occasionally may cause unique problems. Even with limited DC current, corrosion of terminals and ground rods can sometimes occur. This may result in a noisy line. Removing the DC can often solve the problem, as can reversing the polarity of the control voltage. You just

tial for crosstalk into other pairs. It's best to check with the phone company before attempting it over leased lines.

When he's not writing for RW, Tom Vernon reviews multimedia programs and CD-ROMs for computer magazines. He is occasionally sighted around WXPN in Philadelphia. He can be reached at 717-367-5595.

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# Of Audio Mice and Maintenance

by John Spofford

**ANNANDALE, Va.** Back in ancient times (B.C.—before computers) many of you probably spent too much time with razors and tape splices trying to create a perfect piece of audio. I was an art school undergraduate confronted with a wide variety of media such as charcoal, pencils, pastels, acrylics, watercolor, and oils. It was probably my natural curiosity that led me to create most of my pictures on personal computers.

What personal computers have done for digital pictures they have also done for audio. So today, the advent of digital

audio workstations has led to amazing feats of editing and mixing—all done at your desk or in your studio—nary a piece of tape in site. But digitally edited and mixed audio, much like computer-generated artwork is still viewed with suspicion by many traditional engineers and artists.

To me though, and I suspect to many of you, the computer is just another tool. While oil paints are suitable for canvas, computers are suited to creating graphics for the video screen and helping rearrange audio.

It has only been about five years since the first useful paint programs appeared on the personal computer. Today, the rate

of development is astonishing. In order to remain competitive, a paint program might undergo two or three revisions a year. Likewise, the number of DAWs and audio cards introduced to the market in just the last 12 months grows at an amazing pace.

Unnoticed in this evolutionary rush of software has been the development of the human/computer interface.

Perhaps you haven't given this matter too much thought. I can still remember trying to create a picture on the original IBM PC. The software of the day required me to draw lines and curves by typing in numbers.

The most common interface today is the computer mouse. The mouse was first introduced as standard equipment on the Apple Macintosh in 1984 and it soon was available on other machines. Today, tens of millions of PC clones use Microsoft Windows and a mouse as standard equipment. Chances are if you intend to create graphics or edit audio on a personal computer you will be confronted by the mouse.

Actually, with practice, a mouse is a good tool. The standard mouse is more than adequate for cutting, pasting, and re-arranging video or audio. Over the years I've learned to paint and even draw (sort of) with the mouse.

Because the computer mouse is such a valuable tool, it is important to keep it healthy and happy. A computer mouse is a precision instrument that can be disabled by something as simple as a drop to the floor. I first learned this years ago when I dropped my Amiga mouse and found my cursor no longer moved in the vertical direction. (I learned the precision instrument part when my dealer told me the replacement mouse would cost \$100.)

Today, due to the great number of IBM compatibles in the field, tens of millions of mice are manufactured each year, and

a replacement mouse cost as little as \$20 or \$30.

However, though mouse replacement cost is lower these days, it still is a good idea to be familiar with routine rodent maintenance.

The most common malady that affects computer mice are gummed up wheels. You will recognize this condition when your smooth mouse movements get translated into jerky on-screen cursor movements. In extreme cases, the cursor doesn't move, no matter how much you shove the mouse around. Fortunately this condition is easy to repair.

The first step is to shut the computer off and remove the rubber coated steel ball from inside the mouse. Though you should check your mouse manual first, removal usually entails a quick twist of a bottom cover that drops the ball into your hand. Inside you'll find three rollers (usually made of white nylon) normally in contact with the ball. Two of these rollers measure how far the mouse moves in the *x* or *y* direction. These rollers are often coated with lint and a dark sticky substance that only seems to appear inside computer mice.

Using a cotton swab and a bit of isopropyl alcohol, gently clean off these rollers. The mouse then should work like new. Be very careful—the active rollers are connected to very delicate measuring devices. Too much pressure might bend something, and then you'll be holding a dead rodent.

Use of a mouse pad can lengthen the time between cleanings. Mouse pads are inexpensive (under \$10) and can be found at most computer or software resellers. These pads vary in design: the best I've found are the textured plastic pads that are often given out for free at computer shows. I often use an inexpensive pad of drawing paper as a mouse pad. This gives me a place to jot down numbers or file names as I work, and I get a new mouse pad by simply tearing off the top sheet.

There have been several attempts to build a better mouse. One such device is the optical mouse. An optical mouse replaces the ball with a pinpoint light source that shines onto a special reflective mouse pad. This pad has a precise grid ruled onto its surface. As the optical mouse moves, it recalculates its *x/y* position by counting these ruled lines as they pass underneath the light. This mouse has the advantage of no moving parts to gum up. Its drawback is that the mouse is useless without its matching mouse pad. If the mouse pad is lost, "borrowed," or scratched with years of use, the optical mouse can become an expensive paperweight.

Another mouse variant seeks improvement by cutting off its tail. The cordless mouse sends its location data via an infrared transmitter to a receiver that plugs into the mouse port. I have used an infrared mouse on one of my Amigas for several years. It has proved useful in situations where I need to run a computer from a short distance. The disadvantage of the wireless mouse is its dependence on two AAA batteries as a power source.

While the computer mouse is a versatile tool, it is not perfect. It is nearly impossible, for example, to trace a drawing with a mouse.

□ □ □

John Spofford is the editor of *Computer Video*, a sister publication to *RW*. Reach him in care of *RW*.

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Chief Engineer Con Sofologis only has good things to say about the performance of his RS-Series Consoles and the service he's received from Radio Systems. And while we probably wouldn't have published his picture if he had bad things to say, the fact is most every RS-Series user is very happy with his console.

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To create a *professional* digital broadcast solution you can't simply buy a digital audio board and IBM PC computer. Therefore, Arrakis builds our own DSP board; SCSI board; I-O board; audio routing switchers; video switchers; and modular, broadcast quality cabinets. This makes Digilink remarkably powerful with radio specific features such as digital crossfade and Trak\*Star multitrack editing. This also reduces cost so that we are able to sell Digilink for as little as 1/2 the price of other products which have to buy less powerful cards and mark them up. Perhaps most importantly, building Digilink ourselves assures you of long term customer support from a single *broadcast* source. With Digilink, you don't have to be a computer expert, because we are.

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**See page 31.**

## Make the ISDN Connection Overseas

by **Johnnie Dymock**

**LONDON** ISDN dramatically reduced the cost of radio remote broadcasts. Even for a one-time event, it can be cheaper for a station to have an ISDN line specially installed than to use landline or satellite.

However, planning a remote from a different country and time zone can be a major headache. Sending a staff engineer and equipment is costly, and there is normally little chance of a site visit until the day before transmission. On top of this, few stations can afford to release their engineers from domestic duties.

Two years ago Wired For Sound began offering a turnkey engineering and production service to U.S. radio stations that were interested in running remotes from the U.K. Through greatly reduced cost, ISDN offered many a first-time opportunity.

Today our market extends through the U.S., Canada, Australia and Europe, where we use ISDN regularly for live

broadcasts ranging from simple one-mic reports to complex stereo programs and multistation events.

ISDN is as simple to order as a standard telephone. Prices and lead times vary from country to country. But in the U.K., British Telecom currently charges £400 for installation, £84 per quarter for line rental and requires 10 days notice for new installations. With a temporary service you pay the full installation fee and a proportion of the rental.

On long distance remotes, stereo audio sent by ISDN can be 10 times cheaper than by satellite. Even for local links, ISDN can simply be more convenient, because the advantages of the dial-up system go further than cost.

There is no need to pre-book time, so once the circuit is installed you can use it whenever you want. Also, there is less possibility of your link being disconnected at an exchange just when you need it the most.

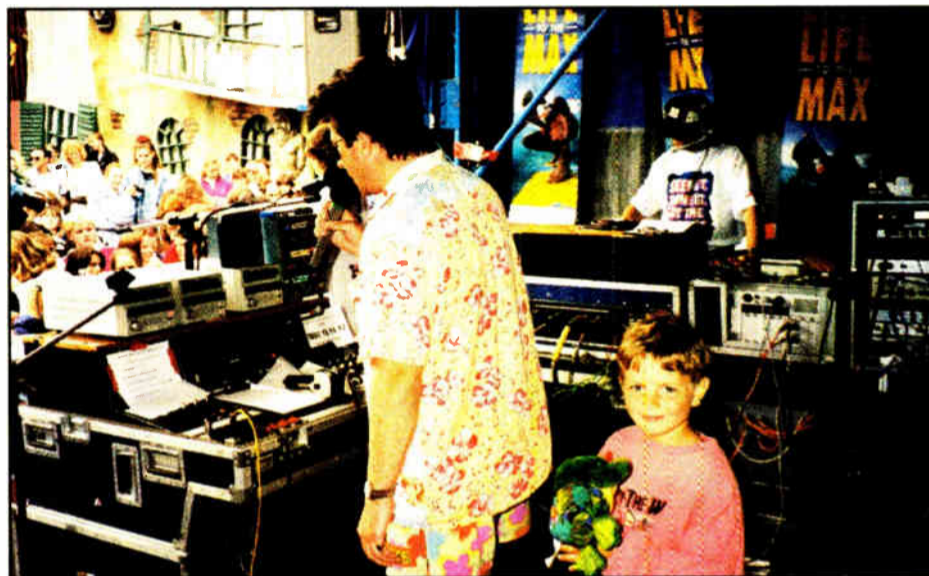
Because ISDN is a terrestrial network,

the "line" delay is virtually zero, but a delay is introduced by data reduction in the audio codec. The amount depends on the type of compression algorithm used, and generally it is greater with wider bandwidth and stereo systems.

For remote broadcasts, G.722, ISOMPEG Layer II and apt-X100 systems are in common use. The drawback is that they are incompatible with one another, so we need regular access to all three systems.

For the U.K. Network Chart Show from Blackpool Pleasure Beach, we used an ISO/MPEG Layer II system to give "CD quality" stereo over the 250-mile link to London and the network. However, the slight delay did mean competition callers to the London studio were best re-dialed and put to air from the remote site.

ISDN is fast becoming a worldwide network, but even at locations not yet served, a satellite or landline link is not necessarily the solution. In Ibiza, for instance, ISDN and music lines are unavailable, and the compulsory use of the Spanish state broadcaster for satellite



The U.K. Network Chart Show broadcast live from Blackpool Pleasure Beach using stereo ISO/MPEG II.

If the broadcast is to be speech only, the G.722 codecs offer mono 7.5 kHz, send and return, and the delay is negligible. In many speech applications it is particularly important to minimize the delay, for instance when music is played in from the studio, or when there are a lot of "hand-overs." In situations where stereo transmission is necessary the significance of a slight delay can become secondary.

When WGST Atlanta broadcast its morning drive from a street cafe in London, we used G.722 as it was ideal for its fast-rolling news/talk format. The rapid hand-overs between London and Atlanta were exceptionally smooth, despite more than 3,000 miles between newsroom, weather desk, flying eye and host.

uplinks is prohibitively expensive.

During September, Wired For Sound ran broadcasts for Unique Facilities from the two-week-long Club Pepsi Max in Ibiza. These went to European stations via London, using two phone lines and a trusty Comrex frequency extender. The quality from the frequency extender was remarkably good, though we used a mixture of ISDN and satellite for the onward links between London and the stations.

The best thing about remotes is they are fun. You go to interesting places, you meet new people, you sample many different program formats and I firmly believe they make good radio. However, if anything is going to go wrong with live

continued on page 33 ▶



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## MANAGER'S NOTEBOOK

# Rate Your Problem-Solving Ability

by Sue Jones

**BURKE, Va.** Resolving problems can be one of the thorniest management headaches. Many managers wrestle with reactive behaviors before they can get to the real problem.

There are several typical reactionary approaches that generally create roadblocks to solving the real problem. As a manager, you should be able to identify the most frequently used reactive responses to daily problems.

## Typical examples

Here are some typical examples:

- Not recognizing or identifying the problem. A classic case is a decline in the ratings. The first explanation is that it is just a wobble or a sampling error. If no further analysis is done, and there is a cause for the decline, like a new competitor, the next rating book or trend may be even lower. Recovery at this point will be more difficult and perhaps longer than if a deeper evaluation was made at the first indication of trouble.

Oftentimes, the management team recognizes the significance of a decline but is unable to identify the source. Is it programming, promotions, air staff, or something else? Clearly identifying the problem is the first step in developing a solution. If it is incorrectly identified, the solution will not solve the problem and the corrective effort has wasted resources.

- Covering up or ignoring it. As management, you may or may not be guilty of contributing to this one. Employees often respond this way, especially if they feel they will be blamed for the problem. An example of covering up a problem is a jock falsifying a log, showing a spot was played when it was not. Not only is the account in jeopardy, but so is your license. In the chaos of a show, mistakes can be made. The object is not to create a bigger problem with a cover-up.

## Loud indicators

- A high staff turnover rate is indicative of some type of problem. Perhaps your salary levels are lower than the current market. Morale could be low for any number of reasons. Management often ignores this problem because it is lower on the priority list.

If the costs for recruitment, orientation, and training new staff people are considered, this type of problem is a hidden expense that, if ignored, will be very expensive in dollars and productivity to correct.

- Offering excuses for why there is a problem. Many times this is a snow job at best. The bottom line many times is that someone did not complete a needed task and a problem has resulted.

Webster's Dictionary defines "excuse" as an expression of regret for failure to do something. An example would be a sales manager claiming that the poor economy is the cause of declining sales instead of finding other sources of income. In this case, the employee had the knowledge and ability to take another course, but elected to take the easiest approach and offered the poor economy as the cause of lower revenues.

Offering excuses should not be confused with explanations of why a problem occurred. You need to gather as much

information about how and why a problem occurred before you decide on a corrective course of action. Some people are very clever in how they construct excuses to

**Some people will not admit to errors even if observed by someone else as the error occurs.**

appear as valid explanations. The ability to perceive the difference will determine how fast you will get to the real problem.

## He did it...

- Blaming someone else. Undoubtedly, this is one of the most frequently used approaches. However, this response is typical for those who fear retribution or feel they may lose their job if they admit to making a mistake or fail to take an appropriate action. First, analyze your own management style to make sure that you are not contributing to the problem. Staff members should feel comfortable enough to bring a problem to your attention without fear for their jobs.

Keep in mind, though, some people will not admit to errors even if observed by someone else as the error occurred. Some people have a problem accepting the fact that they made a mistake. Finally, some people will blame others to escape the responsibility for their own action. Your management skill and experience will be critical in determining which of the above possible reasons is behind blaming another person. It will also determine your response to the situation.

These are typical everyday approaches to problems. Every one of them hinders problem resolution. They are all reactive responses. The opposite of the reactive approach is a proactive approach. So how

do you get your employees to be proactive instead of reactive?

The first step is to make sure the working environment rewards staff members for identifying problems rather than punishing or embarrassing them. Publicly pat an employee on the back when he or she identified a problem and successfully worked through a solution. Staff meetings pre-

sent excellent opportunities for this type of proactive encouragement. It also sends several messages to the staff. It is very obvious that you are evaluating the performance of the staff and how it helps the station in achieving its goals. It also conveys the message that you recognize problems do occur and they can be corrected.

## Do as you do

You must be a trainer and/or example to the staff. Tell your employees if they become aware of a problem, ask them to clearly describe the problem and the potential impact to the station. Also encourage staff members to think of a possible solution they might have to

resolve the problem no matter how crazy or inappropriate it might be. Oftentimes, the best solutions come from the staff on the front lines.

Even if the employee's offered solution is not workable, perhaps it will trigger another solution to the problem. Asking your staff members to offer their ideas for possible solutions also encourages their own professional development. Instead of complaining to management that something is wrong and needs to be fixed or relying on someone else to make the decisions and give directives on how to correct the problem, they begin to think how to resolve them.

They also begin to see the problems from the management perspective and begin to understand the complex considerations that are required to solve them.

Encourage staff members to think outside the normal ways of running a station. You may not want to put all of their ideas into place, but you might get some creative thoughts and ideas that would not have been thought of or used as a solution to the problem.

Remember that changing a staff from reactive to proactive behavior will not happen overnight. It will take some time, training and patience. However, the effort is worth it.

□ □ □

*Sue Jones is a senior manager for Computer Data Systems Inc. in Rockville, MD. She can be reached at 703-323-0491.*

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**ENGLEWOOD, Colo.** With eight 24-hour-a-day radio formats, Jones Satellite Networks (JSN) provides service to more than 900 affiliates nationwide.

JSN's eight formats include The Team, sports talk radio; CD Country, new country hits; U.S. Country, mainstream, traditional country; Adult Choice, adult contemporary; FM Lite, instrumental jazz and adult contemporary and soft vocals; GTO, upbeat 50s, 60s and 70s music; Soft Hits, mellow pop hits; and, the newest format, Z, featuring Spanish language and music.

Six formats originate from studios in Englewood, Colo., while The Team and Z are produced at WTEM-AM in Washington, D.C., and KZSA-FM in Sacramento, Calif., respectively.

Changes for the company in '95 include the relocation of the Dallas-based sales office to Denver. By consolidating all operations, JSN expects to offer significant enhancements in affiliate support. Affiliate stations are encouraged to take advantage of turnkey promotions and public service campaigns, customized ad campaigns, premium items and liners, and research.

For information, contact Gene Ferry, affiliate sales manager, at 800-677-5663, or fax: 804-420-8310.

## SJS Entertainment Launches Production Library

**NEW YORK** SJS Entertainment is offering "DECADE: The Ultimate '70's Production Library," a new service that provides morning DJs with a compilation of the hottest '70's clips of movie and television theme songs, comedians and news events of the decade. The material is distributed weekly and available nationwide on a market-exclusive basis.

Stations ordering "DECADE" will also receive the "Daily Plan-It," a daily '70's encyclopedia containing facts and trivia from the '70s that can be incorporated into the programming.

For information, contact June Brody at SJS Entertainment at 212-679-3200; or circle **Reader Service 78**.

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For information, contact the West region office of ABC/SMN at 214-991-9200, or the East region office at 212-456-1777.

## Westwood Offers A Variety Of Choices

**CULVER CITY, Calif.** Westwood One Radio Networks offers three traditional news services: CNN Radio, NBC Radio Network and the Mutual Broadcasting System, along with weekday and weekend news and entertainment features and programs. Westwood One 70s is the newest of eight 24-hour satellite-delivered music formats and continuous CNN Headline News. Stations affiliated with all of these products are represented to advertisers in format-specific networks. Westwood One Radio Networks also exclusively markets CNBC Business Radio and Last Night on "Tonight with Jay Leno."

Westwood One Entertainment produces music, sports, talk and special event programming. In addition to countdown shows for all formats, including Out of Order (new rock), The Countdown with Walt Love (urban), Country Countdown USA (country), and three countdowns from Casey Kasem—Casey's Top 40 (CHR), Casey's Countdown (AC) and Casey's Hot 20 (hot AC)—the division offers numerous music and interview shows, ranging from its In Concert and Superstar Concert Series, Off the Record, On the Edge, BBC Classic Tracks, and MTV, to Acoustic Country, The Retro Show, Super Gold with Mike Harvey, and Your Goodtime Oldies Magazine, among others.

Known for its exclusive live concert broadcasts, Westwood One Entertainment brings radio audiences concerts such as the Rolling Stones Voodoo Lounge tour. The division also delivers major sports year round with Notre Dame Football, NFL Sunday Doubleheaders, college football and major college bowl games, college basketball, pro tennis and golf, auto racing and championship boxing.

As the nation's leader in talk program-

ming, its talk personalities include Jim Bohannon, David Brenner, Pat Buchanan, Don and Mike, David Essel, M.S., Bob Grant, Don Imus, G. Gordon Liddy, Tom Leykis, Richard Simmons, Mike Walker, Bruce Williams, the daily simulcast of CNN's Larry King Live, gardening tips from Jerry Baker and Sportstalk with Mike Francesca's Sports Now.

For information on Westwood One's Radio Networks, contact Kirk Stirland at 800-225-3270, or Neil Sargent at 805-294-9000. For information on Westwood One's Entertainment division, contact Gordon Peil at 703-413-8550; or circle **Reader Service 55**.

## Championship Wrestling Available To Radio

**HAZELWOOD, Mo.** The SRN Radio Network and World Championship Wrestling are joining forces to bring Hulk Hogan, Randy "MachoMan" Savage, Sting, Ric Flair, Hacksaw Jim Duggan and many other wrestling superstars to the radio.

Available on a weekly program called WCW and hosted in studio by wrestling and broadcast veteran John Ellis. Play-by-play will be by Gordon Solie, the "dean of wrestling announcers" and color commentary by Terry Taylor.

For information, contact Michael G. Talir at 314-781-5404; or circle **Reader Service 215**.

## Point of View Radio

**DALLAS** USA Radio Network has added four new affiliates to program, "Point of View." Heard each weekday from 1:05 to 3 p.m. CT, "Point of View" broadcasts to close to 3 million listeners per week.

For more than two decades, "Point of View" has focused on analyzing current issues from a "biblical worldview." The program is hosted by Martin Maddox.

For information call David F. Reeder at 214-484-3900; or circle **Reader Service 188**.

## Talk America Makes Wishes Come True

**BOSTON** The past Christmas season was a little merrier for several families, thanks in part to Talk America Radio Network's "Good Day USA" talk show host Doug Stephan and his listeners. When Stephan requested "Make a Christmas Wish COMe True" nominations late last year, he received hundreds of requests for help. Stephan's program is broadcast on 170 stations in the U.S.

Doug Stephan, a 25-year radio veteran, was able to help make several of those many request come true. His "Good Day USA" show has grown steadily in popularity over the past six years.

For information on Doug Stephan's program, or any other Talk America program, contact Tom Star at 617-937-9390; or circle **Reader Service 120**.

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## OFFBEAT RADIO

# Taking AM Matters into Radio Hands

by Dee McVicker

**PHOENIX** Remember the infamous dead-air commercial that stations ran (or didn't run) a couple of years ago in order to promote general listenership of radio? Something similar is happening again, only this time listenership promotion is being aimed at the AM band and it is championing anything but dead air.

## No more static

In October, the National Association of Broadcasters (NAB) AMAX AM Improvement Committee sent a mailing to all AM stations in the United States promoting the publicity of AMAX and AM improvement on the air. The message: all the static over AM improvement in general, and AM stereo with AMAX in particular, is over.

A few broadcasters are trumpeting that message, so much so that the demand for AMAX/AM stereo receivers has gone up dramatically in some areas. "Every time we start promoting AM stereo and AMAX radios on the radio, we get swamped with calls from people wanting to know where they can get the AMAX radios," said Ted Snider Sr., owner of KARN(AM) in Little Rock, Ark., and committee chairman for the AMAX AM Improvement Committee.

The same is happening in Elizabeth, N.J., at station WJDM(AM), and new Cadillacs are moving off the lot of one car dealer because of it. "It's helping to sell cars," said WJDM(AM) President John Quinn.

"We have highways here that are heavily wired. There's lots of AM noise, and so these people get interference on their AM radios. They (now) drive the new Cadillacs, which have had the AMAX radios for the last three years, and (the car dealer) has been selling cars because of it." In addition to promoting AMAX/AM stereo in cooperation with the local car dealer, WJDM is airing spots with an AM-quality promotional bent.

## Making an impact

Elsewhere, Anchorage station KFQD(AM) is said to have made an impact on the AMAX radio sales at a local audio store. "What surprises me the most is who is buying them," said KFQD's Dave Taylor, the station's announcer and designated AMAX promoter. "Certainly, some audiophiles are, but the average listener is also interested in them."

Taylor does on-site retailer promotions and A/B comparisons of monaural versus AMAX/AM stereo using a demonstration unit consisting of a Sony AMAX Walkman hooked into an amplifier. He also has a demonstration of a Delco AMAX car stereo that he takes out on remotes on occasion, and, like WJDM and KARN, promotes AMAX/AM stereo over the air.

Listeners, he's discovered, are always "amazed" at the quality of AMAX/AM stereo, and many are interested in upgrading to static-free, stereo AM for home or car listening. Taylor is always quick to point out where listeners can purchase an AMAX receiver. In

Anchorage, the local Radio Shack carries the Sony SRF-42 Walkman and the local Kmart carries the GE SuperRadio III.

Timothy DiGioia, product segment manager for audio information products at Thomson Consumer Electronics, suggests broadcasters call on and promote retailers that handle the AMAX receivers in order to co-op their promotions of high-quality AM now found over the air and over the counter. True Value, Lechmere, Sun TV, Kmart, Best Products, Best Buys, Lowes, American TV, and K's Merchandisers are just a few of the retail outlets that carry the SuperRadio, now in its third generation.

## Interest renewed

The availability and quality of new AMAX-AM stereo receivers like the SuperRadio III and Sony's Walkman SRF-42 are at the heart of listener interest in AM. "The quality of AM has just gone up dramatically in the last few years," commented Quinn. "High-quality AM radios are dominating the market in Japan. AM stereo far outweighs FM stereo in Japan and it's all kind of coming here now."

Broadcasters in the United States have the AMAX standard, a set of specifications set forth by the NAB and EIA, and the FCC's recent C-QUAM stereo standard endorsement to thank for that. Radios with AMAX certification must comply with specifications for bandwidth (6.5 kHz for portable models until September 1996, with provision for selectable

"wide" or "narrow" bandwidth), noise blanking or impulse noise suppressors, and must receive frequencies of the expanded AM band, 1605 to 1705 kHz. Although AM stereo is optional, many AMAX certified receivers include C-QUAM stereo decoding.

The Sony SRF-42 stereo Walkman, the GE SuperRadio, and Denon tuners are now available in the United States with AM stereo and AMAX certification. In addition to the Delco AM stereo car radios that are AMAX-certified,

according to Snider, another major United States radio manufacturer is expected to adopt a car receiver design that will be AMAX-certified and Tandy Corporation has made a commitment to build an AMAX clock radio.

Moreover, at least a dozen AMAX/AM stereo receiver models could be imported from Japan to the United States in the coming future. "We're trying to get the manufacturers of those receivers to import more into this country to meet the demand," said

Snider, adding, "They've had trouble meeting the demand in Japan because they went AM stereo two years ago."

American AM stations have been broadcasting an AMAX-compliant signal since June 30, 1994, when FCC rule 73.44 was handed down that all AM stations in the United States must comply with AMAX RF emissions mask standards.



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Now, it's up to broadcasters to inform the public of the new quality of AM, said Snider.

That shouldn't be difficult—if the AMAX/AM stereo challenge has any application in real-world broadcasting. Said Quinn, previous committee chairman for the NAB AMAX AM Improvement Committee. "We tested more than 7,000 people at the Consumer Electronic shows and the NAB... where people have to tell AM from FM stereo. And they can't tell. Seventy percent could not tell, and the ones that guessed liked the AM more than the FM."

□ □ □

Dee McVicker is a freelance writer and regular contributor to RW. She can be reached at 602-545-7363.



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# Niche Player in Prague Is No Myth

by Charles Recknagel

**PRAGUE, Czech Republic** Since the first private stations began broadcasting in Prague in 1991, radio in this city of more than 1.3 million people has become increasingly niche-defined.

Consider Radio Golem, 90.3 FM, a 1 kW station whose signature programming is theatrical comedy. Named after a mythical creature (a re-animated corpse à la Frankenstein's monster) that roamed the streets of 16th century Prague, Radio Golem is just one of 22 private stations competing for market share here. Among them, formats range from rock to classical to country-western and from all-talk radio to all-English-language programming. But perhaps none demonstrates better than Radio Golem how the niches are narrowing as mainstream radio becomes dominated by big investors, and smaller stations must find their own distinct alternatives.

"We are the only station we know in this market or anywhere in Central Europe whose trademark is broadcasting comedy shows," said Radio Golem Program Director Jana Chlábková. The station built an audience by airing a continuing weekly series of original and exclusive one-hour performances by the most popular theatrical comedy team in the country and packing around it comedy programs of all kinds, along with music and talk shows.

## Comedy fans

The formula gives the station a loyal following of comedy fans, plus many more listeners who regularly defect from mainstream stations to spend a few minutes laughing with Radio Golem.

Chlábková estimates the core listenership of the station at 2 to 5 percent of the two million people living in Prague and surrounding mid-Bohemia, according to surveys that ask what stations listeners tuned to yesterday. "But when we ask if people listen at least once a week to Radio Golem," she said, "the number goes up to 10 percent."

## Golem is just one of 22 private stations competing for market share in Prague.

These audience figures keep Radio Golem on a "frugal budget," as Chlábková describes the financial situation of the station. But in the competitive market of this city, which is dominated by a handful of mainstream giants, it constitutes a respectable market share for a small station.

The four largest private FM stations in Prague each claim from 10 to 17 percent of the Prague market daily, are mainstream and are backed by investors, including a Czech record company and private radio stations in France, Luxembourg and Ireland. Other private stations, usually backed by small investors whose only business is radio, tend to be niche-oriented and hold an audience share ranging from 2.2 to 5.5 percent.

"We could not compete with big investors, and we didn't want to open just another music station, so we tried to offer something uniquely our own," said Chlábková, who operates Radio Golem with her husband, a musician, and his

partner, a theater critic. Both partners worked in state radio before opening Radio Golem in 1991 during the first wave of private license awards.

## Characteristics

The operation supports a team of eight full-time and 15 part-time employees, plus 20 to 25 outside collaborators who produce original comedy material. Broadcasting costs are kept to a minimum: a simple, all-analog studio with Western-manufactured gramophone, CD player and a Studer switcher in a private home outside

Prague. There are no plans to expand.

Since the station began, its operators increasingly have sought to define Radio Golem away from the highly competitive mainstream market and into a stable niche of its own. The choice of comedy material was a first step: The centerpiece series of the station is the work of a Czech comedy pair, Lábus and Keiser, who were widely popular before the end of communism and who tend to draw older, mid-adult fans. Most of the sketches center around family life, for which the comedians conjure up to as many as 50 character voices.

"We gambled on the appeal of Lábus and Keiser to bring us an existing audience, and it has," said Chlábková, who notes that Radio Golem is the only place where audiences can hear the pair's new work today. But, she adds, the gamble was full of risks and taken without much prior research.

None of the operators of the station had previously heard of comedy niche

stations in other countries. "We only knew that comedy series were popular here on state radio before the end of socialism, and that could have simply been because there was very little to choose from on the radio," she said.

Initially, Radio Golem tried to soften its risk by also offering music programs with the broadest popular appeal to bring in the most listeners. In 1991—when Eastern Europe was still newly open to the West after the collapse of communism in 1989—that meant the latest American popular music with heavy doses of rap and disco, plus English techno. Many people in the 16-30 age group were curious to hear the genres simply because access to them was still a novelty.

But over the last two years, Radio Golem found its heavy use of rap and disco steadily drove down the listening age for its music programs. "We first began to suspect our music audience was changing when mothers came to the studio to claim awards won during music show contests," Chlábková said. "They would say, 'It's not for me, it's for my 10-year-old daughter who listens to you all the time.'" Later, the station confirmed the trend in industry surveys that address listeners aged 15 and over, which showed listenership vanishing.

"Now we have completely changed the climate of our music," Chlábková said. The station is airing histories of modern music beginning with the 1930s, with an emphasis on the swing and Liverpool eras, to develop its own adult, melodic sound. "We are stressing now that we are for the discerning adult listener," she said, observing that today the music of the station—like its comedy niche—conforms more to the tastes and backgrounds of its operators than to the rules of mainstream radio.

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## PROMO POWER

# Technical Know-how Can Help Save the Day

by Mark Lapidus

**WASHINGTON** It was an hour and a half before air time and the engineer was just beginning to set up the remote. I had just finished making certain the necessary station signage was in place and double-checking that the client was a happy camper with what was about to be broadcast.

Unexpectedly, the familiar sound of the engineer's pager cut through the

lunchtime noise. I could see as I approached him that the news was not good. He said, "I am really sorry, but I've got to go. The AM station is off the air. I guess we will have to blow off the remote."

"Don't worry about it," I replied. "Go ahead. I'll set up the stuff."

His reply: "Oh yeah. I forgot you used to do this stuff when you worked in smaller markets."

He split. I set up the gear and the show went on.

## Handy to know

The purpose of this story is not to brag about my meager technical abilities. It serves to point out that all promotion people need to have certain skills. These skills are not difficult to learn, but when promotion people do not come from the on-air side of radio, they need to make a point of gradually gaining an understanding of the technical fundamentals that impact their position.

Following is a suggested checklist of basic skills that will be extremely helpful during a career in promotion.

**Control boards:** Learn how to operate every console in the station. This is much easier than most people realize. After business hours, practice in the production room by putting together some music tapes for your own enjoyment. When you can say with confidence, "Sure, I can run the board," you will be able to fill in during remotes back at the station if somebody does not show or if you are short-staffed.

After you learn how to record commercials on cart, you could even assist in an emergency when dubs are needed. Find out how to play carts over the telephone for clients. Note: Be sure to obtain your operator's permit from the FCC. It is a simple application. Post the permit with the rest of your announcing staff's.

## Addressing the public

**Public address equipment:** By learning your station's control boards, you will also obtain an understanding of how all PA consoles operate so that during appearances you will be able to solve problems and completely understand what you need to bring with you.

Inputs and outputs are as easy as plugging in electric cords once you understand what the connections do. Have your engineer explain how equalization and compression affect sound. This will enable you to control feedback problems and enhance the sound presence at appearances.

For your own portable public address system you may wish to label various plugs so that the same numbers plug into each other. For example, a phone jack could be labeled No. 1, the output of the system could be labeled No. 1 and the input of the speaker could be labeled No. 1. All you have to do is plug all the No. 1s together.

Compact disc players, cassette decks and wireless mics: You should be able to cue up songs on any CD player, record comments on a portable cassette deck and hook up a wireless mic. If any of these are battery-operated, determine what type of batteries they require and find out where to buy them.

**Broadcast remote equipment:** If you have already learned how to operate the above, you can begin assisting whomever sets up

your broadcast remotes. Pay particular attention to the device used to get the signal back to the station. Learn that system. There are many different methods available, including line-of-sight open-air transmission, enhanced phone lines, and digital equipment, to name a few. After you have helped someone set up a half dozen times, let him or her give you a shot at doing it yourself while he observes.

**Computers:** If you do not know how to type, postpone everything and take a typing course immediately. Administrative help is vanishing and a promotion person's value is diminished if he or she cannot quickly type copy, releases, instructions and letters. Learn at least one word processing program and one graphics program; you should also learn how computers can function as fax machines and terminals for interaction with bulletin boards.

I highly recommend the skill of turning a computer into a mass-faxing animal. After all, mass communication is a large part of your position. Computer modems have come way down in price in the last two years and sooner or later you will be using one anyway.

**Vehicles:** Can you drive all the vans, trucks and cars the station operates?

**Mascots, tents, booths, and generators:** Sure you may have other people put this stuff in place, but shouldn't you help when you are there? Also, new crews

will have to be trained regularly because turnover is so high in this line of work.

**Cameras:** Get to know both still and video cameras. Books are readily available about film speeds, lenses and lighting. If you are lucky enough to have a station super-eight video camera, be sure and find out how to play back footage on a regular-size television.

**Novelty items:** Any wild items that promotions sends out on appearances should first be tested by the department.

Finally, a word about safety. Use common sense when operating equipment. A few examples: 1) Think twice before storing your gas generator in the van. 2) Do not plug in anything around water. Exercise caution with electricity and rain. 3) If you have a hurry-up mast, create a failsafe system so that nobody drives away forgetting that it is up. 4) Check station vehicles regularly for balding tires and old batteries.

Be safe and remember that a great promotion person's learning is never done. Seek out new mentors and boldly learn what you have never learned before.

□ □ □

*Mark Lapidus is director of marketing for Liberty Broadcasting. Liberty owns stations in Washington, Baltimore, Richmond, Va., Long Island and Albany, New York, as well as Hartford, Conn., and Providence, R.I. It recently launched the Wolfman Jack Show on a national network.*

## U.K. Firm ISDN-Able

► continued from page 28

radio, it is bound to happen away from the studio on uncharted territory.

It is always worth remembering that the station has spent a lot of money, has hyped the event for weeks and its people have travelled a long way.

Unless you are thorough with the site checks, the worst hassles can be of a non-technical nature, particularly when outdoors or in a public area. During broadcasts we set up at the 50th Anniversary of D-Day commemorations in Normandy, security and transport could have been the biggest headache rather than initial problems with terminal adapter compatibility.

So apart from testing lines and equipment well in advance and making sensible contingencies where required, with equal precedence we apply the policy of talking to everyone who is in charge of anything on site.

ISDN brought quality remote broadcasts within the reach of many stations and, as installation and rental costs come down, the facility will be found as a permanent feature at more and more locations.

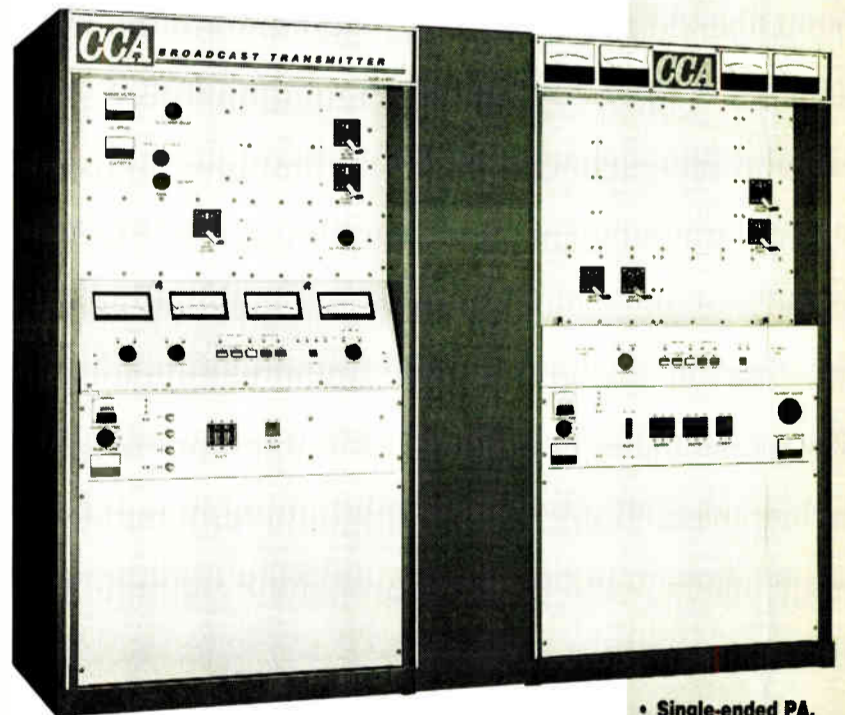
But the most bizarre and basic modes of transmission will always be useful. At the Reading Festival in August, Wired For Sound provided the technical facilities for 30 U.S. stations. Some broadcast live shows, some sent pre-recorded pieces for delayed transmission but there was one station from New Orleans that had no recording machine back at their studio.

Interviews with the artists had to be played in live to the U.S. down a phone line—and the studio had no way of sending us a cue feed. So we simply did not know when to press "play." The solution: The engineer in New Orleans tuned in a portable radio and held it to the telephone.

□ □ □

For information contact Johnnie Dymock, director of Wired For Sound Studios Ltd., in the U.K. at telephone: 44-181-442-8900; FAX: 44-181-442-8901.

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## ROOTS OF RADIO

# Broadcast Pioneer Godfrey Spoke His Mind

by Harry Heath

**LAS VEGAS** It has been 11 years since Arthur Godfrey spoke his last irreverent word, and his fans still are disappointed at the send-off he got from the obituary writers. He deserved better.

Not only did news writers suggest that he capitalized upon the talent of others because he had little of his own, but they neglected to note the fact that the Ol' Redhead changed broadcasting more than any single air personality in history.

Those obit writers didn't know the man the way we did.

## To know him

Until his 1931 auto accident and subsequent two years in a hospital bed, radio was a very formal medium. The Norman Brokenshire announcing style was considered the epitome of the art, with an English accent the ideal.

"How do you do, ladies and gentlemen, how do you do. This is Norman Brokenshire speaking on behalf of..." was as informal as a radio announcer dared to be.

Listening to radio, his main companion during his hospital stay, became torture for the Ol' Redhead. He couldn't wait to get back on the air and put into practice the lessons he had learned while listening to '30s radio in the hospital.

Godfrey was the first to speak to people rather than announcing at them. Franklin Delano Roosevelt not only was a fan, but patterned his Fireside Chats on the Godfrey style, although he refused to abandon his upper-class broad "a."

Godfrey sold products by mixing truth with sometimes outrageous ad-libbing directed at his sponsors. His relaxed, informal poking-fun charm produced phenomenal sales.

He sold products with a mixture of truth and spirited fun, the kind of comments people often made to one another in a friendly atmosphere. He might disparage something about a product, but he never knocked the product.

Nabisco made the best crackers and cookies, but it took a Stilson wrench to get the blankety-blank box open, he'd say. He claimed that's what kept them so fresh, so it was worth the effort.

## Not so appetizing

Lipton soup looked "terrible" fresh out of the package, "like they scraped up the bottom of the chicken coop. So don't look at it. But eat it, it's delicious." The word "delicious" would roll off the Godfrey tongue with warmth and sincerity. In memory, it's not hard to hear that voice as you read this story.

Later, he challenged people to find a piece of chicken in the soup. "They walked a chicken past the post. I guess... but it's the best doggone soup you'll ever eat." His listeners laughed and put Lipton soup on their shopping list.

Health concerns over smoking were infrequently expressed back then and not given major attention by the media. Smokers certainly didn't take the occasional warning seriously.

The Liggett & Meyers agency had Perry Como, Bing Crosby and Frank Sinatra urging everyone to "buy a pack today." The pack of course, was Chesterfields.

Godfrey, the master student of psychology, knew that people could smoke a pack and still go back to their old brand. It took at least five packs to change a person's taste. That's why Godfrey began urging his listener ("always talk to one person, lad") to "try a carton. I'll bet ya you won't be able to go back to your old brand once ya smoke a carton of Chesterfields."

He was right, of course. Your taste buds had become accustomed to the flavor balance. He hooked this writer. Got me to switch from Lucky Strike to Chesterfield for one carton (they only cost \$2.05 a car-

ton in those days). When I smoked my first Lucky Strike after that carton, I couldn't finish it, it tasted so bad. Chesterfields were high in glycerol, which made other cigarettes taste bitter after you had grown accustomed to Chesterfields.

## No talent?

Many people were quick to say that Godfrey had no talent, that he used the talent of others. This, of course, is a talent all its own. But it was not true that he lacked talent.

No one will forget his famous ukelele

playing and his warm, folksy voice as he sang favorites like "Dance Me Loose," "Slow Poke," "Too Fat Polka," "I'm a Lonely Little Petunia in an Onion Patch," "My Little Grass Shack in Kealakukua, Hawaii" and his sentimental them, "Seems Like Old Times."

Twenty-four of his memory-stirring favorites are still available to fans on record, cassette or compact disc.

Upon his television debut, millions tuned to his "Talent Scouts" show. It was a remarkable time in television history, with

continued on page 37 ►

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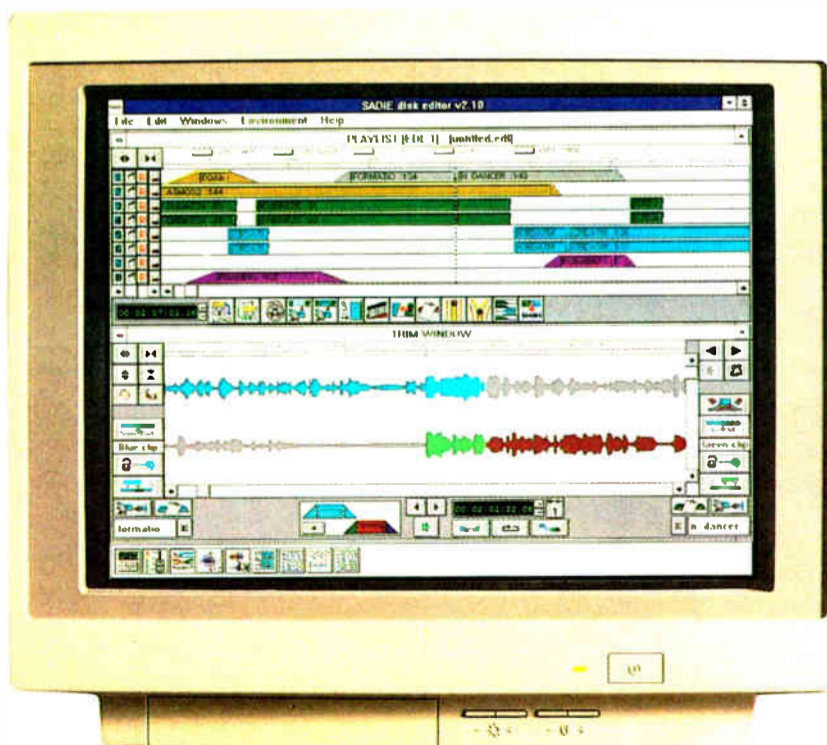
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# Remember Radio's Godfrey

► continued from page 35

live performances that introduced new talent weekly, capturing the admiration of young and old alike. Godfrey launched the careers of such stars as the McGuire Sisters, Vic Damone, Julius LaRosa, the Everly Brothers and Pat Boone.

But it was before TV that Godfrey was at his irreverent best.

Back in 1948 or '49, the tobacco industry's trade association held its annual convention in Chicago. A featured highlight was the taping of the "Bing Crosby Show." Special guest stars were Perry Como, Bob Hope and Arthur Godfrey—all sponsored by Chesterfield. (Crosby insisted he puffed Chesterfields in his pipe.)

The biggest investor in tape development at the time, Crosby had the only taped network show. It was recorded at 8:30 p.m., its regular ABC broadcast time, one week before airing. The show opened with John Scott Trotter and his orchestra, heavy on trumpets and strings, playing "Where the Blue of the Night Meets the Gold of the Day," and Ken Carpenter doing the opening billboard.

## Special guest

Crosby did his opening song and then introduced his special guest stars, starting with Hope. With each guest he did a little bit of schtick, then followed by introducing the next visitor. Each guest, of course, stayed on stage center, participating in the carefully scripted banter.

The writers purposely "overwrote" the show in order to have 40 or 50 minutes of tape. The script, especially with so many guests, was followed to the letter... until Godfrey was introduced.

Arthur was the only one of the four who did his own commercials. Ken Carpenter did that chore for Crosby. The writers obviously thought it would be cute to have Godfrey do the commercial with Carpenter. So Crosby, after bringing Arthur on stage, introduced him to Carpenter with the comment that they both had a lot in common.

Godfrey's opening line should have read something like this: "You enjoy telling people about Chesterfields, too, Ken?"

Instead, the Peck's Bad Boy of CBS ad-libbed, "Oh, you hate the stink of Crosby's corn cob, too?"

Carpenter frantically scanned his script, looking for this line in order to do his response. In mounting panic, Carpenter read his next written line. "Why, yes, Arthur, I do... every chance I get."

Godfrey went on: "It's like standing downwind from a pig wallow. I wore socks in the Navy for two months that didn't smell that bad."

## Thrown for a loop

Totally disconcerted, Carpenter rustled through his script, looking for his unrehearsed routine. In his search, he dropped his whole bundle of papers.

With this, Godfrey threw his script into the audience. Not to be outdone, Hope hurled his script into the bleachers, while Crosby and Como looked at each other in stunned silence.

The production assistants and various crew members scrambled about the audience trying to retrieve the scripts. Extra copies were found. These, too, were

thrown into the audience as Godfrey suggested that Crosby was burning his toenail clippings in his pipe.

Ken Carpenter retreated in shock.

Bob Hope held his own... sort of.

Crosby almost did.

Como was comatose.

The show ran until 11:46 p.m., with the producer and director frantically making notes for the tape editors.

The audience was in hysterics.

Godfrey took liberties with everything, including competitive sponsors' commercials. Sample:

Godfrey: "I almost didn't make it here tonight, Bing."

Crosby: (Puzzled and thumbing his script, thinking Arthur might be using some of it.) "Why? What happened, Arthur?"

Godfrey: "My hunting dogs got loose just before I left the farm in Virginia."

Crosby: (Bewildered, with no idea where this was going.) "Did you find them?"

Godfrey: "Yeah. They were running through the American Tobacco fields. (Pause) Does your cigarette taste different lately?"

This was the Lucky Strike slogan at that time.

At 11:46 p.m., the director broke up this audio riot by announcing that the engineers were running out of tape. Crosby thanked his guest stars, John Scott Trotter played the theme, and Ken

Carpenter closed the show.

Hope, Crosby and Como fled the stage. Godfrey started to walk off and got a standing ovation. He looked at the thousands in the audience, then stopped and walked over to the side of the stage. He picked up his ukelele, grabbed the drummer's stool, and proceeded to sit, strum, sing and joke until 1:45 a.m.

No one left the Chicago Opera House until he was finished.

At a quarter to two, the audience gave Godfrey a nine-minute standing ovation.

And this was the man whose obituary said he had no talent of his own as a performer.

□ □ □

L. David Moorhead contributed to this story. Harry Heath is professor emeritus at Oklahoma State University.

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World Radio History



# VOA Europe Unveils New Studios

by Rogelio Ocampo

**WASHINGTON** "We have put a radio station into a gray government building."

The imagery Bill Torrey, VOA Europe acting director, portrays with that simple statement is what you find with many government-backed broadcast facilities around the world.

For VOA Europe, the situation is further enhanced because the operation just went on line with new digital on-air and production studios.

The Voice of America launched VOA Europe in October 1985. It broadcasts continuously to nearly 800 cities in 40 countries in Europe, Asia and Africa, Torrey said. VOA Europe will have to change its name soon to reflect the many

different locations where VOA is heard.

Its contemporary hit radio (CHR) music format was the first such research-driven, internationally broadcast format. The format is similar to a mix format—hits of the '70s, '80s and '90s—and is targeted to young adults.

### Satellites, not shortwave

VOA Europe broadcasts 22 hours live. The remaining two hours of the day are automated to broadcast jazz and syndicated programs. Satellites, not shortwave, broadcast its programming.

VOA Europe's signal is uplinked to the Eutelsat II analog and digital satellites. Then private AM or FM radio stations and cable systems downlink the signal from the satellite for broadcast.

VOA Europe uses a Radio Computing Systems (RCS) Master Control System from its new digital on-air studio. The system stores all the music, jingles and features VOA Europe uses on a 16GB array of hard disks.

Although the system has the potential to be fully automated, it is used only for live-assist operations. This ability has been put to good use as VOA has under-gone a series of staff and budget reductions. The VOA Europe staff was cut from 25 to 12 and faced a 60 percent budget reduction.



One of VOA Europe's new suites

Newscasts on VOA Europe are live: they are delivered directly to the digital studio from the Voice of America newsroom located on the upper floors of the building. Newscasts on VOA Europe air at the top of the hour and last for six minutes.

The on-air studio is self-operated by the DJ. No technician is present.

VOA Europe selected the RCS Master Control System because it can store all the necessary material to a hard disk. In 1993, when VOA was looking at digital systems, RCS was the most functional one on the market, according to Torrey.

RCS uses a an ISO/MPEG II compression system, allowing it to store 162 hours of programming to the hard drive.

### No carts or CDs

Torrey said the RCS system makes it easier for DJs to run their shows. There are no carts or CDs to gather for a program. All the necessary information, jingles and features are readily available through the Master Control computer. Announcers can use that extra time to improve the content of their show, and it shows.

**VOA Europe broadcasts to nearly 800 cities in 40 countries in Europe, Asia and Africa.**

The system is also better because it is digital. Once VOA Europe switched to digital, listeners immediately began sending congratulatory responses via telephone, e-mail and airmail.

Upgrading the old analog studio would have cost twice as much as assembling the new digital studio. To upgrade an analog system, more equipment, more installation and more connections are required than installing a digital one. Torrey attributed the ease of installation to most of the required equipment being within a computer.

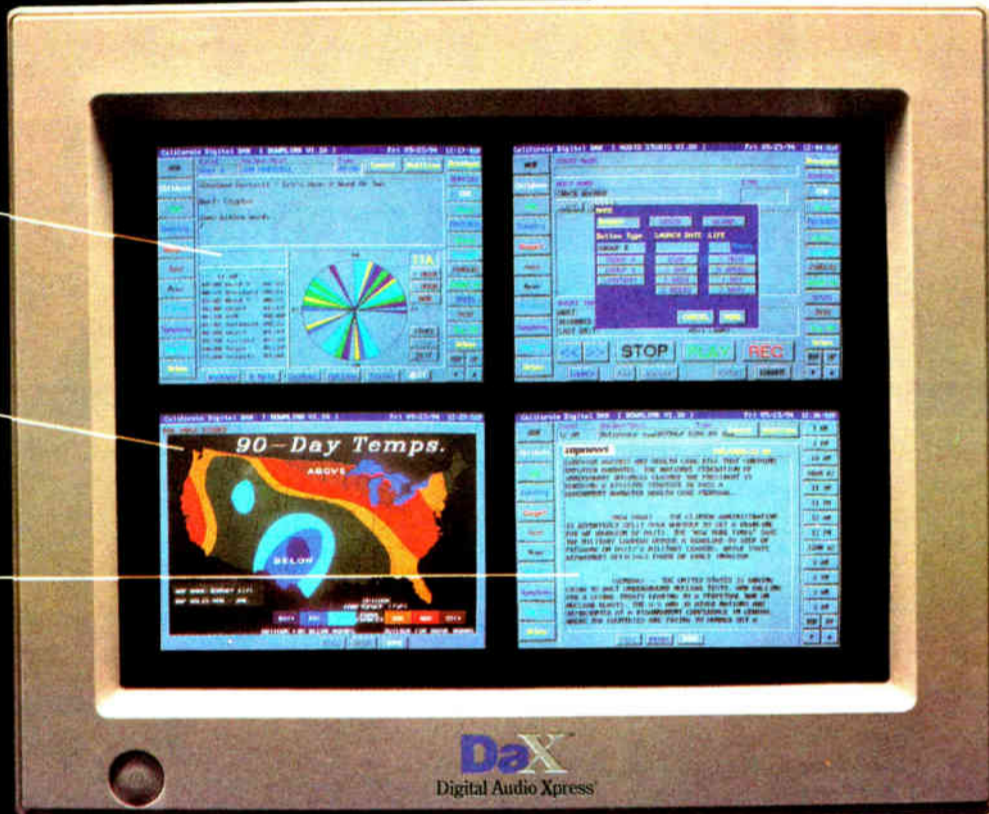
Some of the old VOA Europe analog system equipment was used to complement the new digital studio. An analog console, for example, is connected to the RCS Master Control System.

"The biggest difference from the analog system is that you must plan ahead," said VOA Europe Announcer Eric Phillips. However, changes can still be made at the last minute if one had 30 seconds.

The production studio is digital as well. It uses Pro Tools software by Digidesign.

continued on next page ►

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# Brazilian Radio Offers a Variety of Styles

by Gerard van der Vorst

**SÃO PAULO, Brazil** Brazil, the land of the samba, is an enormous country—geographically larger than Europe. It is a country of many contrasts, with very poor people living in the countryside and many very rich people living in the big cities. This contrast also is seen in Brazilian radio.

Stations in the interior play mainly ferro and other Brazilian country music, while in cities like Rio de Janeiro and São Paulo you can hear the latest hit-parade music from CD in digital quality. Most of the radio stations in the country use CD players, but, on the other hand, more and more radio networks transmit their signal via satellite using only CD and, more and more, frequently MiniDisc.

## Highest concentration

Brazil claims the highest concentration of radio and TV stations in the world, with 3,118 stations nationwide, according to the Ministry of Communications in Brasília, the capital of Brazil. Many are very small stations, for example local religious radio stations, but they are all officially registered.

The first station to transmit via satellite was Rede Bandeirantes, which has 90 antennas all over Brazil relaying its signal

from São Paulo. They even broadcast in AM stereo, but AM stereo receivers are not available in Brazil, forcing people to import them from the United States.

The first FM station went on air in 1973. Now, the FM band in São Paulo is full. São Paulo, the second largest city in the world with nearly 16 million inhabitants, has 51 radio stations on AM and FM. These 51 stations offer a diverse array of music styles: You can hear gospel music on Imprensa FM; jazz on Radio Eldorado; classical music on Cultura FM, the only government-owned station; instrumental music on Scala; rock on 89 and 97; and dance music on Nova FM, which plays the "American Top 40" show every Sunday morning. The programming style of these stations is very modern, fast and American-oriented.

The salary for the average DJ is not too high, and many DJs have other jobs. Some radio stations pay only US\$150, while the best DJs barely earn more than US\$1,000 per month.

## Avenida Paulista

The "Wall Street" of São Paulo is Avenida Paulista, which also is the highest point in São Paulo. Therefore, it is no surprise that there is a high concentration of FM antennas on top of the many skyscrapers. When one drives along Avenida Paulista you cannot receive a single station because of all the interference. Ninety percent of all FM signals in São Paulo originate from along Avenida Paulista.

A year ago, there was great concern about the high concentration of magnetic waves on Avenida Paulista and possible health risks for people living and working in the area, but nothing has been proven.

The hit parade stations like Cidade, Transamérica and Jovem Pan are all very competitive. They all are purely commercial enterprises and the number one spot

on the IBOPE list (a marketing research company). It is surprising then that none of these hit parade stations is the top station in São Paulo. The most popular station is Transcontinental, that transmits mainly typical Brazilian music like samba.

An old law was nullified by former-President Fernando Collor de Mello that obligated radio stations to play a certain percentage of Brazilian music. This ruling allows the network Antena Um to play only international music. They play flashback favorites and music that is easy to digest. This means that the Carpenters is allowed while Metallica is strictly prohibited.

At the same time, another radio station, Musical FM, changed its programming drastically, playing only Brazilian music.

Everyday, between 7 and 8 p.m., all radio stations in Brazil are obligated by law to carry the governmental program "A Voz do Brasil" (The Voice of Brazil), which contains news and announcements from the capital Brasília. Also, with elections coming up, stations are required to broadcast between 7 and 8 a.m. and noon and 1 p.m. "Hora Graduita Política," a program that lets all political parties promise voters heaven and earth. Listeners complain and many turn off their radios. And all radio stations want to get rid of political obligations to carry these sorts of programs.

Tourists must think their radio has broken down during these programs, because on all frequencies—AM, FM and even shortwave—they hear exactly the same voice.

## Satellite future

While musical programming reigns supreme on FM, on AM news radio is extremely popular. The most popular ones are CBN, Bandeirantes and Jovem Pan 1. They all beam their signal from the studio to AM transmitters situated outside of the city center.

The future of Brazilian radio, without a doubt, is tied to satellites. The biggest

one will be Rede Transamérica, owned by Banco Real. At this moment, Rede Transamérica has 32 stations transmitting a signal from São Paulo to nearby regions, but the plan is for a total of 82 all across the country.

As more and more local radio stations have financial problems, Rede Transamérica plans to offer them the opportunity to enter in the network.

**Brazil claims the highest concentration of radio and TV stations in the world, with 3,118 stations nationwide.**

The network's main antenna in São Paulo is the highest radio antenna in the Americas, measuring 180 meters. It transmits the most powerful signal, reaching from 120 to 150 kilometers, thanks to a 70 kW transmitter.

Network commercials are recorded to a hard disk system, and listeners can phone in to tell Rede Transamérica what is on their minds. Everything is recorded by the computer.

Another fast-growing network is Jovem Pan, which has a special studio for its satellite signal and another studio with other DJs for the metropolitan São Paulo area.

The Ministry of Communication is licensing 500 more radio stations for the entire country, but more stations are likely to join the big networks in order to survive.

□□□

Gerard van der Vorst is director of Discolandia, a record and compact disc broker, based in São Paulo, Brazil.

## New Studios for VOA Europe

► continued from previous page

"It's the most popular system. Its price, power and easy-to-use characteristics served VOA Europe purposes best," said Torrey.

## Compile playlists

VOA Europe's music library uses the RCS Selector program. Selector stores all the information about the music needed to compile playlists. The information is sent to the production studio where the playlisted songs are then recorded to the hard drive.

CDs are recorded into the digital system without any loss of sound quality. "It's a direct digital transfer," Torrey said. Once the programs are ready, they are sent via a local area network (LAN) directly to the on-air studio.

The old analog studio is still in operation as a backup. Torrey said that eventually, the analog studio will be converted to digital as well. Old equipment is recycled within VOA and will be put to use in other studios.

VOA broadcasts via two systems, digital and analog. The analog signal is easy to receive with a simple home satellite dish. The digital signal, however, is more difficult to receive. Radio stations need to purchase equipment that meets VOA specifications to receive the digital signal. VOA must then electronically activate the equipment.

The Voice of America intends to upgrade all of its studios to digital by 1997.

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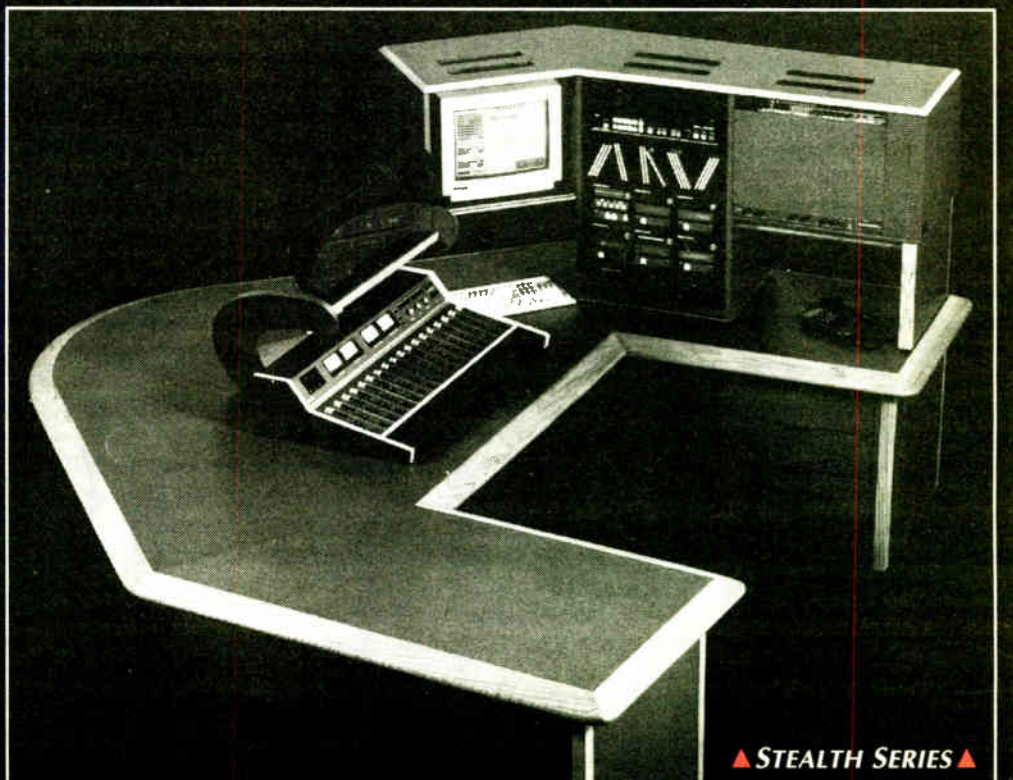
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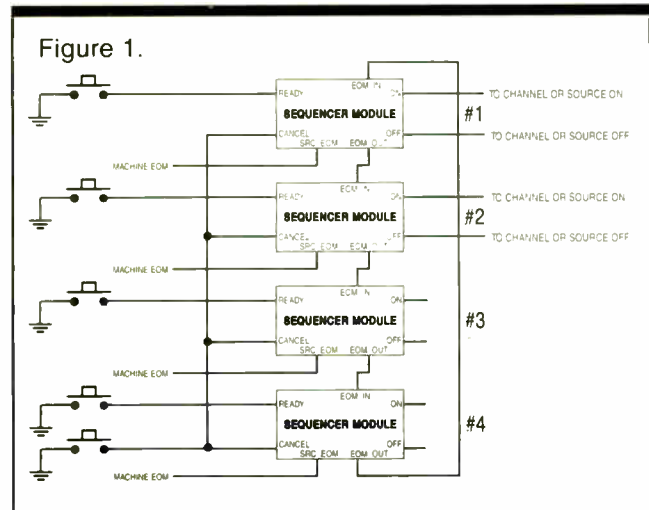
**BOTTOMLINE BROADCASTER**

# Build a Modular Sequencer for Live-Assist

by Jim Murphy

**MORGANTOWN, W.Va** Modern radio is quite different than it used to be. Why, I remember when a control room consisted of only two Edison cylinder machines and a carbon mic, and the trans-

mitter tubes were so big you could literally walk into them. Why, I recall one time when our transmitter engineer, Marconi, called me... but well, that's another story. Today's radio station control room is used in many ways. It is a mixing and switching studio, it is used for monitoring, dubbing and mastering, and of course, production. And the on-air operations run from satellite to totally live to completely automated and all stages in between. A common mode of operation is called "live assist."



mitter tubes were so big you could literally walk into them. Why, I recall one time when our transmitter engineer, Marconi, called me... but well, that's another story. Today's radio station control room is used in many ways. It is a mixing and switching studio, it is used for monitoring, dubbing and mastering, and of course, production.

Another variation of a live assist operation integrates live announcing with a group of cart machines, tape machines, or compact disks running in a selective sequence.

This might just as easily be called "automation assist," because, in many instances, it involves a running automation system that is held up for inserts by a live jock.

Another variation of a live assist operation integrates live announcing with a group of cart machines, tape machines, or compact disks running in a selective sequence.

Another variation of a live assist operation integrates live announcing with a group of cart machines, tape machines, or compact disks running in a selective sequence.

### Sequencer module

An example of a four-source system is shown in Figure 1. Remember that all modules are identical. Each unit has a Ready input, and a tally output to indicate that module is ready. The EOM In and EOM Out are connections between modules, and the terminal marked Machine EOM connects to the EOM circuit in your cart, tape, or CD player.

Outputs are for channel start, or you can use it to start a source directly. Finally the channel off can turn off the audio if

your equipment has those provisions.

You can use as many modules as you have equipment for. A common usage might include three or four cart machines and three CD machines. The sequencer could then be set to play any of the carts, then rotate into the CD machines for their sequence. This can provide short walkway time and will sometimes even improve your stopset and music sweep execution.

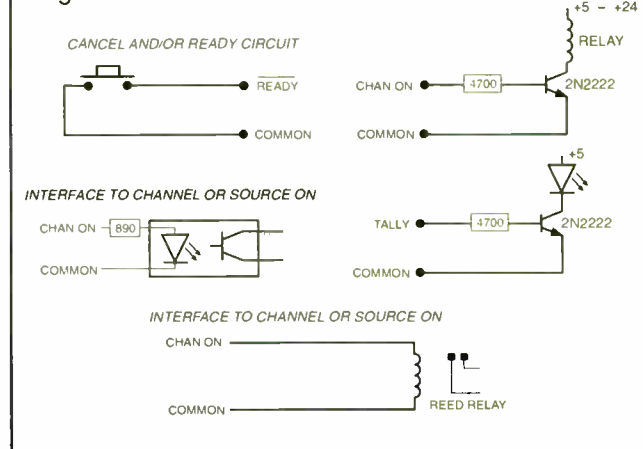
Now that you are familiar with the input and output labels, and the general concept of the sequencer, let's look inside and see how it works.

### Operation

We can start by looking at Figure 2. IC-1 is a J-K flip-flop and is used to ready or cancel the sequencer module. To ready the module, pull the preset (pin 2) low momentarily. The chip goes into asynchronous set mode, forcing Q high. This

will light the Ready LED. The complementary output pin 14 goes LO. Pin 1 of IC-2a goes LO, as does the first section of IC-3, opening this part of the 4066

Figure 3.



analog switch. Pin 2 of IC-2a goes HI, closing the second section of the 4066. The module is now "readied," meaning that when the previous source's EOM comes in via EOM In, a LO hits both pins 1 and 4 of IC-3. Pin 4 allows the LO to go to IC-2b. Inverting this puts a "HI" on the Chan On line. This can be used to start a source or turn a channel on.

If we continue the process, our source has now started. At the end of this source, a "LO" will come in via the Machine In line. CR-1 will pass the "LO" on to the next sequencer by way of the EOM Out line. The "LO" also is seen by the circuitry surrounding Q1, the edge detector. Since a "LO" has no effect on the NPN, the circuit is only active when the EOM ends and the line returns "HI." At this time, the positive-going pulse turns Q1 on briefly, and Q1's negative-moving collector triggers IC-4, a one shot, sending a pulse to the Chan Off circuit.

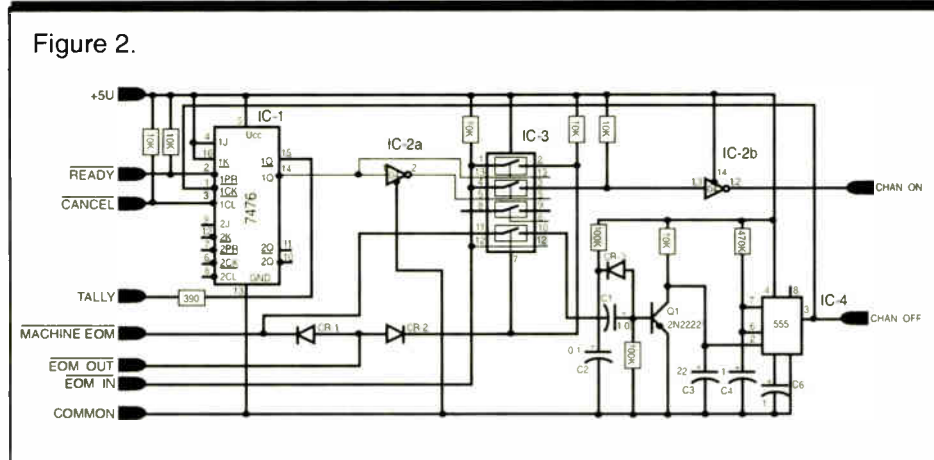
It also is fed back to clock the flip-flop into a non-ready state, and the Ready LED goes out. All this is necessary since we want the next source to start the beginning of the EOM, and we want the channel to turn off at the end of the pulse.

As a system example, we connect 2 cart machines to modules 1 and 2, and two CD players to modules 3 and 4. Using Figure 1, suppose cart 1 is playing a commercial and we wish to follow that with cart 2 (module 2) then skip the first CD (module 3) and play CD 2 (module 4).

We would press "ready" buttons on module 2 and 4. When cart 1's Machine EOM comes in, it would be routed to the second sequencer's EOM In line, and would start the second source, i.e., cart 2.

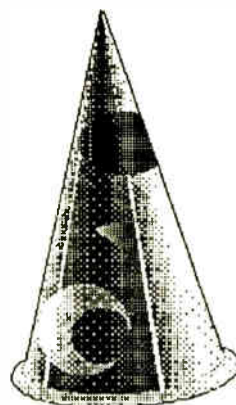
After cart 2 plays, the EOM would cancel the module after sending the LO along to module 3. Since module 3 was not readied, the LO on EOM In would be turned around via IC-3 pins 1 and 2, through CR-2, to EOM out, which is connected to module 4 EOM In. Since it is ready, source 4 would start. After 4 finishes, the EOM would do nothing since all Ready states were canceled.

Since this is a loop, it is somewhat difficult to explain, much like an oscillator circuit. Just remember that the start pulses will travel in ascending order through the modules, and the source that is currently playing need not be readied. Only a follow source must be readied, and any



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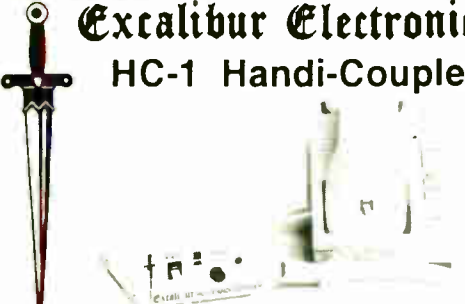
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# Products & Services Showcase

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3CX2500F3/8251		5U4G
3CX2500A3/8161		6A57
4X15,000J/8910		6550B
4CX15,000A/8281		8560AS
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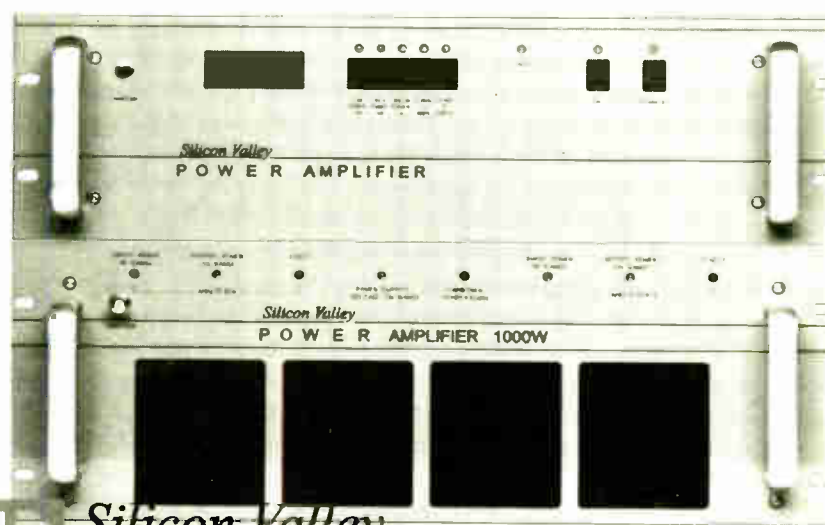
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# MARKETPLACE

Recently Introduced Products for the Radio Broadcast Professional

## Transmitters

The new GZ-Line of grounded-grid transmitters from CCA Electronics Inc. offers increased bandwidth, extended tube life, elimination of the screen-voltage power supply and low AM synchronous noise. The GZ-Line can be used with the CCA FM60G high-performance exciter. These transmitters are available from 8 kW to 25 kW. All CCA FM transmitters include the power supply in a single-cabinet design.

For information, contact Steve McElroy in Georgia at 404-964-3530; fax: 404-964-2222; or circle **Reader Service 32**.



## Reflectometer/ Cable Fault Locator

The new Model 1205C time domain reflectometer/cable fault locator by Riser-Bond Instruments is designed to test coaxial cables as well as twisted-pair. The Super-Store feature provides waveform storage and allows the user to view and compare stored information. Model 1205C stores all on-screen and off-screen cable data for later viewing at all gain levels.

A Wave-View software package turns a PC into a virtual TDR. The user can upload stored waveforms to perform all of the same operation functions possible on the TDR, including manipulation, analysis and documentation. Wave-View software is included free of charge with each Model 1205C.

Other features include Auto-Search, automatic fault severity calculation and independent cursors.

For information, contact Amy Borchert in Nebraska at 402-466-0933; fax: 402-466-0967; or circle **Reader Service 123**.



## Lamp Alarm Relay

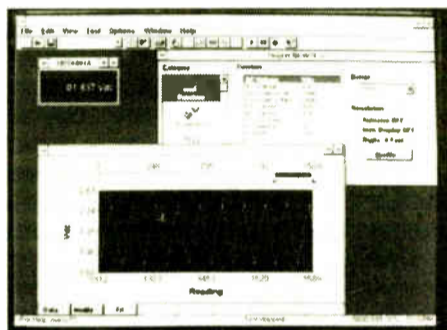
The SCR490D electronic lamp alarm relay from SSAC Inc. can sense a lamp

failure on radio towers and other tall structures. Up to nine 116-W obstruction lamps can be monitored with one unit. Selection of the number of lamps and their respective voltages is made via four switches on the unit.

The SCR490D's toroidal transformer constantly monitors the current flowing in the lamps' wiring. When the current drops due to a lamp failure, the SCR490D's LED lights and its output transfers. A trip delay is included to prevent nuisance tripping.

The SCR490D has two outputs: a solid-state line voltage output to operate a spare lamp (up to 125 W) or an alarm, and a single-pole double-throw relay for a remote alarm system or telephone dialer.

For information, contact Dave Eastwood in New York at 315-638-1300; fax: 315-638-0333; or circle **Reader Service 137**.

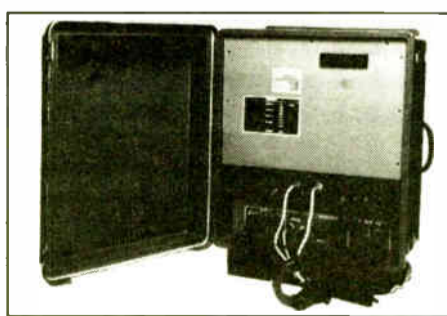


## Connectivity Software

Hewlett-Packard's HP 34812A BenchLink/Meter software allows electronic engineers and technicians to import data from basic test instruments to their PCs. This Windows-based package allows users to transfer data from HP digital multimeters and counters without having to write computer code, simplifying data analysis.

HP BenchLink/Meter uses a PC to capture and display large amounts of data, transforming HP 34401A digital multimeters and HP 53131, 53132 and 53181A counters into single-channel data acquisition systems. Incoming data can be displayed on the PC screen in real time as scrolling strip charts. Once data is captured and stored in PC memory, users can evaluate the entire data stream or specific subsets of data using graphs, histograms and statistical tools.

For information, contact the company's test and monitoring division at 800-452-4844, or circle **Reader Service 62**.



## Power Monitor

The 8020 PQNodePlus from BMI is a transportable, self-contained unit that monitors voltage and current for all harmful power disturbances, including impulses,

waveshape faults, RMS variations and outages. The PQNodePlus can be used as a standalone monitor or with an existing network of 8010 PQNode systems.

The user can connect this unit at one site, obtain data, then relocate it to other critical sites in order to identify power trends throughout a service area.

The PQNodePlus stores up to 7MB of RAM. Data can be transferred to a PC via RS-232 interface or optional floppy disk drive, or remotely, using an optional 9600 bps modem. The system's PASS software for Windows manages the database and provides data for comprehensive report writing.

For information, contact Jennifer McVeigh in California at 408-970-3700; fax: 408-970-3720; or circle **Reader Service 129**.

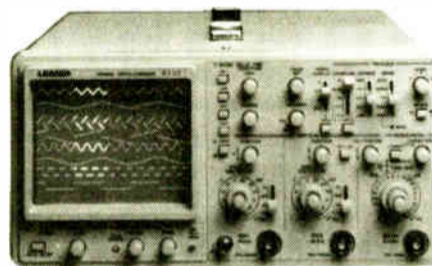
## AES/EBU Digital Metering Module

The LVDIG-1 metering module from Wohler Technologies provides level indication of AES/EBU digital audio signals. Each LVDIG-1 module includes a pair of 10-segment LED level indicators and user-accessible DIP switches for selecting indication modes.

The LVDIG-1 offers a total of eight selectable display modes, including either VU or PPM bar graph display, as well as PPM dot indication over VU bar graph. Three display modes also include a peak hold function, which holds a display of the highest level registered in digital memory until the meter is manually reset.

The module also features two error indication modes: inability to lock to AES/EBU signal on powering up, and signal interrupted during operation.

For information, contact Patrick Hayes in California at 415-589-5676; fax: 415-589-1355; or circle **Reader Service 210**.



## Analog Oscilloscopes

Leader Instruments Corp. has added Models 8104 and 8103 analog oscilloscopes to its 8000 Series of equipment. Both feature 100 MHz bandwidth and three-channel operation. Although each model has the same operating characteristics, Model 8104 adds cursor measurements of voltage, time, frequency and phase, and displays on-screen notices of sensitivity, time base and delay-time settings.

Both scopes offer calibrated delayed sweep with alternate sweep so that the main and delayed traces may be viewed simultaneously. Six traces are displayed in the ALT sweep mode when the three channels are active.

For information, contact Joe Fisher in New York at 800-645-5104; fax: 516-231-5295; or circle **Reader Service 72**.

## ELF/VLF Gaussmeter

Narda's Model 8532 gaussmeter measures magnetic fields from 0.01 mG to 2000 mG with a 50 dB dynamic range. Accuracy at 50-60 Hz is  $\pm 1$  percent of a reading plus one digit.

This unit features a large-character LCD. The frequency switch allows the user to select from the power line frequency, VLF for VDTs, or a wide-band setting that measures 12 Hz to 50 kHz. A video output can be used for spectral analysis. The recorder output allows continuous monitoring of the RMS value.

For information, contact Loral Microwave-Narda in New York at 516-231-1700; fax: 516-231-1711; or circle **Reader Service 184**.

## Transmitter Detector

The Scout from Optoelectronics Inc. is a hand-held device designed solely for detecting radio transmitters in the near field. For walk-by applications, the Scout can automatically detect and record 200 unique frequencies.

When used with the miniature DB32 antenna, the Scout fits in the user's pocket and operates automatically, signalling the user with a pager-style vibration when a frequency is recorded. After recording, the Scout can be downloaded into a computer using the supplied software and an optional TTL to RS-232 interface converter.

In drive-by mode, the built-in beeper signals when the Scout records a new frequency.

For information, contact Dean Iodice in Florida at 305-771-2050; fax: 305-771-2052; or circle **Reader Service 119**.

## Active Subwoofers

QMI, a distributor of Genelec active monitors, now offers the 1092A and the 1094A active subwoofers from Genelec. Both subwoofers are designed to provide additional low-frequency extension, improved dynamic capability and increased sound pressure levels when used with Genelec near-field monitors. The 1092A can be used with the 1030A, 1031A, 1032A and S30C, while the 1094A is intended for use with the 1032A, 1037A and S30C.

Both subwoofers feature a three-channel crossover section with three electronically balanced inputs and floating balanced outputs. The crossover is centered at 85 Hz, with a low-pass slope of 24-28 dB/octave and a high-pass slope of 12 dB/octave. The 1092A and 1094A also offer bass roll-off control, input sensitivity adjustment and active system protection.

For information, contact Barry Fox at QMI in Massachusetts at 508-435-3666; fax: 508-435-4243; or circle **Reader Service 111**.

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World Radio History

# Radio Traffic Control

► continued from page 16

Pacific Recorder channel and you and the caller are mixed into whatever tape machine you selected."

WCHS's Radiomixer console has a 10-line Telos digital hybrid phone system built in; all other studios include the standalone Telos 1x6 hybrid system.

New Otari MX-5050 reel-to-reel recorders were purchased, as were Tascam 122 cassette recorders for all studios except WCAW's. WCAW is satellite-automated with an adult music format, requiring no studio, and it takes its satellite feed direct through the DCS hard disk system. For breaking away to sports

announcements or other program interruptions, WCAW program channels can be usurped by WCHS's air studio or other studios in the building.

This networking of studio operation is an illustration of what Murphy considers the new philosophy in station operation. These days, he said, "stations are getting more into switching than mixing. It's a whole different philosophy."

Few studio designs exemplify this new philosophy better than that of the three on-air studios, where the furniture is arranged in a 'Y.' WCHS's talk show host, for example, can be seated at the apex of the Y, and guests can then be



One of the new studios in Charleston, W.Va.

seated facing the host on the angular part of the Y. "The host has the ability to turn mics on and off," Murphy said, "either individually or as a group, and he can fire off DCS commercial breaks and he can operate the show totally from that position if he wants."

Studio furniture was designed locally. So flexible is the studio setup, according to Murphy, that entire hour-long segments can be pre-programmed.

## Pre-programming

"The producer in the control room can load the entire stop-set separated by an end of cluster for the whole hour, so all the host in the studio has to do is kill all three mics with a button. He has selectable mic kill, (so) he can drop out all three, and with his other hand he can press the DCS to on and that will fire off the stop-set, which will play through the next end of cluster."

All three mics in each studio are preset according to level and ambiance by new Symetrix 425 mic processors. Although both FM on-air studios have the DCS hard disk system, they're on live assist most of their operating hours. Commercials, for the most part, are stored on the DCS hard disk, and music is played live on Audiotronics CD-10 CD players.

"The great thing about the CD-10s is you can adjust power on the laser, so if it starts to die you can increase the power, tracking and focusing, and do a readjustment," Murphy said. "Cart machines are found only in an AM newsroom and a shared FM newsroom."

The WVAF-FM studio, with a contemporary music format, and the WKWS-FM studio, with a country format, face one another across the shared newsroom, which pivots between the two through the control of a PR&E Newsmixer console.

"We're thinking about going wire-ready this year in the news studio," Murphy added. "We can now do wire capture from AP, but we're thinking about doing a star network and being able to capture CBS, ABC and all those services. And that would be available via a server for the studios."

West Virginia Radio is also currently working on a new multitrack studio complex for the FMs, which will replace a temporary production studio now in operation. Plans are to model the new studio after West Virginia Radio's 24-channel production studio in Morgantown, W.Va., and according to Murphy, they will again go first class all the way.

Dee McVicker is a freelance writer and regular contributor to RW. She can be reached at 602-545-7363.



## Manage Your Audio.

The Fast Trac II Voice-over Audio Workstation is an incredibly versatile audio management system ideal for TV audio production tasks.

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Fast Trac II is a 6-input stereo 'micro-console' that provides all the functions of a typical console: input selection, level and

balance control, mic-over-line mixing, and monitoring. Plus, its automatic Machine Control System compensates for the roll-up time of any source, for perfectly-cued dubs with one button ease.

Select from five stereo line sources. Set levels, ride gain and balance, switch in outboard processing gear, mix in a mic, check mono compatibility, monitor tape playback, make dubs with automatic pre-roll timing...and do it all from Fast Trac's comprehensive control panel. It saves time...saves space...saves money.

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World Radio History

## Sequencer An On-Air Boost

► continued from page 40

canceled modules will be skipped.

Some interfacing may be required when connecting to your equipment. The Chan On pulse is a TTL active Hi for the duration of the EOM pulse. I recommend you drive a transistor to which a relay has been connected. The Machine EOM should be dry contacts which ground the line. Most machines provide this contact arrangement.

The tally light should be a LED. If you want an incandescent lamp here, use a transistor driver. Figure 3 has some examples of interface circuits.

This can be etched on a 2-inch x 4.5"-inch PC board, and a vertical side-by-side arrangement works well. Bring out all connections to an edge connector in the rear; make all the through connections here as well. In this manner, you can add as many as you need with room for future expansion.

All chips are standard, and the transistor is a generic NPN. There are no critical components, and any point-to-point wiring system could be used.

You can use a single cancel switch, which resets all modules, or you can use a cancel button for each module. Also, you might want to add a 10 µf capacitor to ground on each cancel switch. This will reset all modules if your power is interrupted.

Using this system with three cart machines and three CD players, I have calculated that your jocks should have enough extra time to finish a Batman comic in less than two hours. And, who knows, it might provide enough extra freedom for them to be just a bit more creative.

□ □ □

James Murphy is director of engineering for West Virginia Radio Corporation. Reach him care of RW.

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Crown D-60 new condition, silver face, with manuals, \$300; Crown IC150 & DC300A preamp & power amp, excellent condition, with manuals, \$400. D Bailey, Rock Shoppe Productions, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

NAD 3130 stereo amp, \$100. R Miller, Miller Media Group, Taylorsville IL. 217-824-3395.

BGW-150 stereo amp, w/impedance matching module, \$400/BO. TVNY Productions, 800-606-8869.

Radix DA-1600 16 chnl, 2 in, 16 out, perfect cond, \$99. R Erak, GMI Media Group, 2012 S 314, Federal Way WA 98003. 206-839-9414.

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McIntosh MI-200 rackmount tube amp. 212-343-0265.

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4 Bay FM 91.5 antenna; Rohn UNR 64' free standing tower, \$1000. M Taylor, KHFO, Rt 1 Box 1821, Neosho MO 64850. 417-451-5636.

ERI FMH-1AE CP FM, on 100.3 MHz, good condition. G Peterson, KFXS, POB 8205, Rapid City SD 57709. 605-348-1100.

Phelps-Dodge CP6 6 bay hi pwr FM on 93.1, \$4000. S King, KMML, 1703 Avondale St, Amarillo TX 79116. 806-355-9777.

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Rohn 45G, 30' new tower, \$850; Mark Grid 10' 950 MHz dish, new never used, \$2000. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

Andrew (2) 2" flanged rigid 3 1/8" sections, in box, never used, \$125 ea; Scala HCDA-5 cut to 92.1, used one year, \$160. K Browall, KTRZ, Box 808, Riverton WY 82501. 307-856-2922.

2 bay FM on 89.3, \$200. R Miller, Miller Media Group, Taylorsville IL. 217-824-3395.

300' towers (2) in WV, buyer responsible for removal, BO. Jack, 304-562-9155.

ERI GSCPS, 8 bays, on 94.9. G Hofer, KJLT, POB 709, N Platte NE 69103. 308-532-5515.

### Want To Buy

225' of 1 5/8" transmission cable. C Belhasen, WRLV, POB 831, Paintsville KY 41240. 606-789-1293.

10-12 bay centered CP system on 93.5 or lower, need high pwr. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

6-8 bay FM on 95.1 or 95.3, prefer ERI or Jampro. L Fuss, WDTL, POB 1438, Cleveland MS 38732. 601-846-0927.

FM antenna tuneable to 105.9 MHz, 6-10 bays; Rohn tower sections No. 25G, 45G, 55G or 26KD, 300' Helix xmsn line 1 5/8" or 3". J Powley, WAOM, 1512 Sherwood Dr, Reidsville NC 27320. 910-342-1843.

## AUDIO PRODUCTION

### Want To Sell

Aphex Expressor, mint/new cond. \$350. R Crabtree, 6201 Grandview Ave, Erie MI 48133. 313-848-6453.

dbx 157 prof 8 chnls, NR, exc, \$500; 2-trk, \$200. H Fenster, Universal R & R, 17 W 20th, NY NY 10011. 212-929-3277.

Dolby 363ASR noise reducer, \$600; Dolby SDU-4 surround decoder, \$350/BO. TVNY Productions, 800-606-8869.

Henry Engineering Mix Minus Plus, \$90; Henry Engineering LogiConverter, \$90; Valley Int'l HH2X2B level matching interface. C Scherer, WMM5, 200 Skylight Office Twr, Cleveland OH 44133. 216-781-9667.

Phase Linear auto correlator, single ended NR/expander, excellent condition, \$200. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

8 track studio equipment, complete studio. H Sewell, Oakridge, 2001 Elton Rd, Haltom City TX 76117. 817-838-8001.

Aphex 10/4 audio interface, -10/+4, \$99. R Erak, GMI Media Group, 2012 S 314, Federal Way WA 98003. 206-839-9414.

Cypher time code generator/reader system with video inset card, Shadow II time code module, machine control synchronizer and Softtouch keyboard controller with micro computer regulator, excellent condition, \$6000/BO. K Johnson, Audio One, 325 W Huron St, Chicago IL 60610. 312-337-5111.

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McMartin LR1004C comp/limiters, \$300/pr; Altec 1589C mic pre, stereo in, mono out, \$125/ea or 3/\$300; Kahn Symetra Peak SP51a passive filters, \$300 pr; Ampex AM-10 6 chnl mic pre/mixer, stereo out, \$175. R Santo, Box 634, Bryantville MA 02327. 617-293-5671.

ADC 1/4" patchbays and cords, NEW, UNDER HALF PRICE, ADC TT patchbays, \$129 up, NEW cords, \$9.95. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Lectrosonics VHF RF mic with Tram, \$750; SQN 4S portable stereo mixer, \$2000; 360 Systems 16" 16 electronic patch bay, \$700; Nagra OQB 10" reel adapter, \$600; Casio FZ-1 sampling keyboard, \$500; 16/35 MTM 2 track mag recorder, \$5000; More, call for faxed list. Billy, 914-666-0233.

UREI LA4 mint pr, \$1095; Lexicon Alex, \$295; bulk eraser, \$49; Stewart direct boxes mono, \$50; 4 Ch, \$95; Cue command decoder, \$125; ABC Network decoder, \$125; NEW Tascam midiizer MTS1000, \$750; Dyna stereo 120 rack mount amp, \$229; Sherwood FM tuner, new tubes, \$49; Infonics 7" reel copier 3 copies, \$125 ea; Crown & Furman elec crossovers, \$95. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

### Want To Buy

Telephone to cart deck interface. Henry Engineering TelecartII, BE PC-1 or similar device. Andy, Ski Areas of NY, 315-696-6550.

Altec 436A, Roland Dimensions D, Ampex MS-10, Roland SDE-3000 and old tube Fender amp in need of repair. R Santo, Box 634, Bryantville MA 02327. 617-293-5671.

Howe stereo Phase Chaser corrector. J Luebke, 10490 Taconic Tr, Cincinnati OH 45215. 513-772-1919.

Ampex tube mixers, plug-in mic pre-amp modules for PR10's. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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Aphex 'Dominator II' Stereo Limiter -	Rebuilt	\$ 795
Orban 622B Stereo Parametric Equalizer -	Rebuilt	\$ 395
Samson Stage 22 Instrument Pack Wireless Mic. -	Close Out	\$ 179
Shure SM-82 Line Level Microphone -	Used	\$ 95
Technics SL-P1200 CD Player - Pro Model -	Rebuilt	\$ 595
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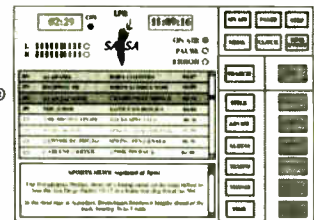


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### Want To Sell

Printed circuit cards for model 452 bi-directional Carousels, DS-20 switcher, ITC SP & RP cart machines. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

SMC DP-2 complete w/350 (3) and 450 (1) Carousels, ITC reel (4), ARS1000 reel, will part out. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

SMC DX-20 switcher w/PDC clock, pwr sup, encoder w/video terminal, sell as pkg or by piece. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

SMC 24 cart mono (6), in racks, \$300/all. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

360 Systems DigiCart w/400 MB internal hard drive, Dolby AC-2 compression, \$3500. L Fuss, WDTL, POB 1438, Cleveland MS 38732. 601-846-0927.

BE automation syst with controller, live assist racks, Carousels (4), ARS1000 (2), 48 tray Insta-Cart w/interface, Wegener satellite receiver, all service manual, excellent condition, \$5000. F Hoffman, Corpus Christi TX. 512-851-1725.

Cetec Audiofile II (2), 1 gd cond, other for parts, you pick up or pay shipping. \$275/both. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Cetec 7000 w/5045 event memory; 350 series Carousels (4); 250 series Carousels (3), \$1000. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Drum/tray motors for IGM 250 or 350 Carousel, never used, \$100. F Vobbe, GNBC, Box 5031, Lima OH 45802. 419-228-4199.

MW Persons 3-A programmer, \$375. G Fuller, WKKR, 205-745-4656.

Sentry ES-12 audio controller with 20 Pioneer 6 pack CD players, \$6500/BO. C Stalnaker, KDDK, POB 100, Little Rock AR 72203. 501-372-7740.

Sentry FS-12C, good/excellent condition, \$1400. Call 806-372-5130.

Smartcaster 8 kHz mono HD audio computer, 4 hours storage, recent factory refurbished, \$3500. R Miller, Miller Media Group, Taylorsville IL. 217-824-3395.

SMC 24 cart mono, 6 complete units in racks, \$300. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

Cetec 7000 automation system. With (3) terminals, (9) ITC R-R, (5) Sono-Mag carousels, (2) 48 tray ITC Instacarts. System price \$5000. Call Tu-Mar Broadcasting, Houghton MI. 906-482-7700.

Smarts SAT-PAC Smart Caster w/100 Meg HD, dbx external audio processor, Smarts Isobar Line filter and UPS emergency power supply. Best Offer, include shipping. Dave Peters, Norwest Financial. 800-247-0032.

### Want To Buy

SMC 250 Carousel manual. J Chion, Rt 2 Box 533, Tall FL 32311. 904-878-5746.

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ITC 3 deck mono w/spare motor and top bearing, \$950. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

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ITC RP/Premium mono, 3 tone R/P, all mods, vgc, incl spare audio card, starter cap and manuals, \$750; RCA RT-27A (3), RT-7A (2), spare parts, spare motor, all docs, \$75 + shpg. F Vobbe, GNBC, Box 5031, Lima OH 45802. 419-228-4199.

BE 5300C tripledeck, stereo, PB, mint less than 50 hours, Best Offer. R Kaufman, Pams Productions, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

Fidelipac CTR-100 (9), play only, \$500; CTR-100 (2) R-P, \$700. G Saber, WQOK, 8601 Six Forks Rd, Raleigh NC 27615. 919-848-9736.

ITC PB decks (4), \$125. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

ITC Delta R/P, almost new, \$1000/BO. C Scherer, WMMS, 200 Skyline Office Twr, Cleveland OH 44133. 216-781-9667.

BE PT-90PS, stereo, NEW, never out of box, \$1295. Call Eric at 503-671-9424.

Tapecaster 700P some VGC. \$195; older 700P, \$125. A Ishkanian, Focus on Truth, 132 Arbor Oak, Ashland VA 23005. 804-752-6942.

BE Spotmaster Super B, R/P, pay shipping and it's yours. B Howard, KOFO, 320 E Radio Rd, Ormsa KY 66067. 913-242-1230.

BE 3000 R/P in good condition, Best Offer. D Missad, WOOD, 180 N Division, Grand Rapids MI 49503. 616-459-1919.

Fidelipac CTR-90 stereo play, \$600; ITC WP stereo R/P, \$650; ITC WP mono R/P, \$550. G Fuller, WKKR, 205-745-4656.

AudiCord mono cart machine, mint condition, \$650.00. Call 806-372-5130.

Spotmaster TP1A cart winder, w/new splice block, vgc, \$100. F Vobbe, GNBC, Box 5031, Lima OH 45802. 419-228-4199.

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Harris Criterion 90 rk mting. P Gray, KJDY, POB 399, John Day OR 97845. 503-575-1185.

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Ampex/Schafer AG 440 (2), 2 trk repro decks, rack mt, \$200/ea. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Audio Technica RMX664 4 trk, R/P, 6 chnl mixer/rcdr, 2 cue sends, phantom pwr, low speed/high speed R/P, parametric EQ she'ving, w/schematics, \$600. G Fitzgerald, Fitzmusic, 37-75 63rd St, Woodside NY 11377. 718-446-3857.

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Otari MX 5050, 1/2" 8 trk, \$1000; Otari MTR 12, 1/4", 2 trk w/time code brd, \$1500; Otari 5050 MKIII, 1/2", 4 trk, \$1000. D Gaydos, WNYU, 721 Bdway, NY NY 10003. 212-998-1663.

Panasonic SV-3700 DAT machines (2), \$1200/ea. M Seaver, KUQA-TV, 510 Maine, Quincy IL 62300. 217-222-6200.

Scully 280, 2 trk, PB only, 7.5 & 3 3/4 ips, \$200; Teac A-2000, 1/4 trk R-P, exc cond, \$200. L Wagner, POB 1788, Orlando FL 32802.

Tascam TSR-8 1/2", 8 trk, mint, less than 10 hrs, inc remote, \$1900/BO. R Crabtree, 6201 Grandview Ave, Erie MI 48133. 313-848-6453.

Fostex R8 8 trk, 1/4", never used, \$1800. J Davis, WJSP, Rt 1 Box 140, Warm Springs GA 31830. 706-655-2145.

Revox PR99 near mint stereo, reproduce only R-R w/25 Hz decoder, \$400. M Persons, 402 Buffalo Hills Lane, Brainerd MN 56401.

Scully 284B gd cond, \$5000. H Sewell, Oakridge, 2001 Elton Rd, Haltom City TX 76117. 817-838-8001.

Sony TCD-D7 used twice, pwr supply and manual, \$425. C Denison, Crystal River Prod, POB 722, Thompson Falls MT 59873. 406-827-4611.

3M M79 24 trk w>Select Take 2, \$7000; Ampex A 440-B, 1" 8 trk, \$1000. B Yauger, VCA, 9332 Larson Road, Cassville NY 13318. 315-839-5841.

Ampex ATR800 \_ 2 track w/remote, pedestal and spare electronics, \$2000. B Yauger, VCA, 9332 Larson Road, Cassville NY 13318. 315-839-5841.

Inovonics 380, gd cond, BO; Akai 4000 DS MK II, gd cond, BO. D Missad, WOOD, 180 N Division, Grand Rapids MI 49503. 616-459-1919.

Ampex ATR 100 (2) 4 trk \$3500 ea, 2 trk 1/2" \$4000, (2) 2 trk 1/4" \$2500 ea. 212-343-0265.

ITC 750 (2) stereo decks, \$150/ea; Scully 280-B SP-14 stereo rcdr, \$400; Ampex 440-C stereo rcdr w/console, \$800. G Fuller, WKKR, 205-745-4656.

ITC PB decks, \$125. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

NAGRA-3 w/pwr sup, R-R, exc cond, \$1000; MCI 8 trk w/remote, exc cond, \$2000/OBO; Otari 8 trk w/auto locator, R-R, exc cond, \$2000. K Johnson, Audio One, 325 W Huron St, Chicago IL 60610. 312-337-5111.

Otari 7308 8 trk 1" recorder, low hrs, heads exc, 15/30 ips, w/remote, \$2500; Studer Revox PR99 2 trk, 7 \_ & 15 ips, low hrs, exc cond, \$1600; Ampex 440, 2 trk R/P 7 \_ & 3 \_ ips, \$500; Scully 280, 2 trk, PB only, 7 \_ & 3 \_ ips, \$200; Teac A-2000 1/4 trk R/P, 7 \_ & 3 \_ ips, exc cond, \$200. L Wagner, ARN, POB 1788, Orlando FL 32802. 407-299-1299.

Otari MX 5050 2 chnl R-R, exc cond, \$950. P Kelner, 11461 Encore Dr, Silver Spring MD 20901. 301-681-9257.

Revox A77B gd cond, \$100+ or trade. A Branch, WGHR, 2402 Woodridge Dr, Decatur GA 30033. 404-325-7847.

Revox PR99 2 trk stereo PB, \$500. C Stalnaker, KDDK, POB 100, Little Rock AR 72203. 501-372-7740.

Scully 284 1" 8 trk R-R, take up reel, alignment tape and manual inc, gd cond, BO. F Cataldo, FC Sound, 351 Carlsam Dr, Rochester NY 14609.

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Scully 250 R-P R-R 3 \_ and 7 \_ speeds, \$100. R Miller, Miller Media Group, Taylorsville IL. 217-824-3395.

Tascam MSR 16 \_ 16 trk dbx-1 parallel and serial ports, \$2800. D Lewis, 4th St Studio, 88 4th St, Bangor ME 04401. 207-941-0810.

Otari 5050-SHD 8 trk 1/2" newly rebuilt, heads have full, life left, \$1600. W Gunn 619-320-0728.

Otari Mark II-IV 1/2" 4-track, multi-track, mint, less than 50 hours, Best Offer. R Kaufman, Pams Productions, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

Scully '100' recorders, record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 4646 Houndshaven Way, San Jose CA 95111. 408-363-1646.

Uher CR134 cassette, \$195; DAT decks w/new heads \$550, Tascam ATR 60 8 trk w/stand, remote, \$3250; Otari 5050-8 no hrs on heads, \$1595, Ampex 440B-8, \$2450; Tascam 25-2, \$695; Ampex ATR700, \$695; Scully 16 trk 2", \$3450; Tascam 52 top of line, \$950; M79-24 fully rebuilt, \$11,500; Tascam locator for 85-16, \$495; Fostex E22 1/2" timecode deck, \$1400; Fostex A80 8 trk w/450 mixer, \$1350; Tascam 5, \$450; Nagra 10" reel adaptor, \$950. W Gunn, POB 2902, Palm Springs, CA 92263. 619-320-0728.

UHER 4400 report monitor, \$650; UHER 440IC stereo, \$125. S&G Electronic, 215-474-7663.

### Want To Buy

Inovonics 405 unit for Ampex transports or equiv. D Dintenlass, 206-784-4803.

Ampex ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

NAGRA 4S, crystal sync not necessary. Reasonable price. Noel 215-474-7663.

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### Want To Sell

Opamp Labs 2008-RS, 20 input, 8 buss + stereo out, 2 16x2 remix/cue sections, \$1500. L Wagner, ARN, POB 1788, Orlando FL 32802. 407-299-1299.

Tandy TRS 80 model 2 w/DMP 120 printer, \$100. R Miller, Miller Media Group, Taylorsville IL. 217-824-3395.

## CONSOLES

### Want To Sell

Alesis 1622 16 chnl mixer, \$425. G Fitzgerald, Fitzmusic, 37-75 63rd St, Woodside NY 11377. 718-446-3857.

MCI JH416 18x4x2 rcdng console w/patchbays and producers desk, updated w/5534 chips, \$3000. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Micro Trak Sports Remote mixer, almost new, \$100. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

Quad-eight 248 series, 6 stereo w/4-to-one stereo mix line inputs, 3 mic/line EQ inputs, 4 output chnls. B Maxwell, Maxwell Productions, 412-441-2020.

Soundtrax FME-12/4/2 stereo mixing console, 5 yrs old, \$4500/BO. TVNY Productions, 800-606-8869.

McMartin B-803 needs amp and monitor, \$50 + shipping. B Howard, KOFO, 320 E Radio Rd, Ormsa KY 66067. 913-242-1230.

Audionics 8x4x2 w/pwr sup, patch bay, custom made cabinet, exc cond, \$3500/BO; Studer 12x2 portable w/custom made cabinet, gd cond, \$4000. K Johnson, Audio One, 325 W Huron St, Chicago IL 60610. 312-337-5111.

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AT w/sports background looking for FT news and PBP position. Lisa, 612-788-5495.

20+ yrs SBE cert, broadcast school grad ACE experience, FCC, 1st cl gen/radar, marine, extra, ham, RP, seeks job in KY. C Hamlin, 606-523-0901.

Bdctng student would like opportunity to heat up your station. Roosevelt, 405-631-1187.

CE/TD 25+ years exp domestic and int'l, AM stereo to 150 kW, FM to 100 kW ERP, digital audio and computer literate, prefer FL or SE. Bruce, 915-833-7651.

Finally a personality who CAN do it all, prgmmg, prod, copy, on-air, and more. Joe, 813-772-8170.

I will work great personality, can do talk, news and public affairs, all formats. Steve, 708-757-7275.

Christian broadcaster looking for prog pso in small market, NW or AZ preferred, 20 years exp. E Puchalski, 909-889-3812.

## HELP WANTED

Assistant Chief Engineer for St Louis FM/FM/AM trombo. Prior experience in all areas of studio and transmitter maintenance required. FCC license, SBE certification and computer knowledge a plus. Resume and references to Bob Hoffman at WKXX-FM/WKQB-FM/AM, 111 West Port Plaza, Suite 1000, St Louis MO 63146. EOE. MF.

## HELP WANTED

### CHIEF ENGINEER

Sun, Beaches, Fun! 100kW Florida FM seeks energetic team player who has strong transmitter and studio knowledge. Good communications/people skills a must. Good benefits. Send resume, salary history, references to Radio World, POB 1214 Falls Church, VA 22041 Attn: Box 95-01-25-02RW-EOE

National/Int'l Sales Industry leader seeks experienced Bdct Equipment Sales professional. Position can lead into upper mgmt in 1st year! For consideration contact: Bob Vaughan  
**309-685-6273**  
FAX 309-685-8860.

### ELECTRONICS ENGINEER

Minimum 3 years broadcasting experience, with customer service exper. w/electronic assembly/repair. Provide technical support w/products including application, specification, theory of operation, troubleshooting, etc. Send resume to:  
J. Murray, ORBAN  
1525 Alvarado St.  
San Leandro, CA 94577  
EOE

## ABOUT OUR EMPLOYMENT SECTION

**HELP WANTED:** Any company or station can run "Help Wanted" ads for \$1.50/word or buy a display box for \$60/column inch. Payment must accompany insert, use your MasterCard or VISA; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$10. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for details.

**POSITIONS WANTED:** Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 2 issues of Radio World. Contact information will be provided, but if a blind box number is required, there is a \$10 fee which must be paid with the listing (there will be no invoicing). Responses will be forwarded to the listee, unopened.

Mail to:  
**BROADCAST EQUIPMENT EXCHANGE**  
PO Box 1214, Falls Church, VA 22041  
Attn: Simone Mullins

### CONSOLES...WTS

BE 8 ch Spotmaster stereo board, ok cond; Carvin MX 1202, 12 chnl, BO, D Missad, WOOD, 180 N Division, Grand Rapids MI 49503, 616-459-1919.

EV/Tapco 6000R 6 chnl rack mixer, XLR inputs, hi & lo EQ, reverb, \$200. W Haley, Rt 2 Box 362-B, Gordonsville VA 22942, 703-832-5247.

**AMPRO  
CONSOLES &  
CART RECORDER  
PARTS AND SERVICE**

**SEQUOIA  
ELECTRONICS**  
(408) 363-1646  
FAX (408) 363-0957

RCA BC-7, 10 chnl, stereo, \$600; LPB 5 chnl mono, \$750. G Fuller, WKRR, 205-745-4656.

Tascam M216 16 chnl stereo mixer, \$600; Sparta 5 pot board for parts, \$50. R Miller, Miller Media Group, Taylorsville IL, 217-824-3395.

Mackie 1604, \$575; Soundcraft Spirit 24x24, \$3950; Ramsa 820 20x8x16 w/meter bridge, \$1950; Quantum 23x16x24 as used by LA Philharmonic, \$4450. W Gunn, POB 2902, Palm Springs CA 92263, 619-320-0728.

#### Want To Buy

Tascam M-208 or M216, mixer in perfect condition. N Sabu, Joyful Sounds Rec, 48 Moody Road, N Little Rock AR 72120, 501-835-7260.

Gates Yard, tube or solid state. E Allman, WFIV, POB 555519, Orlando FL 32855, 407-847-4422.

Neve consoles: any condition or parts. Also: UA, UREI, Teletronics, Fairchild, RCA, PuDoc, API, any TUBE GEAR or COMPRESSORS. Call 201-798-2745 or fax 201-963-4764

Tascam 106 6 in, 4 out w/EQ. C Springer, KLMR, POB 890, Lamar CO 81052, 719-336-2206.

Gates Yard, Yard II or Studioette, need not be working, power supply not required, must be cosmetically clean, prefer low price/trade. F Vobbe, GNBC, Box 5031, Lima OH 45802, 419-228-4199.

Neve console, any type and parts. 212-343-0265.

### DISCO-PRO SOUND EQUIPMENT

#### Want To Sell

Opcode Studio 3 MIDI interface, \$150. G Fitzgerald, Fitzmusic, 37-75 63rd St, Woodside NY 11377, 718-446-3857.

Digitech 256 XL multi-effects processor, low hrs, exc algorithms, \$250; Tascam PB-23P, patchbays, 32 1/4" points front and back, mint cond, \$75/ea or \$300/all. M Ravain, Trinity Christian Rec, POB 2479, Flaglor Beach FL 32136, 904-439-3671.

Electro-Voice Delta Max 15" concert speakers w/controller, low hrs, no aero-quip, \$2000/pr; JBL 4312A studio monitors, 12", 3 way mirror image, mint cond, \$500/pr. M Ravain, Trinity Christian Rec, POB 2479, Flaglor Beach FL 32136, 904-439-3671.

Realistic MD 1800 speakers (2), \$100/pr. R Miller, Miller Media Group, Taylorsville IL, 217-824-3395.

### EBS EQUIPMENT

#### Want To Sell

### NEW REQUIRED EBS SHORT-TONE Decoder Mod. Kits

Easy - Low Cost - FCC legal!  
**1-800-669-3993**  
MC - Visa - America Express

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**Call Mark Wilson**  
(800) 275-0185

### LIMITERS

#### Want To Sell

CRL FN4 system consisting of SP800, SEP400A (2), SMP800 and Orban Optimod 8000A, \$2500. G Peterson, KFXS, POB 8205, Rapid City SD 57709, 605-348-1100.

EXR SP-2 projector, stereo audio exciter, \$99. R Erak, GMI Media Gro.p, 2012 S 314, Federal Way WA 98003, 206-835-9414.

Orban 8100A w/XT chassis, vsc, \$4100; Modulation Sciences CP803, composite clipper, \$500. G Saber, WQOK, 8601 Six Forks Rd, Raleigh NC 27615, 919-848-9736.

Raytheon tube limiter, mono behemoth, \$300. F Santo, Box 634, Bryantville WA 02327, 617-293-5671.

#### Want To Buy

Optimod 8000 & 8100 in any cond; FM xmtrs in any cond. G Evans, Evans Communications, POB 7762, Amarillo TX 79114, 806-355-3517.

Fairchild 670 or 660 tube compressor/limiter, Teletronics LA-2A tube compressor/limiter or UREI LA-3A solid state compressor/limiter, call after 3PM CST, 214-271-7625.

### MICROPHONES

#### Want To Sell

Audio-Technica AT 831 lavalier mics (5). C Springer, KLMR, POB 890, Lamar CO 81052, 719-336-2206.

AKG C422EB, large diaphragm stereo, phantom power, remote pattern selector, 20-meter cable, windscreen and shockmount, excellent condition, \$1850; AKG D-140 cardioid, \$225/pr; AEA MS-38 DM dual matrix decoder, line-level in and out, \$250. R Streicher, Pacific Audio-Visual, 545 Cloverleaf Way, Monrovia CA 91016, 818-359-8012.

Shure VM-1 mic stand isolators (4), \$25. W Haley, Rt 2 Box 362-B, Gordonsville VA 22942, 703-832-5247.

EV RE20's, \$275-325; Sony ECM377 large dia. cond mic, \$495; RCA 44BX matched set of 3, \$3950; Shure new SM7, \$395; AKG new D112, \$295; Crown GLM200 lavalier like new, \$125. W Gunn, POB 2902, Palm Springs CA 92263, 619-320-0728.

#### Want To Buy

RCA mics, call plates, on air and recording lights. J Phillips, 414 Washington Ave, Defiance OH 43512, 419-782-8591.

Neumann KM88 wish to purchase any or AKG junkers for parts. W Sear, Sear Sound, 353 W 48th St, NY NY 10036, 212-582-5380.

RCA Bk6-B, lavalier mic. D Dintenfass, 206-784-4803.

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

RCA 77DX's/44BX's ribbon, chrome/TV grey, gd cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046, 214-271-7625, after 3PM CDT.

RCA ribbons, AKG 451's, Neumann KM84's, EV 635A. W Gunn, POB 2902, Palm Springs CA 92263, 619-320-0728.

### MISCELLANEOUS

#### Want To Sell

AT & T Partners, 2 line x 6 set telephone system, incl 5 sets, new. C Springer, KLMR, POB 890, Lamar CO 81052, 719-336-2206.

Need 70s music? Pop, disco, rock, novelty, DAT or reel, great rates, send list to: Eric Scott Productions, POB 5023, Veirs Beach NH 03247, 603-366-2013.

6' equipment rack. D Missad, WOOD, 180 N Division, Grand Rapids MI 49503, 616-459-1919.

Alden C-2000M color radar w/Sony trinitron monitor, \$1000. C Porter, WCAZ, POB 498, Carthage IL 62321, 217-357-3128.

Equipment racks 54.25" panels space, 30" deep w/casters and internal ventilation, \$150 ea + shpg. D Barnett, KKUP, POB 820, Cupertino CA 95015, 408-325-5015.

**AUDIO TRANSFORMER MAGIC**

9K-600-6

**audisar**  
P.O. Box 1561, Bellevue, WA 98009  
206-454-2040

Circle (206) On Reader Service Card

### MONITORS

#### Want To Sell

McMartin TBM 10050 FM rebroadcast receiver, new, for rebroadcasting, simulcasting, translators or monitoring of RF, modulation, or injection. ALSO: (used) AM/FM modulation monitors. Buy or Sell, Repair & Calibrate McMartin, Belar, Call Goodrich Ent Inc., 11435 Manderson St., Omaha, NE 68154, 402-493-1886 fax 402-493-6821

#### Want To Buy

Belar, TFT or similar, FM modulation monitor, stereo. J Powley, WAOM, 1512 Sherwood Dr, Reidsville NC 27320, 910-342-1843.

### RECEIVERS & TRANSCEIVERS

#### Want To Sell

GE Superadio III, custom modified w/noise free SCA w/improved selectivity & sensitivity, \$95. Other modifications avail. Performance guaranteed **800-944-0630**

Sony ST555ES stereo FM tuner, 8 presets, 2 antenna inputs, \$125. R Streicher, Pacific Audio-Visual, 545 Cloverleaf Way, Monrovia CA 91016, 818-359-8012.

### SCA RECEIVERS—ALL TYPES

Reading Service / Ethnic / Data Professional / Table Will work to meet your receiver needs

DAYTON INDUSTRIAL CORP. (Manufacturer) 2237 Industrial Boulevard Sarasota, FL 34234 Tel: 813 351 44545 FAX: 6081

#### Want To Buy

FM tuner/receiver with multiples MX or composite output. B Campbell, KRIG, Bartlesville OK, 918-333-7943.

## DISTRIBUTOR DIRECTORY

The following distributors serving the broadcast industry would be glad to help you with any of your requirements.

### CORNELL-DUBILIER MICA CAPACITORS

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**1-800-955-6800**  
ask for Kathleen

**PHONE: 703-998-7600 FAX: 703-998-2966**



Call Simone Mullins, Classified Ad Manager, to reserve space in the next issue. Use your credit card to pay, we now accept VISA and MASTERCARD.

## RadioWorld

5827 Columbia Pike, 3rd Floor  
Falls Church, VA 22041

### Select from these categories for best ad positioning:

- |                            |                           |                          |
|----------------------------|---------------------------|--------------------------|
| Acoustics                  | Consoles                  | Software                 |
| Amplifiers                 | Disco-Pro Sound Equip.    | Stations                 |
| Antennas & Towers & Cables | Financial Services        | Stereo Generators        |
| Audio Production (Other)   | Leasing                   | Tapes, Carts & Reels     |
| Brokers                    | Limiters                  | Tax Deductable Equipment |
| Business Opportunities     | Microphones               | Test Equipment           |
| Cart Machines              | Miscellaneous             | Transmitter/Exciters     |
| Cassette & R-R Recorders   | Monitors                  | Tubes                    |
| CD Players                 | Receivers & Transceivers  | Turntables               |
| Computers                  | Remote & Microwave Equip. | Positions Wanted         |
|                            | Satellite Equipment       | Help Wanted              |

### Classified Advertising Rates Effective January 1, 1994

	1x	3x	6x	12x
1-9 col inch (per inch)	\$60	58	54	49
10-19 col inch (per inch)	55	52	49	44
Distributor Directory	100	95	90	85
Professional Card	65	60	55	50
Classified Line Ad		\$1.50 per word		
Blind Box Ad		\$10 additional		

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 \$180, at the 3x rate \$174, at the 6x rate \$162, at the 12x rate \$147, etc.

## REMOTE & MICROWAVE EQUIPMENT

### Want To Sell

Advanced Micro remote control, \$600. S King, KMML, 1703 Avondale St, Amarillo TX 79116. 806-355-9777.

**SUPER ROVING RADIO...** five year...excellent condition, new, \$40,000. Make offer. Send replies to: Radio World, POB 1214, Falls Church VA 22041. Attn box #: 95-2-8-01RW.

### Want To Buy

Composite STL's (2). P Gray, KJ DY, POB 399, John Day OR 97845. 503-575-1185.

**RENT IT HERE!** Call Steve Kirsch for Details

**COMREX** 1, 2 & 3-Line Extenders Switched 56/ISDN Systems

**TELOS** Zephyr Digital Phone Hybrids

**GENTNER** EFT 3100 3-Line Extenders

**SHURE** FP-410 Automatic Mixers

**REMOTE AUDIO PACKAGES**

**SILVER LAKE AUDIO • 516-623-6114 • FAX: 516-377-4423**

Davis Communications Group Cellular prod unit to interface bdct remote mixer to a cell phone, incl docs and adaptor for Uniden CP2000, gd cond, BO. G Peterson, KFXS, POB 8205, Rapid City SD 57709. 605-348-1100.

Marti STL on 102.1, exc cond, \$1000. L Pesce, KBIX, 5107 32nd St, Tulsa OK 74129. 918-742-2228.

MCI PRS-10 composite STL, 945.0 mHz. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

CCS CDQ2000 encode/decode system w/5 multirate DSU's for switched 56 service, \$5200; Wegener 1600 card cate w/tone encoder card and PANDA2 card, \$700. D Ryan, RSN, 800-742-3969.

Burk TC-R set up for phone line use, incl RP-B relay panel, \$1200. J Katonah, WFGB, POB 777, Lake Katrine NY 12449. 914-336-6199.

Hallikainen DRC 1900, studio and xmtr units, \$900. F Hoffman, Corpus Christi TX. 512-851-1725.

MicroTrak sports remote mixer, almost new, \$100. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

**WE RENT**

**TELOS ZEPHYR**

**QEI QUICK-LINK** Stereo RPU, NO License

Frank Grundstein  
Audio/Video Consultants  
COMREX 3 line extender  
610-642-0978

Moseley MIU-2 AM metering insertion unit, \$125. C Stalnaker, KDDK, POB 100, Little Rock AR 72203. 501-372-7740.

TFT 7601 remote cntrl, 10 chnl, gd cond, \$550. B Spitzer, WLS Communications, Box 460, Rapid City SD 57701. 605-343-6161.

Sine Systems DAI-1/PS-1 dial up audio interface, unused, \$625; Rust remote, \$65. Ferguson 602-772-4866 FAX/VOICE.

Marti MR-30/150-170 RPU Rcvr, \$75. M Persons, 402 Buffalo Hills Lane, Brainerd MN 56401.

STL rcvr, 950 MHz band, working or not for low price or tax deduction. D Bamett, KKUP, POB 820, Cupertino CA 95015. 408-325-5015.

## SATELLITE EQUIPMENT

### Want To Sell

## BUY

Satellite Systems pays cash for Westwood One Radio Networks satellite receivers!

## REPAIR

Satellite Systems repairs all major brands of satellite equipment, including the Fairchild Dart 384 and Scientific Atlanta. Our turn-around time averages under 24-hours. Plus, we provide pre-and post-service support along with a 90-day warranty.

## SELL

Ariel Digital Satellite Receiver-5 card slots, Fairchild compatible.

Zephyrus SPC 700 System Receiver and other available models. Just call and ask!

## SATELLITE SYSTEMS

Satellite Equipment for Radio

615 East Brookside  
Colorado Springs, CO 80906  
(719)634-6319 Fax: (719)635-8151

**UNIVERSAL SPC XE-1000**

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**SCPC BROADCAST AUDIO RECEIVER**

New, affordable, frequency-agile receiver, direct channel entry by keyboard, selectable companding 1:1, 2:1, 3:1, wide/narrow bandwidth, de-emphasis selectable, 950-1450 MHz, line output 600 ohms, muting, transponder agile, LNB power supply, 50-channel memory, full baseband output, high-quality audio. Every needed feature at a sensible price (lowest in the industry). Write or call for full information on this quality receiver—the answer for your station. Networks call for prices.

Phone: (614) 866-4605 Fax: (614) 866-1201

**UNIVERSAL ELECTRONICS, INC.** 4555 Groves Road, Suite 12 Columbus, OH 43222  
Communications Specialists Phone: (614) 866-4605 Fax: (614) 866-1201

Tru-Spec LA-915 LNB line amps, 20 dB gains, low noise, 2 dB, \$11/ea. A Wudel, ILCC, S 18th St, Esterhill IA 51334. 712-362-4119.

Wenener 1601-50 mainframe, 1605-03 pwr sup, 1638-08 RX translator 9.69 MHz, 1606-21 block convertor, 1646 dual 35 Hz tone decoder, 1645 dual 25 Hz tone decoder and 1622 dual demod, BO. G Peterson, KFXS, POB 8205, Rapid City SD 57709. 605-348-1100.

Colorado Magnetics Satcue 500, audio switching unit. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

## SOFTWARE/DATABASES

### Want To Sell

**U.S. RADIO STATION DATABASE:** stand-alone program containing 11,825+ stations. Many searches, prints mailing labels, MAC/IBM (specify disk size). Visa/MC \$129.95/yr. (+quarterly updates):

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## STATIONS

10k AM, non dir, C-QUAM stereo, N Central AZ. 602-774-0864.

Building, property, xmtr in Takio MO, \$50,000. K Wolf, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Central WV 25 kW FM, 1 kW AM combo, \$310,000 cash sale. Jack, 304-765-7373.

FM stn w/land, building and xmtr in Tarkio, MO. \$50,000. 816-542-0404.

MANCHESTER NH 5kw-U WKBR, \$290k. Additional 46-acre site option. Bob 617-449-5618.

Three UHF 1 kW community broadcast TV stations in N.W. Indiana, presently in network configuration. Contact Tom, 60 Stagecoach Rd, Portage IN 46368. FAX: 219-763-6349.

### Want To Buy

Midwest bdct veteran seeks AM/FM or FM only, owner-operator situation, \$1 million and under considered. B Holtan, 3619 Greendale Ct, Eau Claire WI 54701. 715-831-8110.

**Your line ad could be here!**  
**Call Simone Mullins**  
**100-336-3045**

Small AM or FM in college mkt. Mr. Ford, 310-423-3899.

AM/FM combo or stand alone, need small to medium mkt, will consider others. B Coleman, Coleman Communications, 114 S Circle Dr, Rocky Mt NC 27804.

Small FT AM & FM east coast compor or CP for retired couple. 718-893-4328.

Former radio station owners want to buy small market AM, FM or combo, on or off-air. 210-680-5778.

Purchase, Lease to purchase, O&O - your dark, nearly dark, troubled or redundant AM, (FT,DT) FM, LPTV in Western U.S. Reply to Radio World, POB 1214, Falls Church VA 22041. Attn Box #: 95-01-25-01RW.

Small market AM or FM in North Carolina, Virginia or South Carolina. 703-433-2884.

## TAPES/CARTS/REELS & CD's

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Let A&D clean, load & pack your carts. They'll be serviced within 10 working days! *Guaranteed!*

3706 Vold Ct. Eau Claire WI 54701 Fax: 715-835-1151

### Want To Sell

10 1/2" stereo automation tapes, 330+ reels, inc 150 oldie reels, \$1.50 or \$400 for all. J Eglolf, UVCI, 5582 Rapid Run Pike, Cincinnati OH 45238. 513-922-7049.

Fidelipac Gold Mastercard II, approx 1200 in exc cond, \$.50 ea or \$350 + shipping/all. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

ITC Cart II AA-70, 1 unopened box of 10 + 7.5 min (1), 6.5 min (1), 70 sec (1) and 40 sec (1) cart. \$25 incl shipping & handling; 140 count cart rack, solid wood, \$60. B Dixon, WAAC, 10129 N 800 E, Syracuse IN 46567. 219-457-8181.

Audiopak (100) 3.5, 5.5, 10.5 minute carts. G Barinowski, Good News Network, 3213 Huxley Dr, Augusta GA 30909. 706-736-1269.

Classic Rock AOR library, all on 7 and 10.5" reels, 1960's and 70s, \$600; 105 x .25" empty reels with boxes, \$50. D Pulwers, Dave's Price Audio, 310 N Howard St, Alexandria VA 22304. 703-751-9346.

Country music on tape, 1975-1976 on R-R, \$150. H Sewell, Oakridge, 2001 Elton Rd, Haltom City TX 76117. 817-838-8001.

Fidelipac MR-200 countertop 200 cart swivel unit, excellent condition, \$100 + shipping. K Browthall, KTRZ, Box 808, Riverton WY 82501. 307-856-2922.

ITC 750 (3) PB only, 1 good condition, 2 for parts. K Browthall, KTRZ, Box 808, Riverton WY 82501. 307-856-2922.

C-90s duplication overruns, new 1st quality, 20¢/each for 1000 or 25¢/each for 500. L Wagner, ARN, POB 1788, Orlando FL 32802. 407-299-1299.

Various lengths (500), \$3/ea or \$2.50/ea for 100+; wire cart rack, holds 300; \$285. G Fuller, WKKR, 205-745-4656.

Pams Jingles ref tapes, 1951-1976, BO. R Kaufman, Pams Productions, POB 462247, Garland TX 75046. 214-271-7625.

# CONSULTANTS

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**803-785-4445**  
**FAX: 803-842-3371**

# SERVICES

**LOCATION SERVICES IN THE UNITED KINGDOM**

Planning remotes from the UK? we provide a comprehensive service

- we organize venues for your shows
- we provide temporary equipment
- live links via ISDN/Switched 56
- experienced radio engineers
- we help you line-up guests

Contact London (44) 81 442 8900  
*Good Morning from Great Britain*  
Wired for Sound Ltd., London N15

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Gen Contractor #278-1 Fax (919)781-6454

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Reach radio professionals worldwide by advertising in Radio World's international edition.

Call Simone for more information.  
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**S** Communications Data Services, Inc.

**800-441-0034**  
703-534-0034  
fax 703-534-7884

6105-E Arlington Blvd.  
Falls Church, VA 22044

**MLJ**  
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Gaithersburg, MD 20877  
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#### Want To Buy

ENG Van 35' or greater telescoping mast, less than 50,000 miles, state price and cond. R Evans, Evans Associates, 210 S Main St, Thiensville WI, 414-242-6000.

Country-Gospel library, country artists singing familiar Christian or gospel music, LP, reels, cassettes or CD. B Campbell, KRIG, Bartlesville OK. 918-333-7943.

Fidelipac/Audiopak Mastercart II gold or AA-4 light blue in 2:30 through 4:00 lengths, must be in vgc, call after 3PM CST. 214-271-7625.

#### TAX DEDUCTIBLE

#### Want To Sell

Small community 501(c)3 needs your old analog equip, tape recorders, mics, signal processors, consoles, software and computers, will ship, provide gift letter, tax documents, etc. M Cohen, KGLP, 200 College Rd, Gallup MN 87301. 505-863-7625.

Public station seek donation of Harris 90 automation equip w/ITC 770 reel w/25 Hz tone sensors. N Mullin, WSGN, POB 227, Gadsden AL 35902. 205-549-8439.

#### TEST EQUIPMENT

#### Want To Sell

FIM-21 field strength meter, like new, \$2800. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.



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*The advertising deadline for the March 8 issue of Radio World is February 10, 1994*

Delta OIB-1 operating impedance bridge, perfect condition, including padded case, \$1500. J Swett, KAFF, 4025 Lugano, Flagstaff AZ 86004. 602-526-1975.

Sound Technology 1710A, distortion measurement sys, \$975. C Porter, WCAZ, POB 498, Carthage IL 62321. 217-357-3128.

HP 141T spectrum analyzer, 8552A, 8553L 1 kHz - 110 MHz plug-ins, \$975. K Ellis, 919-242-6000.

#### Want To Buy

Tektronix 154-0838-00 CRT for 2213 oscilloscope. M Persons, 402 Buffalo Hills Lane, Brainerd MN 56401.

Hewlett-Packard HP 331A operating instruct/manual, photocopy ok; HP 353A patch panel operating instructions. R Lawrence, 11130 Frankstown Rd, Pittsburgh PA 15235. 412-242-7184.

Potomac AM field strength meter. P Spivack, 325 S Washington Ave, Kent WA 98032. 206-859-2680.

#### TRANSMITTERS

#### Want To Sell

Continental 317C2 good condition with some repairs needed, 50,000 W AM, \$15,000. Gates FM 20H3, 20 kW in fair condition, \$15,000. P Christenson, Prism Radio, 3101 University S, Jacksonville FL 32216. 904-721-8223.

Harris plate transformer for MW5, \$500. S King, KMMML, 1703 Avondale St, Amarillo TX 79116. 806-355-9777.

Harris FM1K 100 W FM w/MS 15 exciter, spare tube, on 91.7, great cond, \$4500. M Kellom, WMSE, 414-277-7247.

CCA 10,000 1972 10 kW, currently in Albuquerque, \$10000. M McNeil, Guardian Comm, 800 Compton Rd, Cincinnati OH 45231. 513-931-8080.

Harris FM 1K with MS-15 exciter, \$6800; Technical Material 25 kW 50 ohm, RF load, \$950. D Harry, POB 128, Los Gatos CA 95031, 916-624-6431.

RCA 20Kw FM without exciter, good condition, from metro market, many spare parts included. Call 806-372-5130.

QEI Model 675 FM exciters, \$1750 ea; QEI Model 772 stereo generator, \$650; 150 watt "true" broadband amps, \$2200 ea; All units listed are re-conditioned and guaranteed to work, call for details. Bob Brown 609-232-1625.

CCA TF 20 F 20 kW, factory mod to 23.5 kW, new driver, choke, meters plus spares, possible partial trade for 10 - 12 kW plus cash, \$23,500. J Lien, WNXR, 715-372-5400.

Sparta 680 exciter with 681 meters and Moseley SCG-3T stereo generator, \$1075 + shipping. 207-623-3036.

Energy Onix MK22 22 kW FM with exciter, less than 2 years old. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

Harris BC-5H 5000 W AM, you pay shipping. BO; Harris direction transmitting equipment for 5000 W transmitter, you pay shipping. Jack, 304-562-9155.

## BEXT

Great new or demoed FM transmitters, exciters, amps and STL's, some at discount prices

**USA 619-239-8462**  
**FAX: 619-239-8474**

LPB AM-30 30 W AM on 540 kHz, excellent condition, \$900/BO. D Barton, KNAK, POB 636, Delta UT 84624. 801-864-5111.

MCI PRS-10, composite STL. D Lang, NW TalkRadio, 7404 SE Johnson Ck, Portland OR 97206. 800-313-5313.

Versa Count LA150 150 W solid state FM amp. N Beardsley, 906-753-6930.

TRANSMITTERS - TV/FM/AM, new and used. Tubes, xmtr parts. 305-757-9207.

Used equipment for sale: Belar SCM-1, Belar RFA-1, Belar FMS-2, Belar FMM-1, Moseley MRC 1600 system, Orban Optimod 8100A, dbx 160 & 160X compressor/limiter, Dielectric coaxial switch with switch panel, TFT EBS receiver/generator, Gentner patch panel, Electro Impulse 5 kW dummy load and Harris racks. Call Transcom Corporation 800-441-8454 or 215-884-0888.

TFT 7601-R and TFT 7601-T, controls remote xmtr via telco lines or microwave, 10 chnl, never used, must sell, BO. Marty, MSTV, 1263 Pomeroy Rd, Arroyo Grande CA 93420. 805-489-0919.

#### Want To Buy

3 kW transmitter in good condition, late model preferred. A Lane, WBYW, POB 2892, Grand Rapids MI 49501. 616-451-9904.

5 kW AM in good condition, later than 1975 now in SE. J Katz, Genesis Radio, 417 Main St, Headland AL 36345. 205-693-5672.

10 or 20 W AM, tube or solid state. E Allman, WFIV, POB 555519, Orlando FL 32855. 407-847-4422.

10, 15 or 25 kW AEL in good condition. T Hodgors, KLYK, 14 E Main St, Walla Walla WA 99362. 509-529-6242.

10 or 12 kW FM, up to 10 years old, must be very solid. J Lien, WNXR, 715-372-5400.

5 kW FM transmitter with or without exciter, state condition, price; 1 - 3.5 kW FM transmitter without exciter for standby. J Powley, WAOM, 1512 Sherwood Dr, Reidsville NC 27320. 910-342-1843.

BE, QEI, CSI, etc. 1-2 kW, no exciter needed, less than \$1000. A Branch, WGHR, 2402 Woodrige Dr, Decatur GA 30033. 404-325-7847.

McMartin AM/FM transmitter, any model, exciter or stereo modules. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

#### TUBES

#### Want To Sell

ITT Jennings vacuum contactor w/230 VAC solenoids, brand new, never used, will sell for half price. G Lee, 416-421-5631.

4CX250B, 4-400, 833, 813, 5CX1500, 4-1000, all types, fully guaranteed EIMAC, Amperex, RCA. Westgate 800-213-4563.

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Partial List: 6623, 23791, TH150, 6425F, 5604, 6696, 6697, 5681, 5682, 5671, 7804, 3CX10,000H3, 3CX20,000H3, 4CX5000A, 4CX35,000C

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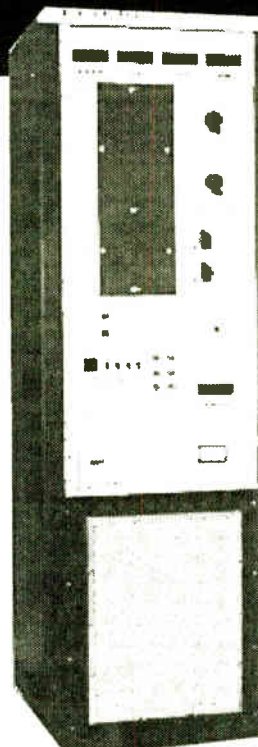
- |                              |                                 |
|------------------------------|---------------------------------|
| 1 kW FM 1978 Collins 831C-2  | 1 kW AM 1980 Continental 314R-1 |
| 1 kW FM 1975 RCA BTF 1E2     | 5 kW AM 1977 RCA BTA 5L         |
| 2.5 kW FM 1983 Harris FM2.5K |                                 |
| 3 kW FM 1980 CSI 3000E       |                                 |
| 3 kW FM 1974 Harris FM3H     |                                 |
| 5 kW FM 196? Gates FM5B      |                                 |
| 10 kW FM 1968 RCA BTF 10D    |                                 |
| 20 kW FM 1976 Harris FM20H/K |                                 |

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TUBES...WTS



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TURNTABLES

Want To Sell

RCA 16" xcription console TT (2), BO. R Davis, Wango Records, Rt1 Box 112, Falling Waters WV 25419. 304-274-1419.

Russco Studio Pro (2) w/Micro Trak tonearms, \$50 ea; RCA phono preamps (2), \$50 ea; Russco Fidelity Pro TT preamps (2), \$75 ea; Technics SP-25 w/pro base and tonearm, \$475. G Fuller, WKKR, 205-745-4656.

CCS Micro 56 codec (2), Tele-processing Products Model 1 modems (2) for duplex 7.5 kHz audio transmission via 56 kB digital telephone lines, cables incl, \$3500; Comrex DXR codec (2) and Teleprocessing Products modems, \$3500. R Cowell, Help Ministries, POB 308, Ferndale WA 98248. 206-384-5117.

Technics SL1200MK2 quartz w/Shure M44-7 cartridge and stylus w/dust cover, \$150; ORK TT (3) w/o tonearms, \$50/ea; ATI Encore series preamp (2), \$75/ea. R Miller, Miller Media Group, Taylorsville IL. 217-824-3395.

TT Patch cables (39), Monster ProLink and Alden/Switchcraft, \$300/all or \$7.50/ea. R Santo, Box 634, Bryantville MA 02327. 617-293-5671.

ADVERTISER INDEX

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Table with 4 columns: Page No., Advertiser, Reader Service No., and Advertiser. Lists various companies and their corresponding page numbers.

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H. Consultant/ind engineer
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G. TV station/teleprod facility
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Reader Service

February 8, 1995 Use until May 8, 1995

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