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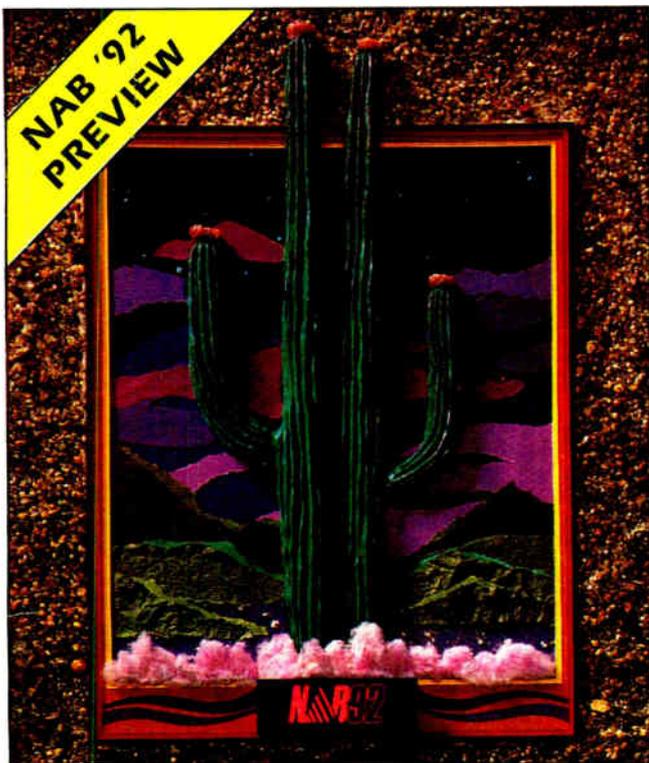
# RadioWorld®

Radio Management  
Conference preview  
in this month's  
**Running Radio**,  
see p. 61

Vol 16, No 6

Radio's Best Read Newspaper

March 25, 1992



### Viva Las Vegas:

The NAB spring show is just around the corner.  
For details, see our preview, p. 29.

## National SBE Under Fire Dues Increase Decried

by Bruce Ingram  
and Pamela Watkins

**CHICAGO** The Society of Broadcast Engineers (SBE) is facing a major crisis with local chapters: open rebellion against the national headquarters because of recent actions, including an 83 percent dues increase and questionable by-law changes. One chapter is even suggesting that the current board of directors step down (see related story).

The dues increase, from \$30 to \$55, was announced as a fait accompli in the SBE's Nov./Dec. newsletter, having been instituted by the board of directors in a closed session at the October national convention in Houston.

Members were surprised, shocked and antagonistic. "They woke the membership up," said Chip Fetrow, chairman of the Washington chapter. "It was kind of like a sleeping bear. Now the bear is awake and it's hungry."

Secession from the national SBE has been discussed all over the country, including the larger chapters of Washington, Philadelphia and Baltimore, Seattle, and Los Angeles.

The topic of resignation also has come up in many other chapters, according to Baltimore SBE Chapter Chairman Dwight Weller, who

continued on page 9 ►

## LA Chapter's Views To Be Aired at NAB

by Pamela Watkins

**LOS ANGELES** With chapters up in arms over perceived problems in the society (see accompanying story), local SBE Chapter 47 Chairman Sandra Woodruff has proposed the following action on SBE Day, April 14, at the NAB convention.

- Three representatives selected by the chapter chairs will confront the national board of directors at the 3:00 p.m. meeting on April 14.
- The representatives request that the National Board of Directors submit their resignations effective October 1992, on the normal expiration date of term, which is during the national SBE convention.

- Elections be held that reflect a slate of candidates selected to represent regions, each region consisting of 8 to 10 chapters. At present the national board is elected on an at-large basis, which the chapters feel dilutes accountability.

- Regions (11 or 12) will select their own representative(s) to the national board of directors and that person(s) will be directly answerable to the chapter members in their region.

Regional representation is not a new idea circulating in the thoughts of the SBE membership, according to Woodruff. Charlie Hallinan, founder of the National Society of Broadcast Engineers, was a member of the By-Laws Advisory Committee in 1983 and wrote a proposal which outlined the need and the way to implement region-representative government.

At that time the national board refused to put it on the ballot, Woodruff said, but she promises to sustain the momentum of the current chapters' indignation in order to meet face to face with the board.

There are no guarantees that the board will agree to meet with the active chapters' three representatives. But there is a growing fear that if the national board does not begin to reflect the wishes and concerns of their constituents, the chapters will withdraw, possibly to become stand-alone entities, according to Woodruff.

## WARC: Exceptions, No Rule

by Alan Carter

**TORREMOLINOS, Spain** The ideal of a worldwide digital audio broadcasting (DAB) allocation may have been lost at WARC '92.

The World Administrative Radio Conference (WARC), which concluded here March 3 after meeting for approximately four weeks, allocated 40 MHz at 1.5 GHz for satellite broadcasting of digital audio but left countries the option to place the new service in other areas of the spectrum.

Consensus on a worldwide frequency allocation is anything but unified with countries opting to broadcast at different frequencies.

WARC delegates, numbering about 1,400 from almost 130 countries that are members of the ITU, also passed a resolution stating that frequency assignment or allotment for a satellite service, and coordination of a complementary terrestrial service, would be decided at a later conference to be convened before 1998.

But the U.S. entered footnotes stating 1.5 GHz is unacceptable stateside, and DAB would be broadcast at 2.3 GHz (2310-2360 MHz) on a primary basis terrestrially and via satellite.

The U.S. went to WARC as the lone proponent of 2.3 GHz and was successful—if by default.

"This is a happy group," said Judy Jamison, spokesperson for the U.S. delegation. "We were the only country looking at 2.3."

The resolution WARC adopted was a last-

minute compromise that seemingly gave the U.S. an opportunity to get what it wanted for digital radio. The real division was among European countries, some favoring 1.5 GHz

(1452-1492 MHz) and other supporting 2.6 GHz (2535-2655 MHz).

Japan entered footnotes similar to the U.S. but at 2.6 GHz.

As the closing days approached, it had appeared WARC '92 would end with no consensus on DAB allocations.

continued on page 3 ►

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# NEWSWATCH

## Pioneer's Rule Clarified

**WASHINGTON** The FCC has "amended and clarified" its so-called "pioneer's preference" rules for individuals developing new communications technology.

The decision is a blow to two digital audio broadcasting (DAB) proponents in particular. The NAB and Strother Communications (SCI) had petitioned the FCC to review its ruling, but each for its own reasons. The NAB

contended that the pioneer's preference rule was vague; SCI that it did not constitute sufficient incentive for pioneers.

Responding to a petition filed by SCI, the FCC ruled that a tentative preference will not be awarded at the Notice of Proposed Rulemaking (NPRM) stage of a proceeding unless a "pioneer" applicant has either "commenced an experiment or submitted an acceptable technical showing." Such a preference will be awarded for only one service area, the Com-

mission said.

The FCC also stood by its decision to award preference generally for only one service area. SCI, which planned DAB testing in a number of cities, had hoped for preference in more than one service area.

The Commission also decided that a petition for rulemaking would not be required from a "pioneer" applicant when a new technology under consideration in an existing proceeding hasn't reached the NPRM stage.

As for the NAB's criticism of the rule as vague, the FCC maintained that the pioneer's preference criteria are "sufficiently clear, that a guarantee of a license is necessary to induce innovators

to submit proposals, and that a technical showing can be as useful as an experiment in some instances."

## SBE Papers Deadline Near

**INDIANAPOLIS** Proposed engineering paper abstracts are now being accepted for the 1992 Society of Broadcast Engineers (SBE) engineering conference at the national convention in San Jose. The deadline is April 1.

Those interested in preparing a technical paper for presentation at the conference should submit an abstract outlining the scope of the paper and its importance to the industry. Some of the topics include: broadcast automation, PCs

in broadcasting, remote transmitter control, new radio technologies, digital radio broadcasting, transmitter maintenance, fiber optic and broadcasting, and digital hard disk recording.

Those interested in participating in a panel discussion or serving in some other capacity at the engineering conference should

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## No WARC Consensus

► continued from page 1

The division between countries is "fairly significant," according to Francine Lambert, spokesperson for the WARC organizing committee. She cited the U.S. backing 2.3 GHz and Canada adopting 1.5 GHz—two neighboring countries that traditionally support each other.

"We'll work out the coordination we need with Canada," Jamison said.

At press time, the list of countries that noted objections to 1.5 GHz and referenced their spectrum preference was unavailable. The document was not expected to be released for four weeks, until final edits were completed.

In Europe, strong differences existed between the EBU, which backed 1.5 GHz for the Eureka 147 DAB system, and the 32-member Conference of European Postal and Telecommunications Administrators (CEPT) that endorsed 2.6 GHz.

At the end of the debate, CEPT relented to the 1.5 GHz compromise. But the organization had the strong backing of the U.K., Germany and Italy, all of whom supported 2.6 GHz throughout WARC.

DAB proponents in the U.S. were not surprised by the outcome, but said the lack of a worldwide consensus on satellite delivery will not affect pursuit of a domestic terrestrial DAB standard. In the U.S., terrestrial DAB appears headed toward an in-band approach.

Strother Communications President Ron Strother said he "sees WARC as a satellite issue, not a terrestrial issue."

Tony Masiello, director of technical operations for CBS Radio, said whatever the outcome at WARC, the U.S. approach to DAB will be a driving force. "Any smart manufacturer is going to wait to see what happens in the U.S.," he said, "because this is the largest market for radios."

From the perspective of receiver manufacturers, a worldwide DAB standard would be "ideal" according to Gary Shapiro, Electronic Industries Association (EIA) Consumer Electronics Group VP. But, he added, the lack of one will not adversely impact receiver production in the U.S.

One negative stemming from a proliferation of DAB frequency assignments, however, would be that new product introductions may be slower because different designs would have to be made for each market, Shapiro said.

NAB Science and Technology Senior VP Michael Rau agreed, noting an international satellite plan would have benefited shortwave services such as VOA and the BBC, which may have switched. The NAB, however, opposes satellite delivery for domestic broadcasting.

□□□

News Editor John Gatski contributed to this report.

## Site Care Linked to Clear Reception

by Bill Young  
and Tim Wilde

**ATLANTA** Of the thousands of network affiliates broadcasting satellite-delivered digital audio, the overwhelming majority enjoy clear, high-quality reception.

Some stations, however, have been plagued by C-band radio frequency problems, or site problems, for years. These site problems are often mis-diagnosed as being caused by the conversion to compressed digital audio technology. For example, recent difficulties with muting on the SEDAT system, and its predecessor DATS, have been traced to site problems at individual stations.

Here are a few simple and inexpensive guidelines for identifying, repairing, and preventing the most common site problems.

### Maintain your electronics

Poor equipment maintenance is probably the most common of all site problems. Stations broadcasting digital audio since the early 1980s must realize that their receivers and RF cabling are 10 years old and may require complete refurbishing.

Defective LNAs can lead to lower signal or higher noise levels, which often causes interference or muting. Most older LNAs have a noise temperature of 120 degrees, while today's models have a typical noise temperature of 40 degrees. By replacing your LNA for as little as \$150, you can provide more margin to your system, thus eliminating many interference problems.

Now that you've worked your way out to the antenna, check to make sure nothing is obstructing the satellite feed. Clear all organic debris (birds' nests, fallen branches, etc.) from the surface of the receive dish and eliminate tree growth that may obstruct a clear view of the satellite. Also, check for any possible damage that may have occurred to the antenna.

Microwave interference from nearby major phone company towers is the most common form of terrestrial interference. Also, the insurgence of cellular phone towers has become more than a minor annoyance for many station operators. This may cause popping and thumping noises in the older audio decoders and occasional muting in newer compressed digital audio decoders. Simultaneously, fault indications will likely be observed on demodulator or error correction modules.

If you suspect the interference is being caused by local microwave towers, you can always use a spectrum analyzer to verify if that transmitter's signals are overriding your signal. You may also contact Comsearch (Reston, Va.), a frequency database listing service, to check for known C-band transmitters in your area.

If the interference seems minor, the easiest fix is the installation of a notch filter between your downconverter and demodulator.

### Stabilize the AC

When checking the condition of your receiver unit, first examine the power supply. As power supplies age, filter components wear out, leading to AC ripple in the supply lines. The best way to minimize this possibility is to maintain your indoor electronics in a stable environment, at a room temperature between 50 degrees to 80 degrees Fahrenheit.

Also, make sure your power supply DC output voltage is within manufacturer-specified levels. Because today's new digital circuits provide higher functionality

with fewer parts, they may require more current and are more sensitive to power supply voltage tolerances.

As you examine your receiver, use a blower to clear any dust that may have accumulated on removable modules. It's best to repeat this procedure annually. When you reinstall a module, check to verify that it's seated properly. If you suspect an intermittent connection, try inserting the same module into another slot in the chassis.

Over time, oxidation may occur on connector contacts. You would be surprised at how many reception problems have been eliminated simply by cleaning contacts or reconnecting cards.

Outdoors, the deterioration of RF cabling is among the most common sources of weak signals and reception problems. With buried cabling, extreme low temperatures that cause the ground to freeze often lead to cracked or split cabling.

When inspecting the connectors, look for damage caused by moisture intrusion or corrosion. If the damage is severe, immediately replace and weatherproof the connections. Make sure to remove all DC power before attempting to clean the connections.

In severe cases, where the interference levels are overloading your outdoor electronics, you have two primary choices: 1) Erect a wire screen barrier to shield your antenna from the offending microwave

tower, or 2) Move your antenna. A relocation of as little as a few blocks may provide natural shielding by surrounding buildings or other sources.

### Check dish direction and size

The recommended size for all receive dishes is 2.8 meters or larger. If your station is located on the edge of the satellite footprint—in Maine or Seattle, for example—you may want to increase the antenna size to at least 3 meters.

Finally, don't forget that your receive dish can easily become mis-pointed due to environmental conditions. Severe flooding or frequent freezing can cause the ground to shift and affect the antenna direction.

High winds or an improperly laid cement foundation can also result in tilting. If you're going to attempt to re-direct your antenna, move the dish slowly and carefully until you reach the peak signal level. It's also an excellent idea to mark the antenna before moving it to allow you to return to the original position, if necessary.

□□□

Bill Young is an associate service engineer with Scientific-Atlanta Broadcast Radio and Data Systems in Melbourne, Fla. at 407-255-3000. Tim Wilde is a systems service technician with Scientific-Atlanta Network Systems Group in Atlanta at 404-903-6001.

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# Here's One for the Record Books

by Alex Zavistovich

**WASHINGTON** If you heard something land with a thud on your desk earlier today, don't worry. It was just this issue of *RW*—our NAB Preview issue, all 104 pages of it.

This isn't just our biggest NAB Preview issue, it's our biggest issue of *RW*, period. And I think this is one that people are going to remember for a long time. Not only do you get a bigger-than-ever preview section with expanded exhibitor listings and session information, you also get *Running Radio*, with its own management-oriented take on the Las Vegas get-together.



That, combined with our *Buyers Guide* on tape recorders, microphones and monitors, and *RW*'s usual first-rate news reporting and practical, informative features make this an issue you'll be coming back to long after NAB '92 is a dim memory. Just don't hurt yourself carrying it around. Remember: Lift with your knees.

\*\*\*

Ordinarily around the convention season, we start to get wind of mergers and acquisitions in the industry. Although I'm sure more are to come, the first has just been announced, and it's a hot one at that.

On March 4, Gentner Communications issued a statement that it had signed a letter of intent for the purchase of all products and technology of MacroMedia, Inc. MacroMedia is best known as the maker of the "Audisk," a digital audio storage device for station automation.

Gentner sees the Audisk as a complement to its own Digital Audio Workstation Network (DAWN). Company CEO Russ Gentner said Audisk—which earned \$1.5 million for MacroMedia in just a year and a half—will enable Gentner Communications to fill the needs of any broadcaster, "regardless of size or format."

No mention was made by Genter as to whether the Audisk will be changed in any way, which I take to mean the product will stay essentially the same. The Audisk has been very popular in the United Kingdom, where a number of smaller stations have

adopted it for automation. It's a proven commodity, and a real enhancement to Gentner's stable of products, which now includes telco equipment, processing gear and hard disk storage devices.

\*\*\*

It will be interesting to see what happens at NAB '92 in the way of DAB system development, especially in light of the recent decision (or is it a *non*-decision?) on spectrum allocations for DAB made during the World Administrative Radio Conference (WARC) earlier this month.

An eleventh-hour decision by WARC delegates has given space in the 1.5 GHz L-band for satellite and complementary terrestrial DAB service. The catch is that all nations have the option to footnote the decision. In essence, it means a free-for-all with no rules, only exceptions.

For the U.S., the heat's been turned up a little with this decision. The NAB thinks that Canada and Mexico—both of whom are going with the L-band allocation for their DAB efforts—will try to influence the U.S. to move its telemetry operations from the L-band to the S-band. (The U.S., by the way, was way out in left field with its 2.3 GHz recommendation—we were the only country asking for it.)

According to the NAB, "For the U.S. terrestrial broadcasting system to remain competitive, it is urgent now that all proponents of terrestrial DAB systems develop them quickly."

Perhaps the only clear winner in the WARC decision was Satellite CD Radio, one of the earliest proponents of DAB. The WARC delegates allocated the U.S. its 2.3 GHz DAB recommendation, which suits Satellite CD Radio's purposes quite well.

The company's VP, David Margolese, noted that the allocated S-band frequency is "more than twice the size of the AM and FM bands combined, ensuring a robust service of many dozens of subscription digital audio and mobile point-to-multipoint services."

Satellite CD Radio plans a satellite-delivered, commercial-free CD music service for car listeners. Since most radio listening is done in the car, the NAB perceives this as a legitimate threat. A terrestrial DAB system would be a strong defense against this threat.

The only problem is a certain lack of liquidity among terrestrial DAB system proponents. Word on the street is that some proponents are slowing down on system development until the cash starts flowing again.

And where does Eureka fit into all of this? It kind of makes you wonder ...

\*\*\*

By the time you read this, the dreaded

"Michelangelo" computer virus has come and gone. Preliminary reports are that a number of computer systems on the African continent were thrown into turmoil; domestically, things seemed to be pretty much business as usual. I hope none of you were affected.

With the increasing acceptance of computers at radio stations—particularly systems that tie together a variety of station functions—the threat from such esoteric viruses has become a real cause for concern. I wouldn't relish the idea of some rogue software deleting files on what has become the brain and heart of my radio station while I stand by, powerless.

Now, I don't want to throw a scare into any stations that are ramping up their level of computerization; these days, if you want to compete, you have to have a computer.

Still, with all these viruses floating about, it's just good sense to practice Safe Computing. In particular, try to avoid pirated disks. I know, I know: It's cheaper than buying the software outright. That's fine, until you pick up a tainted disk and lose your list of accounts receivable, or your program log—or both. I don't want to sound like your mother, but don't put something in your machine if you don't know where it's been.

That's it for now. Tune in next time,

Alex



► Synergetic Audio Concepts has announced a 1992 schedule for its three-day audio engineering seminars, to be held in Norman, Ind.

The Sound Engineering Seminars, which carry a \$525 price tag, will be held May 21-23, June 18-20, July 16-18, Aug. 20-22, Sept. 17-19 and Oct. 15-17. The sessions will be conducted at the company's farm complex.

For additional information, contact Syn-Aud-Con at 812-995-8212; fax: 812-995-2110, or write the company at 12370 W. Co. RD. 100 N, Norman, Ind. 47264.

### Silent Keys:

► Robert Hyland, senior VP for CBS Radio and GM of KMOX/KLOU St. Louis, died March 5. He was 71 and had been undergoing treatment for cancer of the liver. He joined CBS in 1950 as an account executive at WBBM(AM) Chicago.

► Tom Humphrey, a sales person for Visual Electronics, McMartin, and most recently Broadcast Electronics, passed away Feb. 19 in Quincy, Illinois.

► Dr. Andrew Alford, engineer, founder of the Alford Manufacturing Company and inventor of the Alford combiner system, died Jan. 25. Alford was a resident of Winchester, Mass. He was 87.

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## WCBS: A Story or a Crusade?

Dear RW,

Reference Frank Beacham's article on the Emergency Broadcast System in **RW** ("WCBS Escapes Fine for EBS Violation," Feb. 19, 1992).

I'm beginning to wonder whether Mr. Beacham hasn't turned his earlier pursuit of a legitimate story into a crusade to hold WCBS up to ridicule for something that's not at all uncommon.

Sure, someone at WCBS admittedly goofed during Hurricane Bob last August and caused a pre-recorded two-tone EBS Attention Signal to be aired instead of the live tones prescribed in Section 73.940 of the Commission's rules and regulations. Equally certain is the fact that this slip-up caused a break in the fragile "over-the-air" relay chain that EBS has depended on for local program distribution since its inception in 1964. But, the specific circumstances here were little different than you'll find in most areas of the country.

EBS is a valuable tool that's become dull and rusty, largely through years of disinterest and disuse on the part of government and the broadcast industry. Industry deregulation has also become a culprit through the elimination of the longstanding requirement that control operators be licensed on the basis of their tested knowledge of rules, regulations and procedures.

As Mr. Beacham knows from one of the interviews he conducted in connection with this article, at least 50 percent of the stations inspected by one FCC field office have either been fined or issued violation notices in recent years because of EBS deficiencies. Most of these have been in the areas of improper operator performance and the logging of weekly tests, both sent and received by the stations. Inoperative EBS monitoring and signaling equipment have run a close second. The story is much the same throughout the country.

But this is only part of what prompted Chautauqua Broadcasting's specific troubles at WDOE. The notice of apparent liability served against the company cited a

series of administrative and technical deficiencies which, as a group led to the \$1,250 forfeiture that was levied on WDOE.

As a result of the Hurricane Bob situation, WCBS instructed its personnel to use only the EBS encoder in the future. It also made a specific commitment to the Commission last October that it would conduct periodic instructional classes in EBS procedures for its personnel, both as refresher courses and to train new employees. As Mr. Beacham knew full well prior to writing his article, these are two of the actions specifically mentioned in the FCC's letter of admonishment to WCBS that mitigated against a fine or forfeiture.

Enough is enough, already! Someone made an honest, if ill-informed mistake, and while not reflected in Mr. Beacham's article, everyone associated with it has learned from it in the intervening six months.

Perhaps the time has come for a bit of positive trade reporting on EBS. The cold war may be over, but there's still a very important day-to-day role for the Emergency Broadcast System. A lot of people in broadcasting and government are putting considerable effort into revitalizing it to meet this role, and it is a story that should be told.

John Nelsen, Vice Chairman  
New York State Emergency  
Communications Committee  
Albany, N.Y.

## NAB '92: Be There

If economic indicators continue upward, the National Association of Broadcasters' annual convention (NAB '92) in Las Vegas could take place just as the country starts to emerge from the recession. Now, more than ever, broadcasters should make every

effort to attend the convention and exhibition.

Recent surveys show that ad revenues in radio sales have started to climb again. For stations that have operated at a loss for so long, such a trend is encouraging.

From the standpoint of equipment manufacturers, a large number of product introductions have been announced by companies exhibiting at NAB '92. This wave of new products also supports the feeling that business is improving.

So, with the convention less than three weeks away, the NAB is faced with the happy prospect of a trade show full of new products, attended by station owners who, for the first time in countless months, have fresh money in their budgets and a renewed optimism about the industry.

The high-tech parade of equipment innovations is a classic signature of the NAB convention. It's important, however, not to lose sight of the fact that NAB '92 is also a place to sharpen one's skills at *running* radio. From the engineering sessions to the management presentations, to the sessions on opportunities in overseas broadcasting, the annual gathering offers something to enhance the performance of anyone working in radio today.

Yes, there is a light at the end of the tunnel, and no, it's *not* the headlight of an oncoming train. Better times are ahead, and attending NAB '92 is one good way to lead yourself out of the tunnel and toward a brighter future. Be there.

—RW

*Frank Beacham replies: In an earlier letter, Mr. Nelsen praised me for managing to sort through "a lot of smoke and mirrors" involving EBS issues. This letter, which I would put in the "smoke" category,*

*cites not one error of fact in my RW story on WCBS. The reason this story strikes a nerve is that it holds up a big mirror to what is wrong with EBS and why it never seems to work in big emergencies.*

## GUEST EDITORIAL

# In Defense of an Industry-Wide FM Freeze

by Robert Fox

**Ventura, Calif.** The **RW** editorial of Feb. 19, 1992, titled "A Freeze Is Wrong," misses the point. You apparently misunderstood the thrust of the NAB's petition. The petition specifically asks the Commission to suspend temporarily its acceptance and processing of applications for new commercial FM broadcast stations and petitions to add new station allotments through amendment of the FM Table of Allotments.

The petition filed by the NAB is based on technical, policy and economic conditions. The petition requests a review similar to the FCC's recently completed reexamination of the AM broadcast service. The Commission chose to suspend processing of AM broadcast applications during the pendency of its review of AM allocations, technical and licensing policy.

A very important part of the request for a freeze is the fact that the integrity of the FM band has been compromised because of the proliferation of stations and short spacing.

Your editorial called the petition "protectionism." Apparently, you misunderstand the difference between protectionism and the need to maintain technical standards that will preserve an interference-free FM band. Unfortunately, 80-90 and the present demand system of FM allocations has already caused a deterioration of the technical quality of the band.

Your editorial stated that it cannot be said, categorically, that the marketplace has been overcrowded and you are concerned that aspiring broadcasters may be turned away

and their diverse voices never heard. Your editorial stated that a freeze is inconsistent with this country's free enterprise system.

A "free market system" did not create all of those new stations. The government (FCC) arbitrarily created thousands of new stations. The marketplace neither created nor requested those new allocations. Broadcasting is a regulated industry and regulators don't always regulate in the world of reality. Economic conditions in good times and bad will not support the number of stations currently on the air and absolutely will not support additional stations.

There are now 4,570 commercial FM stations and 4,985 AM stations operating. In addition, there are 1,507 non-commercial FM stations as well as 1,892 FM translators. Another 1,015 FM CPs have been issued—making a 22 percent increase imminent. In 1970 there were 2,636 FM stations on the air.

The average radio listener has access to 26.4 radio stations. For the largest metropolitan areas, well over 100 radio stations are available to listeners. In the smallest markets—those with under 1,000 population—the average number of radio stations available to listeners is 10.5.

It is possible for aspiring broadcasters to enter the business of broadcasting. There is nothing that precludes them from purchasing an existing station. Stations are bought and sold every week.

Regarding allocations (80-90 and others), they are never made to major markets such as Los Angeles, New York, Chicago, etc. The allocations have been

made to small and medium markets that cannot support additional stations regardless of the economic climate. What is happening is that the proliferation of stations in small markets is making it difficult, if not impossible, for existing broadcasters to generate enough business that will allow them to properly serve the listening public.

Several months ago, I developed the idea for a freeze on allocations. I called the Legal Department of the NAB and we proceeded to develop the petition that is presently before the FCC. One of the aspects of the petition is that any request for a new allocation must include a study that will demonstrate that the economics of the market will support an additional station. The petition also requests the study of greater incentives for the entry of minorities into FM broadcasting.

The petition is not against free enterprise. What we are attempting to do is preserve the integrity of the FM band and the quality of broadcast service that the American public deserves. Local broadcasters will find it increasingly difficult to serve their communities given a continuation of past regulatory policies. With respect to future allocations, we're asking that technical and market factors be considered as they should be in any free market.

□□□

*Robert Fox is director of the National Association of Broadcasters' Radio Board, and chairman/CEO of KVEN-AM/KHAY-FM in Ventura, Calif. He can be contacted at KVEN Broadcasting Corp., P.O. Box 699, Ventura, Calif., 93002.*

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**Next Issue of  
Radio World  
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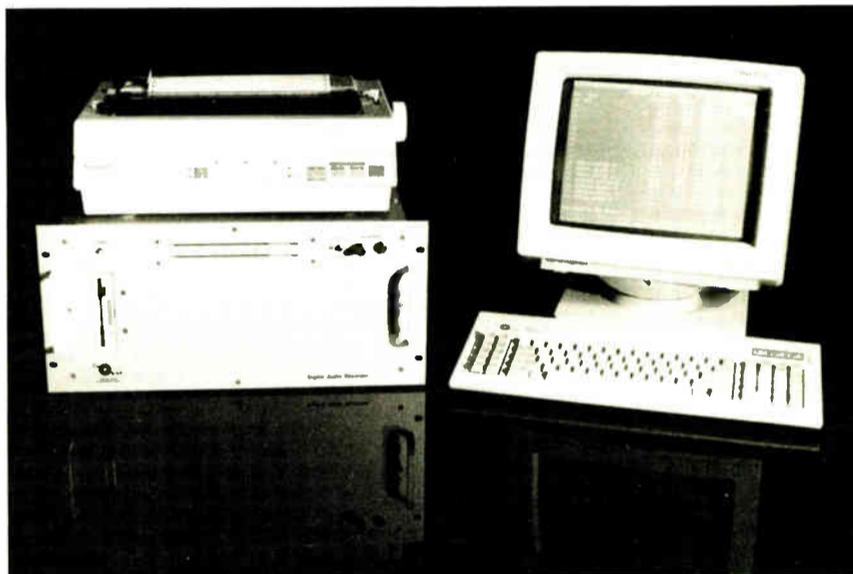
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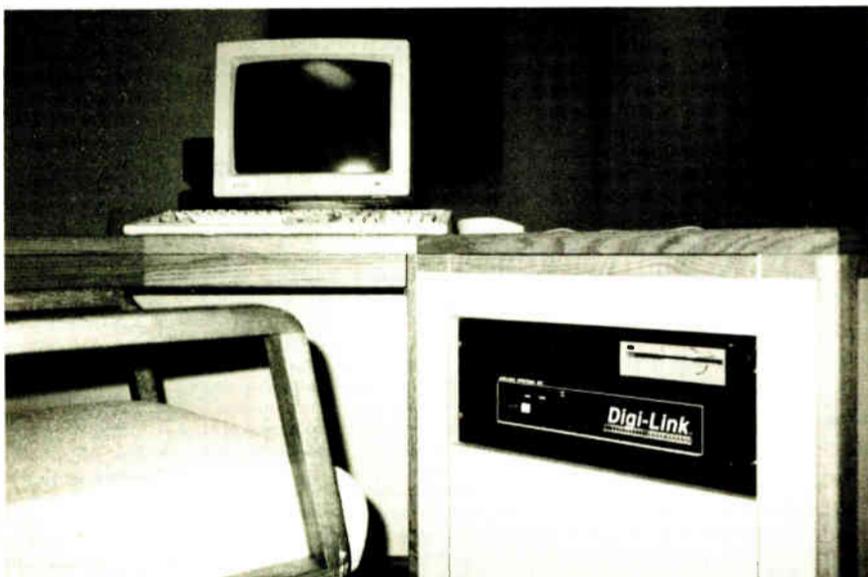
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# Engineer Claims RF Exposure Injuries

by Arthur Cole

**ARLINGTON, Va.** A local radio engineer who said he was burned by radiation from an illegal microwave transmitter has sued a Utah communications company for \$5 million dollars plus damages.

Keith Angstadt, an engineer for Mutual Broadcasting, is charging that an unlicensed, jury-rigged microwave transmitter operated by Multicom Telecommunications, based in Salt Lake City, doused him with enough microwave radiation to impair his eyesight and cause possible brain damage.

The suit was filed in Arlington County Circuit Court in January and also names as defendants the Anway Corp., which the suit said was Multicom's parent company at the time, Raymond Rask, Multicom's president and CEO. The two owners of the building where the transmitter was installed and the Texas company that installed the device also were named in the suit.

Angstadt said his troubles began May 31, 1991, when he was preparing coverage of Mikhail Gorbachev's visit to Washington for the NBC radio network. Mutual Broadcasting, a division of Westwood One, provides satellite service to NBC.

"I was getting our antenna oriented the right way for our receive sites in Washington when I heard a strange noise coming from somewhere else on the roof," Angstadt told *RW*. "I started to investigate."

## Strange dish

Angstadt said the source of the sounds came from what he believed to be a microwave receiver. But the dish was not one of Mutual's and it was making such a strange sound that he said he did not examine it too closely. Using his engineer's training, Angstadt said he remained several feet behind the unit to avoid any harmful radiation.

Nevertheless, by the time Angstadt returned to the building, co-workers told him that his face was extremely red.

"By the time I got home, my face was

on fire and had started to blister," he said. "The next day, I noticed my eyesight was considerably worse. It was like looking through a dirty glass. I went to a doctor and he said the cornea in both eyes had been burned."

Angstadt said he learned the truth about what happened several weeks later—that he had received a harmful dose of microwave radiation.

**According to one RF expert, however, the radiation levels posed by licensed, legal transmitters are considered acceptable —if a person takes precautions around the dish.**

According to the suit, Angstadt claimed the receiver he had examined had been rebuilt into a C-band uplink, but was operating without an FCC license. Multicom was later fined \$2,000 by the FCC for operating the transmitter without a license.

## Radiation poisoning

Even though Angstadt said he took precautions when approaching the unit, he said he still took a large enough dose to permanently damage his eyes and cause possible brain damage as well.

Angstadt said he brought the suit not only to make up for the damage done to him, but to bring about public awareness to the danger posed by microwave transmitters.

"It's a proliferating problem, especially with mobile units," he said. "Digital compression has made these systems smaller and more portable. I've seen engineers standing directly in front of these dishes without even realizing what is happening to them. "I think the government should tighten up radiation level regulations and require transmitters to be cordoned off."

## Acceptable levels

According to one RF expert, however, the radiation levels posed by licensed, le-

gal transmitters are considered acceptable by numerous standards groups and enforcement authorities—if a person takes precautions around the dish.

"If a guy sticks his head in front of the feed horn with a full kilowatt of microwave power coming from the transmitter, obviously he's going to get hit with a high level of radiation," said noted RF consultant Richard A. Tell. "But if

you are several feet away, the microwave beam is so tight that there is very little chance of exposure."

Groups such as the American National Standards Institute (ANSI) and the National Council of Radiation Protection say microwave levels of 5 milliwatts/cm<sup>2</sup> for 1500 MHz and up is safe for areas limited to broadcast and satellite professionals. The levels are stricter for areas open to the public.

That, however, assumes that the equipment is licensed and operating correctly. In Angstadt's case, there is no telling how much radiation was absorbed because the actual cause of his symptoms was not discovered until after the transmitter had been dismantled.

## Failing eyesight

Angstadt said his doctors at Johns Hopkins University told him that he now has extensive health problems including vision loss. "I am now nightblind and I suffer from colorblindness. I've lost 50 percent of my eyesight in my left eye," he said.

For now, Angstadt said he has to contend with the failing eyesight and possible brain damage, all of which have hampered his

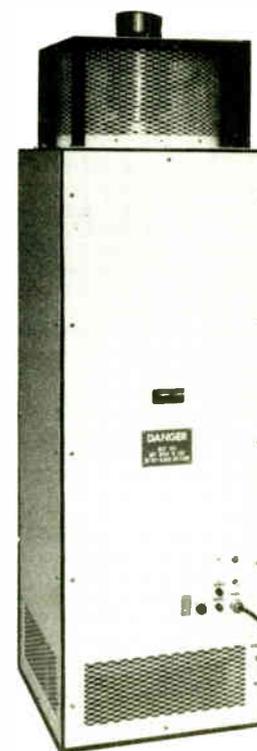
working ability.

Luckily, Angstadt noted, he has received support from Mutual and so far has been able to work around his disability. But he said it has been difficult getting through each day.

"My life has been a living hell," Angstadt said. "I've gone from being a very productive person to being limited in what I can do.

"If a problem arises at the network at night, I can't drive in. I constantly worry that I won't be able to do my job someday. I also have to consider the possibility of cancer."

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# Spectrum Reserved for New Technology

by Arthur Cole

**WASHINGTON** Continuing its drive to introduce new products and services to the marketplace, the FCC recently earmarked approximately 220 MHz of spectrum for advanced technology.

While the action could open the door to such advancements as digital audio broadcasting (DAB) and Low Earth Orbiting (LEO) satellite technology, its most immediate impact will likely be the introduction of Personal Communications Services (PCS), which use hand-held, microwave telephones.

For these and other advanced technologies, some of which are still on the draw-

ing board, the commission has reserved spectrum between 1850-1990 MHz, 2110-2150 MHz and 2160-2200 MHz.

While some of those ranges are currently being used by other services, primarily fixed microwave and cellular operations, the Commission is hopeful that, given enough time, there could be an easy transition between the older services and the newer ones.

"It will probably be tough to move them out forcibly," said Thomas Stanley, chief engineer for the Office of Engineering and Technology. "But we are thinking that they can be bought out."

To that end, the FCC has determined that new technologies will be granted co-

primary status with existing services up to a point. During this phase, neither service will be allowed to interfere with the other.

The Commission will eventually reduce the incumbent service to secondary status, opening the possibility of interference from the primary service. But by this time, it is hoped that the two services will have reached an agreement to relocate the incumbent to another area.

Stanley said the entire process could take up to 15 years.

"Our view is that there are a variety of places that the existing services could go," he said. "We feel with some confidence that it is very likely that there is available fre-

quency not too far from that being used now."

While the decision was made unanimously by those at the meeting (with Commissioner Sherrie Marshall absent), it was not without reservations.

"I am always concerned when the Commission considers displacing existing, proven users of spectrum for speculative, unproven technologies," Commissioner Ervin Duggan said.

However, Chairman Al Sikes lauded the ruling, calling it "one of the landmark efforts by this Commission in recent years."

While the ruling sets the broad range of spectrum for new technologies, it does not identify specific allocations for particular technologies.

## NEWSWATCH

► continued from page 2

send a letter of intent to SBE. Paper abstracts or letters of intent should be sent to: Engineering Conference Chair, SBE, P.O. Box 20450, Indianapolis, IN 46220.

### Digital Recorder Bill Progresses

**WASHINGTON** A U.S. House of Representatives subcommittee recently held the last of the scheduled hearings on legislation that would require a royalty tax on digital media and recorders as well as digital copy-limiting circuitry on new equipment.

HR 3204 and its companion Senate bill, SB-1623, known as the Audio Home Recording Act, would assess a two percent levy on hardware and three percent levy on digital media (tapes, recordable discs, etc. to be paid by the manufacturers. The levy, however, would likely be passed on to consumers.

The bill would cover existing technologies, such as DAT, DCC, Sony MD, and recordable CDs, as well as any future digital recording technology designed for consumer use that is imported or produced in the U.S.

The bill also would require the Serial Management Copy System, (SCMS), the Philips-developed technology that only allows one digital copy, to be included in hardware.

Proponents hail the legislation as a compromise between the equipment manufacturers and recording artists groups and a way to allow digital audio technology to flourish while justly compensating the artists.

Legislation critics point out that such a law would, for the first time, tax the consumer's right to make recordings, and the SCMS would hurt fledgling recording artists who cannot afford the exempted professional equipment.

According to opponents, many musicians, amateur recording buffs and even professionals make tape dubs on consumer equipment during their editing process. If the law passes, this capability would be eliminated if the person wanted to make high quality digital dubs on a consumer machine.

Although there is concern about whether approval of a bill that levies a tax is possible during an election year, congressional proponents believe the bill could be approved by April.

### EEPA Conference Scheduled

**ALEXANDRIA, Va.** The Electromagnetic Energy Policy Alliance (EEPA) will hold its eighth annual symposium at the Radisson Mark Plaza Hotel May 4-6.

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# SBE Chapters in Uproar Over Increase in Dues

► continued from page 1  
said "a lot of them are ready to cast the national aside and function within their own local chapters."

## Members threaten to quit

Formal secession by any chapter seems unlikely at this point, but may not be necessary either if the chapter chairs are correct in estimating that 30 to 50 percent or more of their members are ready to quit.

"If enough people withdraw their dues, the SBE is out of business anyway," Philadelphia SBE Chapter Chairman Ron Simpson said.

Reportedly, the SBE board expected a membership loss of 20 percent in response to the increased dues, which would leave them with a clear profit of about 50 percent in increased revenue. The actual result, however, may be very different.

"The SBE is going to lose a lot of members over this," Washington SBE Chapter Vice Chairman Tom McGinley said. "I think this is a very negative, ill-timed increase, during a recession when fewer and fewer stations are hanging on to full-time engineering staffs."

SBE Executive Director Stephen Ingram said the dues increase was well thought out by the board and was long overdue. He conceded, however, that the membership needed a better explanation.

Chapter leaders are also angry about the SBE national handling of recent by-law changes that limited member right to vote and/or participate in future SBE by-law changes.

## By-laws adoption questioned

According to Seattle SBE Chapter Chairman John Schneider, the by-law change proposals were attached to the back of the 1991 officer election ballot—Articles 1 through 7. All members were asked to approve or reject the attached articles.

The national SBE allegedly said approval should be given because it was the best thing for the society. Several chapter leaders said the language of the by-law proposals was "lawyer-cumbersome." So the membership, not knowing the full implications, approved the by-laws by a 7 to 1 margin.

The Seattle chapter membership later realized what had happened and argued that they didn't know the general members' approval of the new by-laws would indeed change them. They wanted the issue redressed. Schneider put together a petition that requested the by-law changes passed in October of 1991 be held in "abeyance" until adequate discussions and specific knowledge about the changes were addressed.

In December of 1991 Schneider sent the Seattle petition with 30 names to SBE National President Richard Farquhar. The petition requested that the new by-laws be put in abeyance and the old by-laws restored until the issue was settled. The SBE, however, rejected the petition because it did not meet by-law conditions, stating that the

Seattle chapter did not include enough concurring petitions to be in accordance with SBE rules.

Although criticism has been intense and resignation/secession rhetoric is running high among the chapters, efforts are underfoot to change the SBE from within.

The SBE has more than doubled its membership over the past decade— from roughly 3,000 to 6,000 members in about 100 chapters. In an effort to hold on to SBE members but address chapter concerns, Los Angeles SBE Chapter Chairman Sandra Woodruff has devised a widely-circulated and supported plan (see sidebar story) that calls on members to refuse to pay their dues until the national organization has been completely reorganized.

## Withholding dues?

Fetrow clearly approved of at least some aspects of Woodruff's plan and said he would urge his members not to pay the dues increase. He had struggled unsuccessfully for a week to secure annual reports from SBE headquarters for his chapter, which wanted to know why such a large dues increase was necessary.

Although SBE by-laws clearly say annual reports should be made available to chapter chairs, Fetrow said Ingram told him that he would not release the information before the April 14 meeting, and SBE Treasurer Robert Goza claimed he didn't have it.

Fetrow said Goza told him he was "treasurer in name only" and that only President Richard Farquhar could release the report. Farquhar, according to Fetrow, said he would try to get him the information before April 14 but probably not in time for his chapter's next meeting.

In fact, no financial accounting has ever been released to the chapter leaders at any time in the organization's history, although Ingram says as far as he knows, the information has never been requested. Ingram, however, has recommended that the SBE board release a 1991 annual report to the chapters.

Clearly, the days of complacency on the part of the individual chapters are over, according to various chapter leaders.

"People are suspicious about what's happened to the organization's money," said SBE Board Member Mike Fast, who opposed the 83 percent dues increase in favor of a two-year increase at 25 percent per year, subject to membership approval.

## Expenses under scrutiny

Baltimore Chairman Weller said some people are so suspicious they are talking about an investigation. "It has been alleged by many members that there's been misappropriation or mismanagement of funds," he said. "But of course that's not something that can really be claimed without evidence."

The SBE national conventions, a sore point for many rank and file members who cannot afford to attend them, are also the source of the national organization's

continued on page 19 ►

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# Understanding "Short" AM Antennas

by Ron Rackley

**WASHINGTON** In the FCC's recently concluded AM improvement rulemaking, changes were made in the requirements governing post-sunset antennas for daytime-only AM stations. These rules will allow alternative, less costly antenna designs for enhanced nighttime operation.

AM stations, which have been authorized nighttime power of less than 250 watts up until now, will have the opportunity to install new antennas designed and situated for optimum coverage during post-sunset operation.

The FCC has allowed daytime stations—which can operate with low power at night and not cause objectionable interference to other stations—to operate after sunset for many years. Stations within the nighttime skywave service areas of clear-channel stations on their frequencies cannot meet the no-interference requirement, but most other daytime stations have received authorizations for powers ranging from a few watts to over 200 W.

## In the old days

In the past, post-sunset power had to be based on the use of a station's authorized daytime antenna. Stations were not allowed to propose alternative antennas for post-sunset operation. In some cases, stations were penalized in the determination of post-sunset power because other stations imposing the most stringent nighttime pro-

tection limitations received major-lobe radiation from their daytime directional antenna patterns.

For many stations, however, their daytime transmitter sites are not situated to provide coverage to populated areas with the nighttime powers authorized for them.

The new rules bring relief to these stations in two ways. It will be possible to use a directional antenna designed specifically for nighttime operation to increase a station's post-sunset power to any level up to 250 W, providing that the interference protection requirements can be met. It also will be possible for a second post-sunset site, with a directional or non-directional antenna, to be selected nearer the populated areas.

It is likely that any station that can operate with 250 W at night with an affordable directional antenna would have done so by now, since it could have become licensed as a full-time station under the old rules.

Some stations operating with daytime directional antennas, however, might find it possible to improve their nighttime low-power coverage by modifying their directional antenna systems for two-pattern operation.

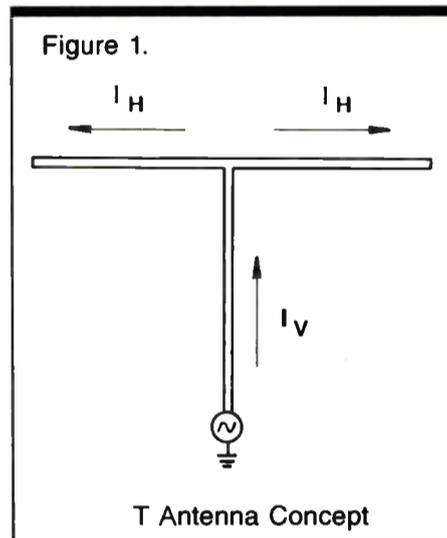
## Keeping a "low profile"

Any daytime station with post-sunset authorization, whether directional or non-directional, might install an inexpensive, "low-profile" non-directional antenna at a more advantageous site. The new rules

make such an antenna possible.

In the past, all AM stations were required to use antennas which met certain minimum radiation efficiency requirements, depending on the class of station. This requirement was imposed during the early years of radio regulation to promote efficient spectrum use.

The FCC now recognizes that better



nighttime coverage could be provided during post-sunset operation with antennas located in places where cost, land-use and FAA considerations might mitigate against the installation of a conventional tall tower.

Antennas with much lower height than required for AM stations have been in use in other services for many decades. Aircraft beacons, for instance, operate on frequencies below the AM band, where wavelength is even greater, with antennas constructed from wire and telephone poles. The VLF stations that transmit to submarines operate with antennas which are about one-tenth the height, in terms of wavelength, of the minimum required for AM stations.

Such technology should interest AM broadcasters considering separate low-

profile antennas situated for optimum post-sunset coverage.

## Some drawbacks

There are three disadvantages of low-profile antennas. First of all, antenna and ground system losses are much more significant because of the high currents necessary to drive power into their low self-resistances. Electrically short antennas have poorer inherent bandwidth, as well.

Additionally, because of the higher currents necessary to drive electrically short antennas, near-field radio frequency (RF) exposure levels are greater for a given power level than for conventional towers—on the order of a quarter wavelength or higher.

In order for a station to use what the Commission has termed an "unconventional" antenna, it "will require detailed engineering showings to accompany any application where such an antenna is proposed as well as a subsequent proof-of-performance demonstrating proper system operation," according to the FCC's Report and Order, MM Docket No. 87-267.

The new rules were not yet effective at the time of this writing, and the meaning of "detailed engineering showings" is still a bit vague. It is my belief, though, that the Commission intends to allow operation with sufficient power to overcome the losses of short antennas, provided that field strength measurements are submitted to confirm proper operation after construction is complete.

On the issue of bandwidth, corrective matching circuitry can be constructed with relatively low cost components, if necessary, because of the relatively low power. A licensee will have the same responsibility to ensure that persons will not be exposed to excessive RF fields as at its daytime site.

## Designs vary widely

Low-profile antenna designs can range from the ridiculous to the sublime. Design possibilities to attempt optimization of radiation and bandwidth are limited only by the imaginations of antenna design engineers.

continued on page 13 ►

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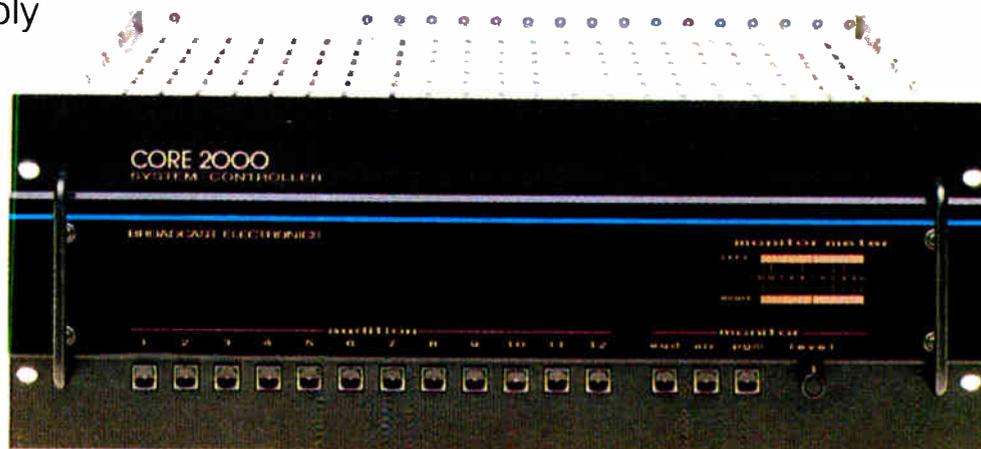
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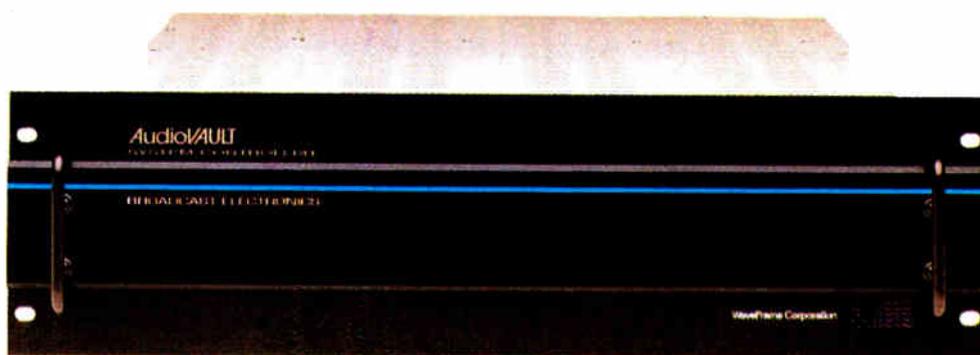
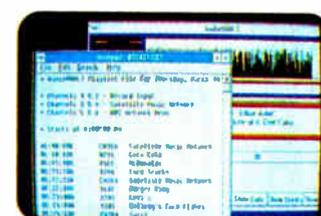
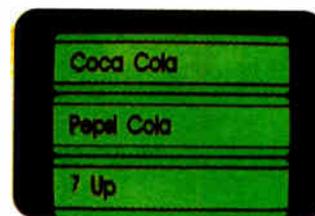


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## LOWPOWER LOWDOWN

# FM DXing: Improving In-Home Reception

by Howard L. Enstrom

**MOUNT DORA, Fla.** Low power accomplishes amazing things when it's used intelligently. With important communications work, each transmission circuit end is controlled by a professional. But in broadcasting, only one end of the circuit is so attended—which is why there can be so much difficulty in reception.

Consider shortwave communications—say, 2 to 30 MHz, where circuits may be hundreds or thousands of miles long. Propagation data is consulted, equipment and antennas are set up for the most useful

frequency for the particular time of day, season of the year and signal path over dark or daylight parts of the earth.

The latter is important because of the sun's effect upon the ionosphere, the electrically charged layers of the earth's uppermost atmosphere roughly 50 to 250 miles high.

Long-haul HF signal transmission and reception manipulators are like pool sharks. They keenly calculate billiard shots using wave energy—deliberate and controlled signal multipathing involving the ionosphere.

There's another factor about the transmission circuit, antenna orientation and

aperture in the E-plane (horizontal) and H-plane (vertical) with respect to the earth's surface. Among other things, even signal launch and intercept angles are optimized.

## On the receiving end

All this interests few broadcast listeners, whether they crave drums, horns and shrieking, or meaningful programming. Broadcast promoters and managers hardly care, either.

They just want the whole world to hear their thing—if only limitless power could be used to blast and knock'em down. Ideally, many AM listeners wouldn't even

# The Digital Audio Cart Machine

People like the sound of Digital Audio. It's revolutionized the way listeners respond to radio. Today, 360 Systems' DigiCart brings consistently great sound to spots and ID's too.

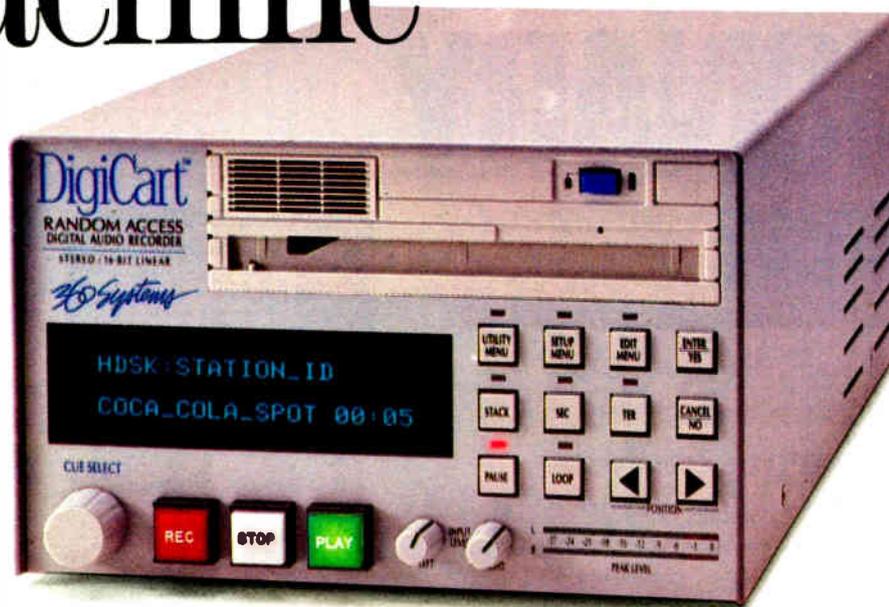
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World Radio History

need a radio: Their dental fillings would be non-linear detectors.

Have you ever heard someone at an FM station suggest how listeners might improve reception? I haven't, except for myself, when I was once interviewed on the air.

Do station managers ever ask their chief engineer to prepare something that can be sent to help complaining listeners? No, he's far more likely to be asked about the station's power. That's the way everyone's conditioned to think.

## A variety of models

In early days of broadcasting, all kinds of roof "aerials" were used. They were necessary. Models ranged from the single to the multiwire flat and to the elaborate "cage" aerials. Some neighbors may have viewed the contraptions as a status symbol. ("They have a radio.")

When Armstrong's regenerative AM receiver introduced sensational new sensitivity, indoor "loop" antennas became popular. Then they were eventually replaced with tiny built-in ferrite antennas. Many complained about reception and noise, not

**People will spend plenty on component-type entertainment centers. . . But, no decent FM antenna.**

knowing that sometimes reception could be greatly improved simply by turning the radio a bit, because the ferrite devices have directional characteristics.

Things aren't much different today. A listener may have made a financial contribution to fund a translator, then complained because his \$20 doesn't deliver a loud and clear signal from a flea-power station. Yet, he makes no effort to do anything to improve his receiving conditions.

It is axiomatic that a listener's complaints are directly proportional to the height and mass of his TV antenna. People will spend plenty on component-type entertainment centers, complete with receiver, amplifier, speakers, equalizer, turntable, CD player, and cassette playback. But, no decent FM antenna.

Probably in the same grouping, they have a TV set connected to an outside antenna, cable TV system or even satellite dish. How many do you know to have an outside FM antenna? The only one I know is me.

## FM DXing for fun

For our home, I have rotatable master TV and FM antennas. On FM, I can really dig signals out of the noise and can select against interfering co-channel and adjacent channel signals. The system, of course, greatly improves single-pathing for a signal, to provide the excellence of recovered audio.

If I had the time and inclination, FM DXing could be fun, because when you see the carrier level meter going through excursions you know it's not being transmitted exactly around the corner. But I have waited, usually at the top of an hour, only to hear some uninformative ID like "Q100 Radio."

Often you can tell more about a station's location by the commercials on the air than by the station ID. I'm not about to write down the antenna's heading and go through the FCC database in the computer.

Here in Florida, "coastal-tropo" is a term for irregularity in the atmosphere caused by heat variations between land and the Atlantic Ocean. Temperature inversions occur mostly in fall months, when days are warm and nights are cool.

continued on page 21 ►

# Dataworld Software Ready for AM Thaw

by Timothy Sawyer

**CHEVY CHASE, Md.** Many station managers and owners are anticipating the lifting of the AM freeze and the allowance of major changes to existing AM stations. Many have expressed an interest in the possibility of improving daytime or nighttime transmission facilities.

The new set of frequency allocation rules may have an impact on any previous plans for improvements a station may have had in the works before the freeze. Although improvements will be possible under the new rules, the bad news is that in almost

daytime horizontal radiation from a given location based upon applicable protection contours and the new interference ratios.

In general, AMSTUDY is the program to run first. Using the program, the engineer can almost immediately determine if it is possible to improve the present daytime operation of the facility to be studied. AMSTUDY is a computerized study of the AM band by frequency.

All that is necessary to run this program is the station location (geographical coordinates), and the frequency. Given that information, the program searches through its databases for all station records that have

The program will provide this information in a tabulated form, along with a detailed printout of the stations considered in the study. Additionally, an option is provided in the program to request that the company mail you a map with the contours to be protected plotted on it for later analysis by the engineer.

## Case study

To give you an example of the use of the program AMSTUDY, let's look at an existing facility and see if any improvements can be made. Station WPGS(AM) Mims, Fla., is a daytime-only operation on 840 kHz with 250 W and a non-directional antenna system.

The station's location is presently overlapped at night by the 0.5 mV/m 50 percent skywave contour of a Class 1A co-channel station; that being the case, no operation at night is possible. Given that information, we'll take a look at what, if any, are the possibilities of improvement to the daytime operation of WPGS.

Most of DATAWORLD's computer programs can be accessed remotely via computer modem after setting up a user's account with DATAWORLD. If you don't have access to a computer and modem, DATAWORLD's staff can run the program in-house for you, and mail or fax the results to you.

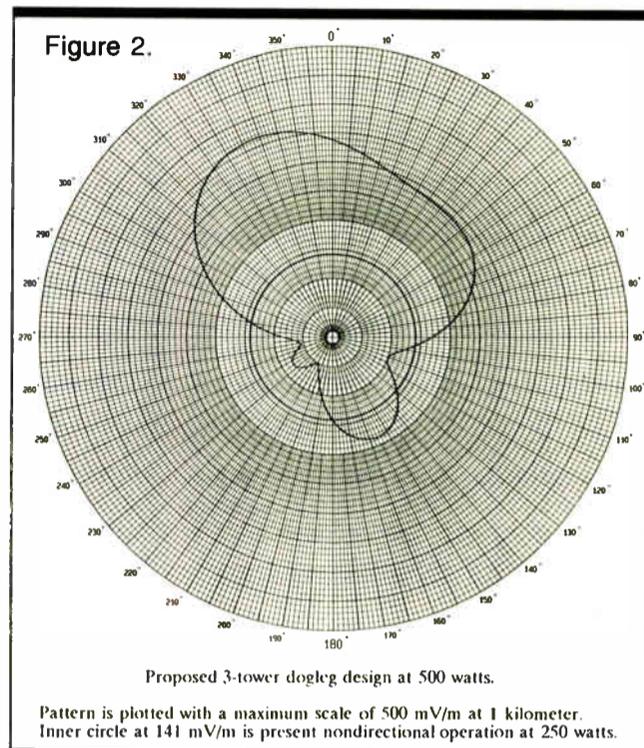
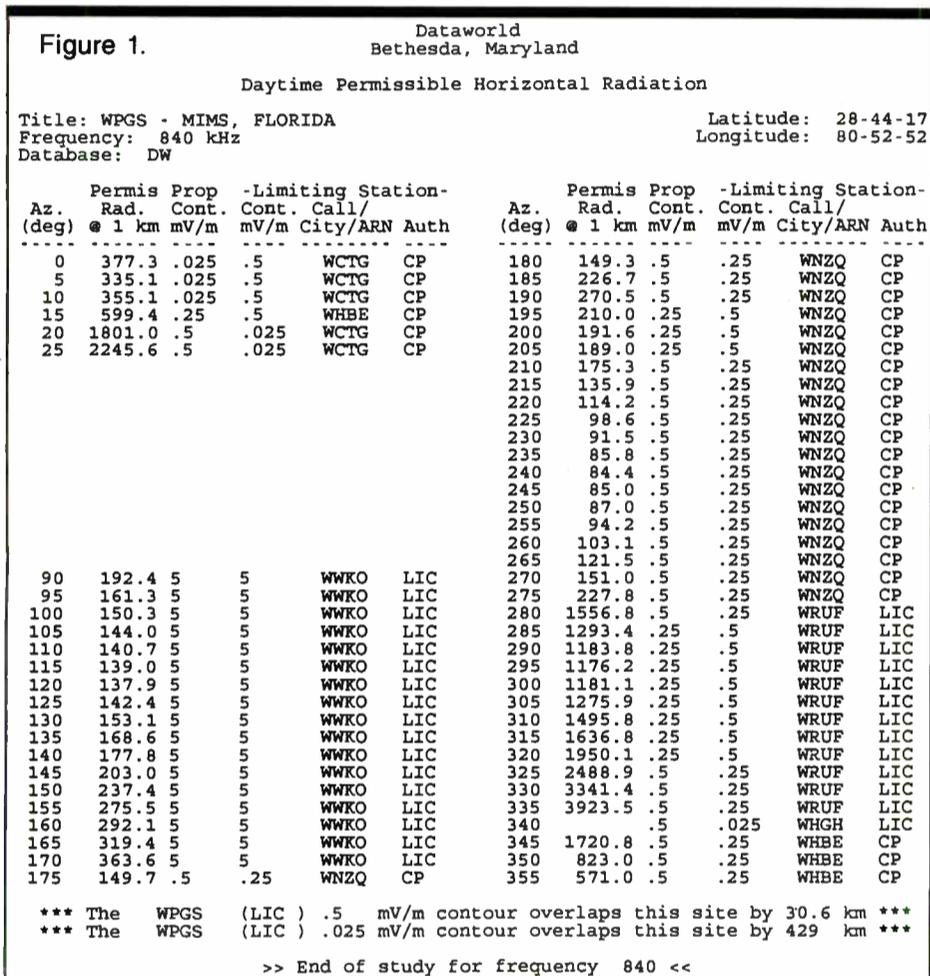
Back to WPGS. Given the station's location coordinates and frequency, AMSTUDY generates a table of *daytime permissible horizontal radiation values* in mV/m at a kilometer (see Figure 1).

This table is based upon the values of soil conductivities as provided on the FCC M3 Conductivity Map, the station's facilities, and the "to be protected" contours and their pertinent azimuths from WPGS. The user can quickly determine from this table if improvements can be made to the facilities at WPGS.

## New rules, new map

In this particular example, if WPGS were a new station, it would not be able to oper-

ate with its present non-directional antenna, because of the tighter first adjacency protection now required. In the past, we would use the 0.5 mV/m contour of the proposed station and the 0.5 mV/m protected contour



every case it is now more difficult to accomplish improvements allowed under the old rules.

Engineers and managers can look for some answers with the help of Dataworld, a provider of computerized frequency database searches and other services. The company has a number of computerized allocation programs available to assist the station engineer, or frequency allocation engineer, with a cost efficient answer to these questions. For the purpose of this article we'll focus our efforts on a possible improvement to a station's daytime coverage area.

## Two kinds of software

When looking for possible improvements to an AM station's daytime operation, there are two major programs to consider. The first is GWAVE, which calculates the groundwave contours of the proposed facility using the FCC "equivalent distance" method, combined with the retrieval of the M3 Map soil conductive data to predict the distance to "contour" of all contours required to be studied. GWAVE also allows for the substitution of measured conductivities from those provided by the M3 Conductivity Map, as required by the Commission's rules.

The second program is AMSTUDY, which calculates the maximum allowable

an impact on the proposed facility. It then provides the user with the maximum permissible horizontal radiation value (mV/m) to stations on co-channel, first, second and third adjacency channels—a calculation based upon facilities of the stations to be protected and the soil conductivities retrieved from a digitalized version of the FCC M3 Conductivity Map.

## AM Antenna Primer

► continued from page 10

Two very important principles for design are: loading to shift the current distribution upward on the vertical conductor (such as top-loading) and providing sufficiently large effective element diameters for improved bandwidth.

In the case of wire antennas, multiple-wire cages instead of single wires should be employed to increase effective diameters of the radiating elements. Many other design features might offer improvement in antenna characteristics for some cases, such as skirt-wire feeding to simplify antenna matching circuitry.

When designing for top-loading, particular care must be taken to avoid horizontally-polarized radiation which might contribute to high-angle skywave interference.

A very simple, time-honored design which uses large amounts of top-loading with no horizontally-polarized radiation is the T antenna.

antenna can be constructed between two telephone poles or other suitable supports.

The symmetry of the horizontal-wire currents in a T antenna ensures that radiation from the two horizontal segments will almost completely cancel at all azimuths and vertical angles. It is likely that the use of T antennas will increase to enhance nighttime performance.

With the new rules, a station with a daytime directional antenna should explore whether improved nighttime coverage might result from employing a different directional pattern, or a non-directional antenna.

A station with a transmitter located distant from the populated area might be severely limited by sunset.

## KEYBOARD CONNECTION

# A Look into Accessible Word Processing

by Barry Mishkind

**TUCSON, Ariz.** Finding the right word processor may seem like a difficult task. Indeed, software manufacturers have spent a lot of time and effort to provide a solution to everyone's needs. Programs exist from the very simple to the highly complex.

Possibly one of the biggest problems that users encounter is feature overkill. Many fine word processors have many more features than you'll ever use. It's rather like buying an expensive sports car to commute three blocks to work: the seats sure are nice, but you never get past second gear.

Similarly, if you are a small station, or need something for your personal computer at home, there are several options costing well under \$100 at your local software shop. One impressive package is Microsoft Works™. Actually several programs in one, Works contains a word processor, spreadsheet, database, telephone dialer, and mail merger in one program shell. It's also mouse aware.

## You see what you get

The word processor includes a spell checker and thesaurus. And since it can display in a graphical mode, you can actually see the print enhancements you have added; italics, bolding, and underlining appear right on the screen.

Furthermore, Works uses a consistent set of keystrokes to carry out commands, so you don't have to learn new commands for each feature group. This speeds up learning, and makes it easier to teach the program to other users. All of this has made Works a very

popular program—many computers are bundled with Works already installed.

To illustrate one of the best features of Works, consider what happens when you are working on something and need to check another file for some information, or do a calculation. In most programs, you must close the application, open another and seek the information, then close that and reopen the first program. Whew.

In Works, all you do is create another

**It's a strong performer on virtually any computer you might be using—even a laptop.**

"window." Several documents, or spreadsheets, etc. can share the screen or tile one over the next. Even better, you can exchange information from one "window" to another.

Now, perhaps you're thinking, "with all this graphics and sharing ability, that sounds a lot like Microsoft Windows™." And you'd be right. But, to really grasp what comes next, we have to return to the sports car metaphor.

## BMW or VW?

While a sports car is nice for long pleasure drives, if you live only 10 blocks from work, you'll likely choose a compact car for commuting. You'd want something eco-

nomical that simply gets the job done: a sports car would be a waste of resources.

The same applies with Works. It's a strong performer on virtually any computer you might be using—even a laptop. Neither high speed nor color is required. And although it has many features, it's not designed for highly complex projects.

On the other hand, maybe you like long drives on the weekends. Maybe you long for some of the more sophisticated features of Windows. Could Works be improved for use in Windows?

Absolutely. Microsoft has developed a sister program to Works, Windows Works™, that picks up where Works left off, and provides links to other Windows programs.

What does this mean? For one thing, you're no longer limited to the Works shell. Windows Works can import and export to any Windows program you may have as well as specific companion programs like Microsoft Publisher™, and Microsoft Money™.

For example, if you want to utilize some of your documents in a desktop publishing environment, Works screens can be a bit limited. Instead, Windows Works operates in a true graphic environment, and allows you greater ability to manipulate the various elements. Using built-in WorksWizards, you can easily set up custom documents such as address books or mailing labels.

Windows Works even has drawing capabilities, but being in the Windows environment, you can use Windows Draw™ or graphics power tools like CorelDRAW™ to create everything from letterheads to ad-

vertising layouts.

In fact, anything available in Windows is now available to you in Windows Works. Telecommunications, cardfiles, calendars—the whole Windows world.

## Virus watch

With more than 60 percent of business organizations now having had some encounter with a computer virus, a program upgrade that just arrived may strongly interest you.

Version 2.0 of the Symantec's Norton AntiVirus™ now can find and repair damage from over 1,000 viruses, as well as detect unknown viruses by their activity. Windows users will be happy to know that Norton AntiVirus now works both under DOS and inside Windows.

One major improvement to the package is that the checksum feature no longer creates hundreds of 77 byte files on your hard drive. Now Norton AntiVirus puts all the data in one file per disk.

According to Symantec, as many as 20 new viruses can turn up in an average week, many of them from new computer hackers from Eastern Europe. They can turn up anywhere, even in new machines. One local vendor here had a worker bring in a game from home to test new machines, and the result was Jerusalem Virus on every unit sold.

Symantec provides several low cost ways to update your virus database, so the program won't necessarily go out of date and leave you defenseless. It sure wouldn't hurt to check every machine in your shop from time to time, including new units you may be installing.

Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant in Tucson, Ariz. He can be reached at 602-296-3797, or 70631,116 on CompuServe, or "barry@coyote.datalog.com" on Internet.

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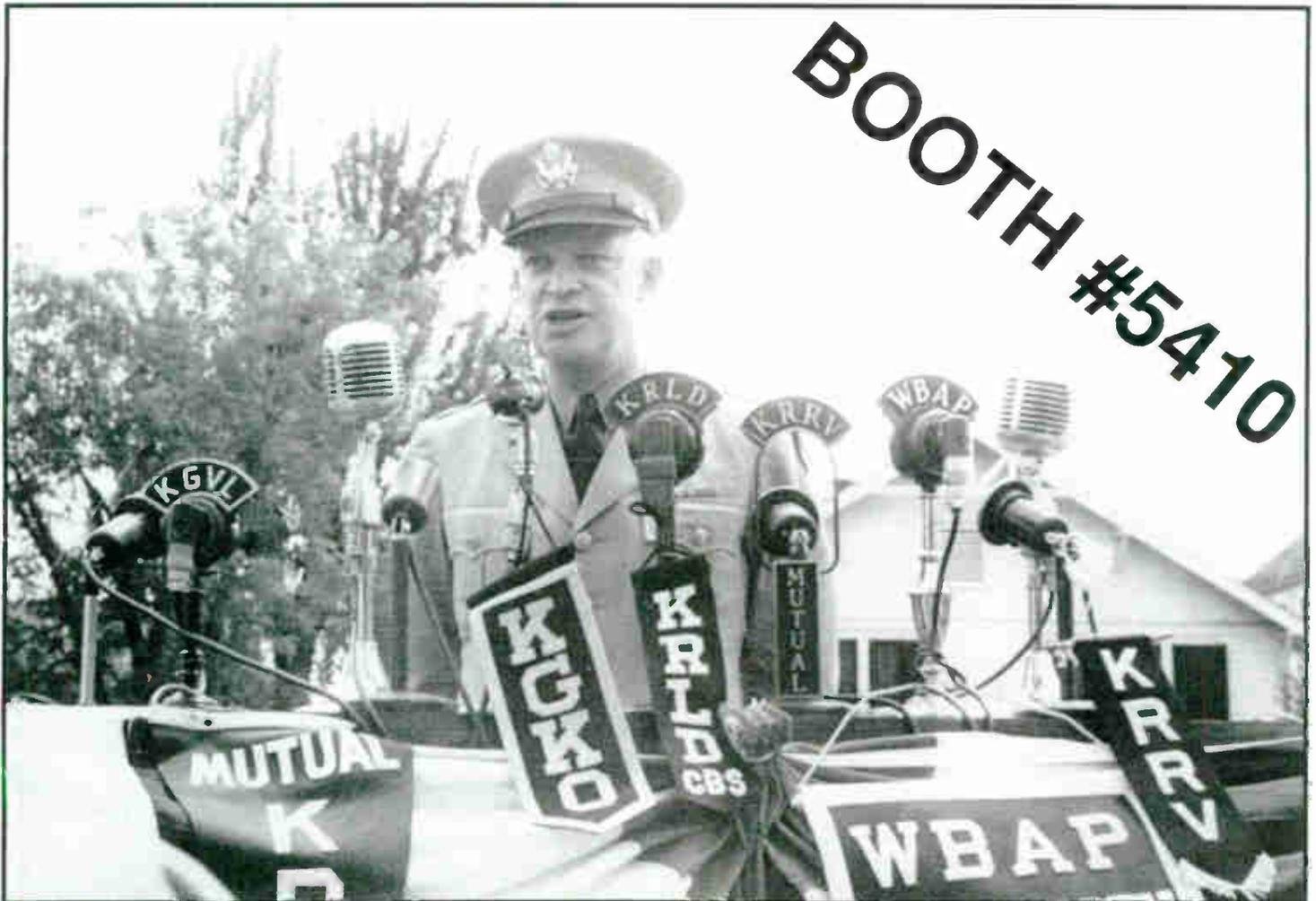
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World Radio History

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## Technics



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The Telos 100 is a true digital processing system. Because it uses state-of-the-art digital techniques to subtract the send audio from the caller output, it allows smooth, natural, two-way conversation without up-cutting or announcer voice distortion. On many telephone lines, trans-hybrid loss of better than 50dB can be expected.



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The switch console and 1A2 key system interface module provide line selection, dialing, and conferencing capabilities in systems using standard key telephone equipment. Depending upon configuration, each console can control 9 to 20 lines. Each interface module handles 10 lines and two hybrids.



## Telos Link



A state-of-the-art solution to interconnecting 2-wire intercom production systems with dial-up phone lines. With digital auto-nulling hybrids on both the Telco and com paths, the Link provides full-duplex communication without the usual level and feedback hassles.

## Telos Pricing Guide

### A. Hybrids

Telos 100 Digital hybrid	#TS100	\$2450
Telos One Digital hybrid	TS1	\$985

### B Interface Modules

Telos 100 1A2 interface module	TS1001A2	\$1050
Telos 100 Direct interface Module	TS100DIM	\$1840

### C. Controls

Telos 100 switch console	TS100SC	\$650
Mitel Superset IV Phone Set	TSMIT-1	\$350
Mitel Superset IV Phone Set Refurb.	TSMIT-2	\$250
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PR&E AMX/BMX2 10 Line Panel	PRB2-10	\$980
PR&E AMX/BMX3 10 Line Panel	PRB3-10	\$980
PR&E AMX/BMX3 30 Line Panel	PRB3-30	\$2450
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PR&E ABX 30 Line Panel	PRABX-30	\$2450
PR&E Turret 10 Line Panel	PRTRT-10	\$980
PR&E Turret 30 Line Panel	PRTRT-30	\$2450

Telos 100 Local Power Supply	TS100PS	\$185
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Telos One Auto Answer Board	TS1AA	\$50
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### Telephone-to-Intercom Interface

Telos LINK	TSLINK	\$1680
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Note: PR&E Panels allow simple, logical multi-line selection and dialing functions to be accomplished at panels mounted within Pacific Recorders & Engineering consoles.





### Model FSK-221 field support kit

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  - 1. AT-804 mic
  - 1. custom mic cable
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Add \$40 more for EV-635A



# AudioArts

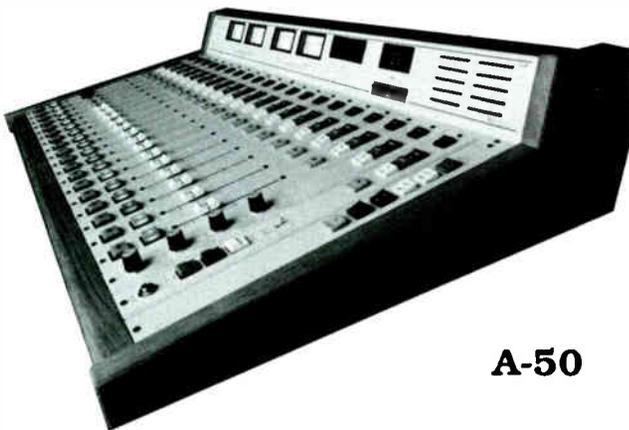


**R-30**

Due to the incredible success of the Audioarts A-50 line of audio consoles, Audioarts has now added two new lines. The first is the R-10, a lower priced console than the A-50. The second is the R-30, a more sophisticated console than the A-50.

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**A-50**

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World Radio History

**audio-technica.**

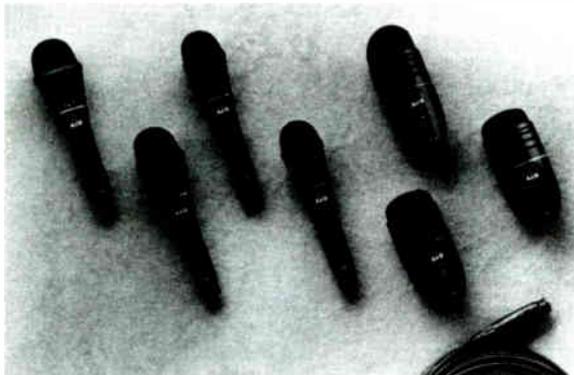


Now, for a limited time, save an *extra 10%* when you buy any of the popular ATW Series of wireless mic systems! These systems deliver crystal clear sound that is perfect for remote broadcasts and any live sound reinforcement application.

ATW-1031/831 (lavalier system)..... List \$730  
 ATW-1032 (handheld system)..... List \$750

Your Choice **\$439<sup>00</sup>**

**AKG**  
 acoustics



**AKG Tri-Powered Series**  
 AKG introduces the new Tri-Power series designed specifically for the stage performer. With the latest technology in: transducer designs, shock mount designs and chassis construction, the Tri-Power series is ready to perform as great as the performer.

*Call to see which mic is best for you!*

**DigiCart™**



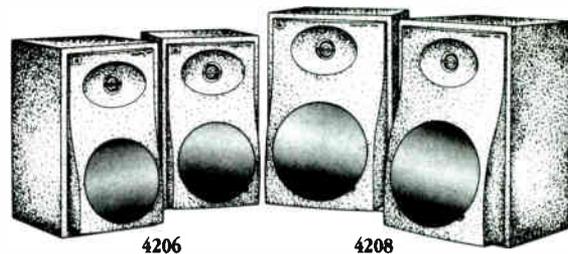
All the advantages of digital with the convenience of a cart machine! The DigiCart allows you to store several hours of stereo audio on optional hard disks, while removeable disks hold up to 10 minutes in stereo.

Suggested List.....\$3,995

*Call for pricing!*



**4200 Series**



"Designed for the Control Room not the Living Room," is the 4200 series by JBL. With newly designed magnetically shielded pure titanium tweeters, low frequency transducers and the uniquely sculpted Multi-Radial baffle, you get the latest in technological advances right in your ears.

*Call for pricing!*



**CROUSE-KIMZEY COMPANY**

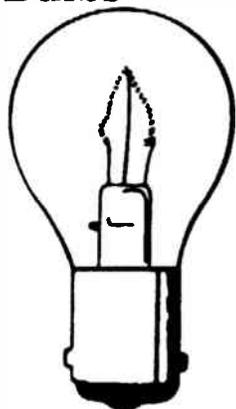
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**Annapolis Office (800) 955-6800**

# Tower Flasher



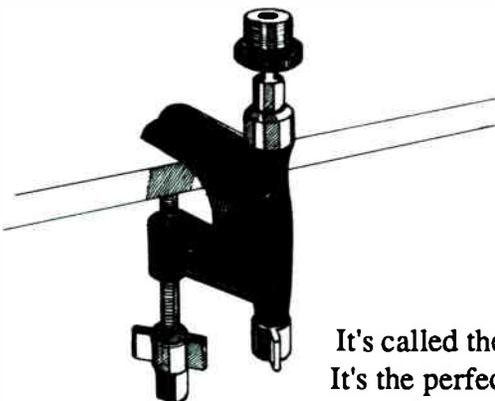
## Bulbs



SSAC solid state tower flashers are highly immune to lightning and totally encapsulated for protection from the elements.

SSAC Flasher.....\$69  
part #FS155-30T

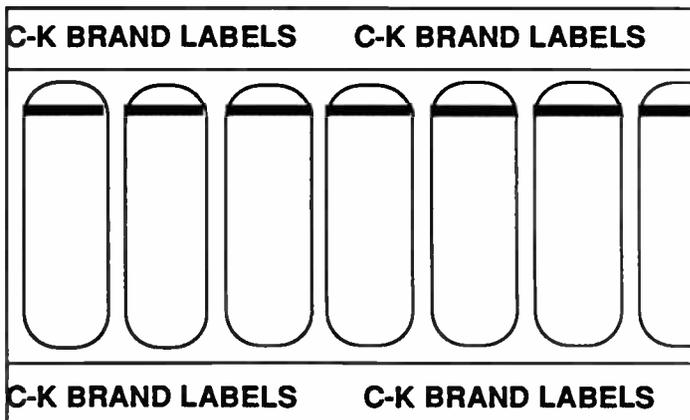
- Beacon lamp....620W 120V....\$34.00  
part #620PS40P
- Beacon lamp....620W 120V....\$39.95  
part #620PS40P Durotest
- Sidelights.....116W 120V....\$3.50  
part #116A21TS



It's called the "Rowi" clamp. It's the perfect mic stand for every situation. Fits in your

pocket, attaches to any table-desk-lecturn. Adjusts to any angle and holds. Standard thread to fit your mic's stand adaptor. Use them for press conferences, remotes, disco gigs, interviews. Throw a couple in with your remote broadcast equipment and never search for a place to put a mic again.

Rowi clamp.....\$29.95



## C-K Brand Cart Labels

Crouse-Kimzey has developed the perfect cart label, working closely with the largest label manufacturer in the U.S. Guaranteed to stick as long as you want it to, then easily removed leaving no residue. Matte surface easy to type on. Six colors plus white. Packs of 1000, call for a free sample.

C-K Brand cart labels.....\$18 per 1000  
\$85 per 5000



# WILL-BURT HURRY-UP MAST

Will-Burt's 25' HURRY-UP telescoping mast is designed for fast and easy deployment of lightweight antennas. Great for Marti remotes!

List \$1,225

## Special \$1089



# SHURE



SM7

Suggested List..... \$550

**\$299<sup>00</sup>**



SM57-LC  
List \$141

**\$89**



SM58-LC  
List \$181

**\$109**

## Line Matching Transformers

Special Purchase  
While Supplies Last



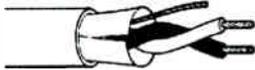
list \$31

**\$9.95**

CP-8201

The Audio-Technica CP-8201 line matching transformer is ideal for using low impedance microphones with hi impedance equipment.

## WOW WEST PENN WIRE CORP.



### Wire in Colors???

Did you know that West Penn 291 wire comes in red, white & blue, black, gray, brown, violet, orange, and yellow?

## ATA 19-Inch Rack Mount Cases



**SKB**  
made in U.S.A.

Lightweight, yet strong the SKB-19 inch racks are made of military grade 50-100 ultra high molecular weight polyethylene material. They are stackable and less than half the weight of wooden racks. The draw-tight latch front and rear covers are gasket-sealed to keep out moisture and dirt.

2-space	List \$139.95	\$99
4-space	149.95	105
6-space	169.95	119
8-space	199.95	139
10-space	219.95	149
12-space	239.95	169

## SENNHEISER



HD-450  
Stereo headphones

Suggested List.....\$99

**One for \$69<sup>95</sup>**  
**Two for \$129<sup>00</sup>**



HMD-224  
Sportscaster Headset

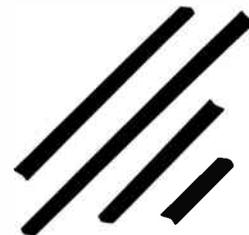
Suggested List..... \$315

**\$239<sup>00</sup>**



## middle atlantic products

### Rack Rails



RR-3	5-1/4" (pair)	\$9
RR-12	21" (pair)	21
RR-15	26-1/4" (pair)	27
RR-18	31-1/2" (pair)	29
RR-27	47-1/4" (pair)	39



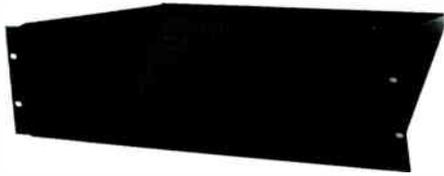
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World Radio History

### Rack Shelves



- U1 1 space x 11" D.....\$34.95
- U2 2 space x 15" D.....46.50
- RMT-3 3 space x 14" D.....49.95
- RMT-4 4 space x 14" D.....55.00

### Littlelite



The Littlelite L-3 comes with attached base, power cord and mounting instruction. Great for the studio or your workbench!

L-3/18" gooseneck .....List \$57  
*While supplies last.....\$39*



Switchcraft or Neutrik  
**XLR Connectors**  
**YOUR CHOICE \$2.75**

### MIC CABLES

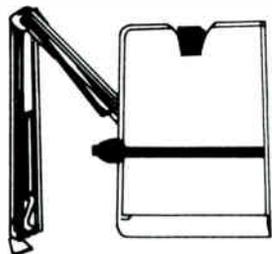


CK-5	5-footer	\$12.95
CK-10	10-footer	13.95
CK-15	15-footer	14.95
CK-20	20-footer	15.95
CK-25	25-footer	16.95
CK-50	50-footer	24.95

### Microphone Arms



- Luxo LM-1.....\$59  
*(includes base)*
- Luxo KM-1.....69  
*(for heavier mics)*
- O.C. White.....99  
*(includes 12" riser)*



### Copy Holders

- Letter size.....\$49
- Computer size.....69



### Westclox Studio Clocks

- #709 AC powered.....\$29
- #710 battery powered.....29

### Warning Signs



Available in metal or "peel & stick" vinyl:

- Radiation sign (metal).....\$25
- Radiation sign (vinyl).....14
- High voltage (metal).....20
- High voltage (vinyl).....10



### USS Stands

Sturdy lightweight tripod stands are ideal for mounting PA speakers. Available in black or silver.

- TS-30BT (6'7")-black) List \$120  
Special \$89
- TS-33BT (9'2")-black) List \$145  
Special \$119



**Gentner**



**OPTIMOD FM**



**Lazer/Prizm**

Get the cleanest stereo separation and limiting possible! The all-digital Lazer/Prizm combination delivers excellent aural specs while providing you with total modulation control. Front panel pushbuttons and a numerical readout allow you to preset specific parameters.

List \$8,995.....CALL



**Paragon-Digital**

Give your station a louder, more competitive sound with this complete system. The Paragon's unique touch-screen permits easy adjustment of all parameters and On-Air A/B comparisons of different setups.

List \$10,000.....CALL



**8200U3S**

The all-digital Optimod audio processor offers superior performance and powerful new features. Multiple Variable Processing (MVP) architecture allows you to change processing configurations with the push of a button. Edit any parameter easily using front panel controls.

Optimod FM 8200.....CALL

**Inovonics**

**DELTA ELECTRONICS**



**Model 705 FM Stereo Generator**

A full-featured stand-alone stereo generator featuring digitally-generated subcarrier and pilot signals for optimum performance and drift-free operation. Patented overshoot compensation, built-in peak overmodulation protection, easy setup and maintenance, FMX plug-in option.

705.....\$1,375  
705-01 w/FMX.....\$1,990

**"Affordable AM Stereo"**



**Delta ASE-2**

Go AM stereo with the ASE-2 C-QUAM AM stereo exciter from Delta. You get state-of-the-art performance for about half the cost of other AM stereo exciters. The ASE-2 is easy to install, requires only 1 rack space and is backed by Delta's full 1-year warranty.

Delta ASE-2 AM Stereo Exciter.....\$3,155

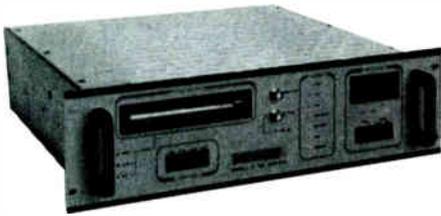


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**Annapolis Office (800) 955-6800**

**TTC**



**TTC Model X FM Exciter**  
 For Breakthrough performance with digital audio and multiple subcarrier opportunities. Can handle up to five subcarriers with no loss in quality. Backed by an unbeatable 2-year warranty.

Model X ... List \$5,695 ... CALL

**modulation sciences, inc.**



**ModMinder™**  
 Accurately measure & display peak FM deviation.

ModMinder.....List \$2,395  
 w/ Demod card upgrade.....List \$695

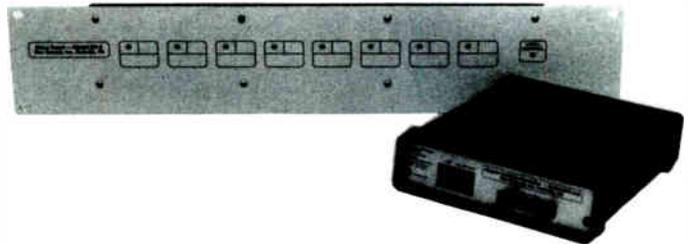
**APHEX SYSTEMS**



**Model 400 Digicoder**  
 The Aphex stereo generator...a leap beyond digital utilizing a proprietary PPDM (Parallel Path Digital Modulation) circuit to provide a dynamic range better the 110dB. Class A analog with the separation and stability of digital. Totally interfaces with your existing equipment.

*Call for price!*

# A dial-up remote control for *how much?*



You would probably expect to pay \$2,500 or more for what the Sine Systems RFC-1 remote control offers for just **\$1,498 complete.**

(That leaves \$1,002 for something else!)

- Expandable up to 64 channels of status, control & metering
- User programmable dial out
- Easy installation & operation
- Full one-year factory warranty

**Primary Components:**

<b>RFC-1/B</b>	<b>Remote Facilities Controller</b>	<b>\$1099</b>
<b>RP-8</b>	<b>Eight Channel Relay Panel</b>	<b>\$399</b>

**Accessories**

<b>AFS-1</b>	<b>Dual Channel Audio Failsafe</b>	<b>\$249</b>
<b>UPS-1</b>	<b>Uninterruptable Power Supply</b>	<b>\$249</b>
<b>SP-8</b>	<b>Heavy Duty Surge Protector; for telephone line &amp; 8 telemetry channels; highly recommended for sites prone to lightning damage (mounts on RP-8 panel)</b>	<b>\$129</b>
<b>SP-9/TO</b>	<b>Telemetry Surge Protector, 8 channel telemetry-only version of above</b>	<b>\$89</b>
<b>ACM-1</b>	<b>AC Current Monitor; for tower light monitoring</b>	<b>\$99</b>
<b>RK-3</b>	<b>Rack Mount Kit for RFC-1, AFS-1 &amp; UPS-1; mounts up to 3 units.</b>	<b>\$35</b>
<b>TM-1</b>	<b>Temperature Monitor module; mounts on RP-8</b>	<b>\$29</b>



**CROUSE-KIMZEY COMPANY**

**Main Office (800) 433-2105**

**Annapolis Office (800) 955-6800**

World Radio History

**Arrakis consoles have quickly become one of the most popular audio broadcast consoles in the industry providing outstanding performance at a reasonable cost. Choose from over a dozen models from six to 28 channels. All come backed by a 2-year factory warranty.**



**150SC** 6-channel w/18 inputs, program output, rotary faders  
 mono \$2395                      stereo \$2495

**250SC** 6-channel rack mount w/18 inputs, program and audition outputs, rotary faders  
 mono \$2895                      stereo \$2995

**500SC** 8-channel w/22 inputs, program and audition outputs, rotary faders  
 mono \$3495                      stereo \$3595

**1500SC** 8-channel w/22 inputs, Penny and Giles slide faders, program and audition outputs  
 mono \$4395                      stereo \$4495

**2000SC** 12-channel w/24 inputs, Penny and Giles slide faders, program & audition outputs  
 mono \$4895                      stereo \$4995

**2100SC** 12-channel w/34 inputs, Penny and Giles slide faders, program and audition outputs  
 mono \$5895                      stereo \$5995

**5000 series** is a 16-channel modular version of the SC series at under \$10,000 when fully loaded.

**10,000 series** is Arrakis' top-of-the-line total broadcast product combining complete "ON AIR", stereo production, and multitrack production capability within a single product specifically designed for contemporary radio and TV broadcasting. 12 to 24-input mainframes are available with many optional modules to choose from.

**12,000 series** offers a large variety of modules and mainframes from 8 to 28-input at a value that is unmatched in features and performance.

**15,000 series** modular console was designed specifically to maximize reliability and durability. It features 8 to 28-input mainframes with many modules to choose from.

## Teleswitch



- Easily connects 5 lines to your hybrid
  - Works like an old business phone
  - Connects via RJ-11 jacks
  - Even has music on hold!
- \$995**

## Frequency Extenders



**EFT-100**  
**\$549**

- Extender Only
- Requires Hybrid
- 2-Way Communication



**EFT-900A**  
**\$829**

- Stand alone unit
- 250 Hz shift
- 2-way communication

## Hybrids

**Hybrid Coupler**  
**\$169**



**SPH-3A**  
**\$549**



**SPH-5**  
**\$829**



**Digital Hybrid II**  
**\$1,795**



## VRC 2000 Remote Control



VRC-2000 Remote control including telephone surge protector .....List **\$3,195**

Package 1 includes VRC-2000, command relay and two screw barrier strips.....List **\$3,449**

Package 2 includes VRC-2000, command relay, two screw barrier strips, data interface, and setup software .....List **\$4,349**

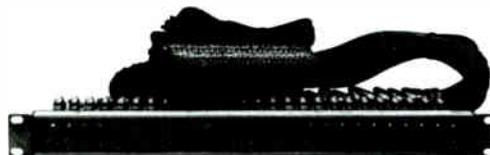
Many, many other communications, special purpose, interconnection, and miscellaneous accessories are available. Call for all the details and a package price for your configuration.

## Micro-Tel

It doesn't get any easier!

Plug into standard phone, plug microphone in, plug headphone in, you're broadcasting!

**\$249**



Need a pre-wired patch bay?  
Gentner has what you need.  
*Call for prices*

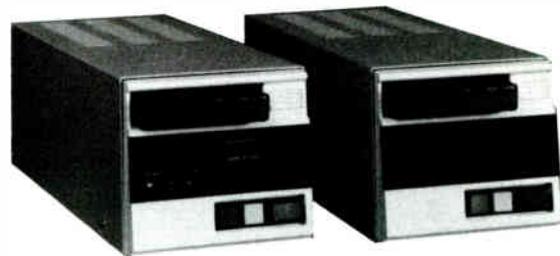




**Phase Trak 90**

The PT-90's continuous non-encoded phase correction and Dynafex noise reduction ensure consistently superior audio.

Stereo playback.....List \$2,750.....CALL  
 Stereo rec/play.....List \$4,550.....CALL



**Dura Trak 90A**

Dura Trak cart machines offer outstanding audio performance and reliability at a very affordable price.

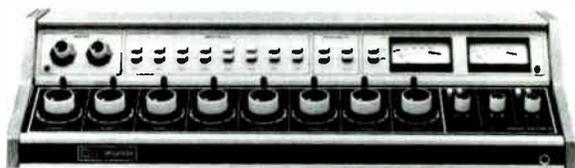
Stereo playback.....List \$1,900.....CALL  
 Stereo rec/play.....List \$2,850.....CALL



**Splice Trak 90**

Dual erase heads thoroughly erase and NAB standard cart to a typical depth of 90 dB, while splice detector accurately positions the splice.

Suggested List \$1,150.....CALL



**150A/250A**

Both the 150A and the 250A series consoles offer the best in noise-free performance. The 150A utilizes sealed pots with cue position for attenuation while the 250A offers step-type attenuators for precise level control. Many other features too numerous to list. Available in 5, 8, and 10 channel. Call for the one that is right for you.

5S150A 5-mixer stereo.....List \$3450  
 5M250A 5-mixer mono.....List \$3450  
 5S250A 5-mixer stereo.....List \$4350  
 8S150A 8-mixer stereo.....List \$4650  
 8M250A 8-mixer mono.....List \$4650  
 8S250A 8-mixer stereo.....List \$5650  
 10M250A 10-mixer mono.....List \$5950  
 10S250A 10-mixer stereo.....List \$7000

*Call for pricing!*



# HENRY ENGINEERING



## DIGISTOR

Henry Engineering presents DIGISTOR, a digital message storage system that stores up to 4 minutes of audio for playback via a regular telephone line.

Features include:

- 4 minutes of recording time
- Single or Continuous playback mode
- Play, Stop, Record functions remotely controllable
- Battery backup prevents memory loss during AC failure
- Records from a microphone, or from tape deck or studio

DIGISTOR.....LIST \$350.....\$299

# DENON



## Denon DN950FA CD Cart Player

The first CD cart player for broadcast and still the best! The industry standard DN-950FA uses a protective housing to keep your CD's free of dust, fingerprints and scratches.

- ACD-5B disc housing.....3.50
- 38C39-7147 test CD.....19.95
- AMC-9 lens cleaning cart.....19.95
- DN950FA TOOL alignment kit.....91.00
- Extra labels (per sheet)..... .50
- Extra screws..... .10

## WANT TO PLACE AN ORDER OR BE ADDED TO OUR MAILING LIST?

### Mailing & Billing address:

Company name \_\_\_\_\_ Call letters \_\_\_\_\_  
 Attn: \_\_\_\_\_ Purchase order # \_\_\_\_\_  
 Address \_\_\_\_\_ P.O. Box \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_  
 Signature \_\_\_\_\_ Phone(\_\_\_\_) \_\_\_\_\_

Add to mail list ONLY

Shipping charges are not included and will be billed.

Qty.	Model	Description	Amount	Total
Crouse-Kimzey Box 155999 Ft. Worth, TX 76155 (800) 433-2105 fax (817) 283-8133			Sub-Total	
Crouse-Kimzey of Annapolis Box 6300 Annapolis, MD 21401 (800) 955-6800 fax (410) 757-6666			Tax (TX & MD only)	
			<b>TOTAL</b>	





### SONY UHF Wireless System

SONY introduces the new UHF wireless system which operates in the vacant UHF TV band in a range of 794 to 806 MHz giving you a total of **94** different frequencies! Never worry about interference again. Also many, many other features, so many we can't list them! *Call for details!*



### PCM-2300 DAT Recorder

The affordable new PCM-2300 DAT recorder from Sony has all the features and performance you need at a price you'll like!

- XLR balanced inputs & outputs
- wired remote control
- standard 19" rack mountable
- 3 sampling frequencies
- 1-bit delta type A/D converter for outstanding audio quality!

PCM-2300.....List \$1,590.....**\$1,295**



### CDP-2700 CD Player

The CDP-2700 is perfect for ON-AIR or production rooms. Loaded with professional features:

- XLR balanced inputs & outputs
- AES/EBU standard digital outputs
- advanced 18-bit, 8-times oversampling
- standard 19" rack mountable
- auto-cue
- remote connector for console fader start/stop

CDP-2700.....List \$1,295.....**\$1,099**

### SONY STEREO HEADPHONES

Both the **MDR-7502** and **MDR-7506** feature a rugged closed ear design, gold connectors and oxygen free cord with frequency response from 10 Hz to 20 kHz. The MDR-7502 is a compact version of the full-size MDR-7506.

**MDR-7502 \$49**

**MDR-7506 \$89**

## Special pricing on SONY DAT Cassettes



<b>SONY</b>	
45-minute.....	<b>6.90</b>
60-minute.....	<b>8.50</b>
90-minute.....	<b>9.75</b>
120-minute.....	<b>10.95</b>

### PBR-330

#### Parabolic Reflector

Focuses sound waves directly to a microphone for increased sensitivity. The PBR-330 is widely used in sports and other remote recording applications. Will accept most hand-held microphones.



PBR-330.....**\$89**



# Digital DJ

## 18 Months—180 Systems

### Thanks Everybody!



In our first 18 months of delivery, Digital DJ has become the most popular digital Satellite automation system on the market. A combination of low cost, great flexibility and rock stable operation has propelled Digital DJ into the lead. We are constantly adding features in response to customer requests that make Digital DJ even better.

### Complete Digital DJ Satellite systems from \$7,995 - Lease from \$198/month

Digital DJ is a *complete* satellite automation system that easily runs all SMN, Unistar, JSA and other music networks including alternate news network feeds. Each system includes a premium 386 computer with VGA monitor and fast hard disks. Complete, Live Assist operation included at no extra cost. Fully station programmable with no relays and an integrated 5 channel stereo audio switcher, Digital DJ will air your current format and will adapt to any future changes in programming. Many advanced options are available for special requirements.

#### New Product:

#### Compact Disk Automation with Music Log from \$10,995

- Complete live or auto-sequencing 180 CD system with full time update and over programming capability.
- Standard selection capacity as high as 576 CD's, with fast access. You select the number of storage devices.
- Stand alone or interface to optional Digital DJ hard disk spot storage.
- Complete with the famous Music Log™ CD based music selector with integrated interface. (limited offer)
- Accepts play lists from Selector™ and other music selector systems.
- Includes 386 computer, monitor, special CD audio switcher with interface, CD players, cabling & Music Log.

#### New Product:

#### SmartCart™ Audio Cart Machine Replacement System from \$3,995

- Replaces all the old audio Cart machines in your station.
- Supply your own Computers, hard disks and monitors.
- A complete setup: includes separate *Record* and *Playback* units with high speed interconnection.
- Full break sequencing under total operator control. The full Broadcast Log is on the operator screen.
- Free SOS (Station Operations System) with on screen pop-up *info* windows and utilities.
- Special *quick play* mode for last minute insertions.
- Not a Cart machine *wannabe*, or cheap floppy disk device. SmartCart is a complete audio handling system.

#### Integrated Traffic & Billing from \$695

- All Traffic & Billing Systems store sales Orders, generate Traffic Logs, handle complete A/R, produces Invoices, Affidavits and Statements and tracks sales staff.
- Three Separate price and performance levels to fit your exact needs.
- Complete interface to Digital DJ and other automation is available.
- Traffic systems may be upgraded to higher level at low cost.
- Traffic systems use standard PC compatible computers with hard disk.
- Over 1100 Traffic & Billing systems in the field.

#### CD Music Log from \$895

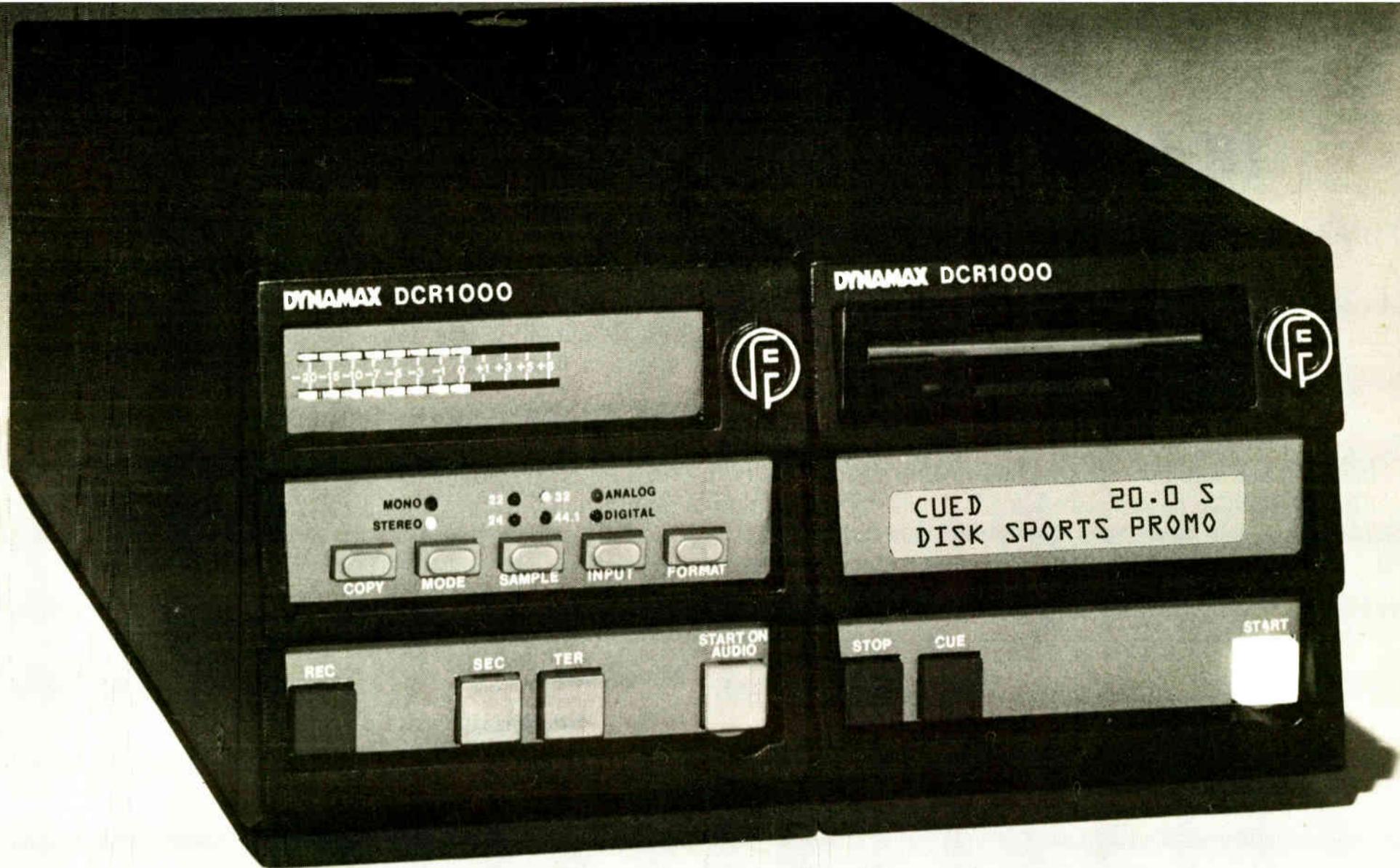
- Exclusive *FLOW* scheduling gives complete control of any format style.
- Handles singles, albums, carts, and CD's interchangeably.
- Specially optimized for use with multi-player CD control systems including optional interfaces to Digital DJ-CD™ and Format Sentry™
- The music director has full control of tempo in/out, artist, category, daypart restriction, media ID separations and many other formatting and control parameters.
- Uses standard PC compatible computer with hard disk.
- Sets up quick, runs fast, simple to use, very powerful.

**See Digital DJ, Music Log and the Traffic systems at the NAB  
Las Vegas Hilton - North Tower - Suite 868**

**The Management - Box 1-36457 - Ft. Worth TX 76136**

**Phone 1-800-334-7823**

**FAX: 817-624-9741**



# DYNAMAX DCR1000 Digital Cartridge Recorder

## The Recorder

- Selectable sampling rates
- Secondary and Tertiary cues
- Extended scale peak metering
- AES/EBU digital input
- Start on audio
- Direct digital dubbing from CD
- PC keyboard for titling

## The Reproducer

- Simple cart-like operation
- No on-air personality training
- Just three front panel buttons
- Instant start and cue
- Maintenance-free design
- No head cleaning or alignment
- Awesome audio quality

## The Media

- Standard low cost floppy disks
- 2MB holds 60 second commercials
- 10MB stores over 5 minutes stereo audio with 15kHz bandwidth and 15 minutes mono with 10kHz

**Call your nearest RF Specialties office  
for more information or to schedule a demonstration.**

**The remarkable new DCR1000 is available now,  
and it's priced like an analog cart machine.**

**A. NORTHWEST**  
Seattle, WA  
Phone (206) 546-6546  
FAX (206) 546-2633  
John Schneider

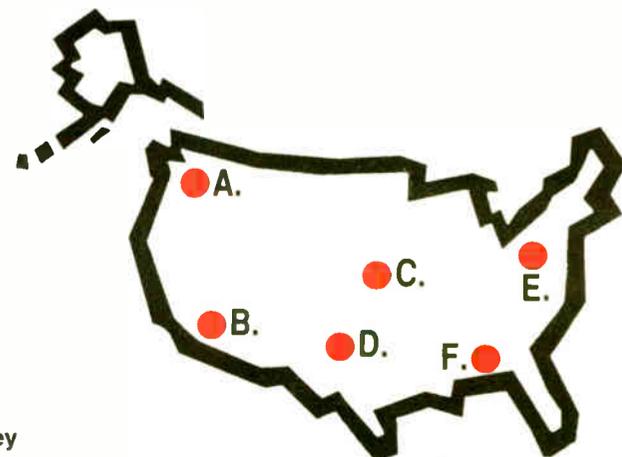
**B. WEST COAST**  
Santa Barbara, CA  
Phone (805) 682-9429  
FAX (805) 682-5170  
Sam Lane

**C. MIDWEST**  
Kearney, MO  
Phone (816) 635-5959  
FAX (816) 635-4508  
Chris Kreger

**D. SOUTHWEST**  
Amarillo, TX  
Phone (806) 372-4518  
FAX (806) 373-8036  
Don Jones & Tim Hawks

**E. NORTHEAST**  
Pittsburgh, PA  
Phone (412) 733-1994  
FAX (412) 327-9336  
Tom Monahan

**F. SOUTHEAST**  
Niceville, FL  
Phone (904) 678-8943  
FAX (904) 729-2744  
Bill Hoisington & Bill Turney



 **RF Specialties®  
Group**

Circle (64) On Reader Service Card

World Radio History

# FROM THE TRENCHES

by Alan Peterson



## Magic Memo Machine

Dear Alex,

We're getting into my favorite time of year, only a short shake away from the beginning of warmer weather here in the Northeast. Log is plenty full again and the Spring book could be promising.

The entire broadcast world is NAB-happy right now (sure is enough in print about it), but for me, it's prep time for the 1992 Intercollegiate Broadcast convention in New York. I'll be reprising my role from last year as panelist in several sessions, and I'm always happy to comply.

I'm writing this during a break in my search through countless folders of material I've saved over 15 years; hundreds of articles, clippings, schematics and graphs, all to help me put a new spin on some of my workshops.

Too bad I couldn't do a workshop on one folder I've labelled "M3." It would have been a beauty.

M3 is the Magic Memo Machine; an accumulation of the most imbecilic, unimportant memos ever to roll off a thermal drum. My collection is stunning.

I will admit memos are very important. They serve the need to notify all departments of important news all at once, and they become a written record of a policy or decision. Very important indeed. *But*, are they always necessary? My M3 folder is the final resting place of the ones that astound me with their idiocy.

Such as the "Megabucks Memo" of seven years ago.

While I was PD/OM of a combo, a PD-

wannabe memooed me about a lecture she gave our FM evening guy about giving the "Megabucks" lottery game winning numbers over the phone. He should be restricted from doing so, as any listener can get them by merely tuning us in.

The memo ran three paragraphs, and was so niggling you could almost hear her whining right through the page: "A listener's job is to listen. If he continues, I recommend discipline" . . . and more fun.

My reaction? Number one, my night-timer has enough to do—stop hassling him. Number two, listeners don't *know* their "job" is to listen, they just want to be entertained. Number three, tell the caller, "Hey, I'll have them on the air at 8:45, listen for them." If the caller persists, he gets the statewide lottery call-in line for instant winning numbers. Her memo got saved.

Insecure PDs run the Magic Memo Machine like it was Mr. Coffee™, which has blossomed into what I call Peterson's Paranoia Constant: A PD's level of insecurity is exponentially proportional to the insignificance of the memo's subject, times the emptiness of the phrase "subject to immediate termination."

These guys love using that phrase, as it gives them an omnipotence they've never before experienced. I have about eight pages in the M3 folder from the same guy, threatening the staff with a housecleaning for some really globally-significant infractions.

Among the gems: a green record before a blue one; leaving an electric typewriter on, and placing objects on the floor by his

door instead of in the plastic catch-all.

I have never met a person who's lost his job because he's forgotten to sponge off a coffee ring in the newsbooth. Memos like those only serve to crush morale and waste paper. Once that PD moves on, he leaves the new PD a lot of damage to be undone.

Part of the M3 folder is devoted to memos handed me by a person who could have simply told me what was on his mind as he stood there handing it to me. "Dear Al: No." Wonderfully to the point. "Al: Have you done an EBS test this week, as FCC rules strictly state yatta, yatta . . ." Check the op log, willya?

"Al: Corporation and I decided on your raise, and why you're not getting one. There will be no more discussion on the matter." No doubt I'd be subject to immediate termination, right?

No one's immune, Alex. My own contribution to the M3 folder proves *EvvaBuddy Plays Da Fool*. When someone began graffiti-izing my schedules and announcements to the staff at one place, the Magic Memo Machine was activated to announce that the culprit—when caught—would be booted off the air for three days.

No pay. Never mind I could have simply compared handwriting styles between the program log and the "artwork," keeping it quiet. No, I had to show my horns and come out of it looking like a doofus. My own handiwork is in my own Hall of Shame.

Maybe I can't make a workshop out of the Magic Memo Machine, Alex, but I hope people reading this may recognize themselves or someone they work with. For the folks who send out effluvia such as I've described, what kind of aggravation will the next memo cause?

Will it resolve a problem or start three new ones? And why *can't* there be further discussion, especially since there probably was never any *initial* discussion?

The typewriter is not what dictates policy at your station, folks—you do. There is a difference between management and management, and the Magic Memo Machine is the distinction.

To any jocks reading this, take a long look at your staff bulletin board. Is it filled with paper that basically says nothing? All threatening discipline for walking and chewing gum? If you're working for a guy like this, just keep doing the best work you can.

Don't take Magic Memos personally; everybody gets them. Do what I did—save them over 15 years and laugh at them later. And, if you do get immediately terminated, adopt the attitude of Richard Dreyfus from the movie "The Goodbye Girl": it gives you the chance to consider that other job (whatever it turns out to be).

I'm happy to say I've not seen the ol' Machine activated for over two years, as it hasn't been necessary. Where I am now, it's plain old pick-up-the-phone-and-work-it-out. If it needs to be in writing, so be it. When it doesn't, it saves electricity, toner, and a tree somewhere. Not to mention a little more dust atop the Magic Memo Machine that would've been disturbed.

I'll be in touch around April or so. If you don't hear from me, send a memo. Naaah, never mind.

—Al

□□□

*Al Peterson writes from WLAD, Danbury, Conn., 06810. Got a lame memo to show him? Send it along to Al, in full confidence he won't show your boss.*

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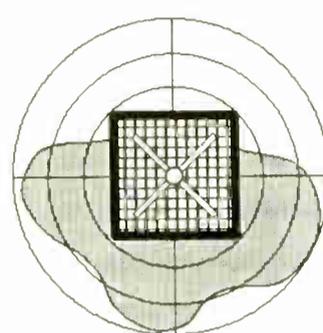
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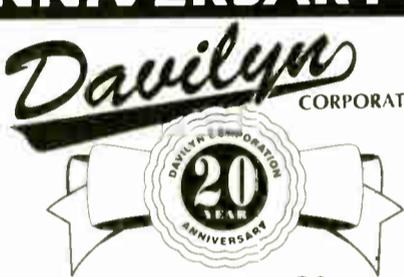
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STATION SKETCHES

# Using AM Noise as a Diagnostic Tool

by Tom Vernon

**HARRISBURG, Pa.** Many FM stations only monitor AM noise when proof-of-performance measurements are taken. That's too bad, because AM noise can reveal deficiencies in the FM transmitter system that would otherwise take expensive test equipment to diagnose.

This month's *Station Sketches* looks at static and synchronous AM noise as a diagnostic tool, and touches on some of the historical background for the current FCC AM noise regulations.

By definition, AM noise is amplitude modulation of the FM carrier at an audio rate. It is measured in dB, and calculated by the formula:

$$\text{noise} = 20 \times \log_{10} E2/E1$$

where E1 equals the carrier voltage, and E2 is the variation from that voltage.

**Modulated and unmodulated**

Static AM noise is what you measure with an unmodulated carrier. Synchronous noise is additional amplitude variation occurring when the carrier is frequency modulated. It is so named because the power output dips at the edges of the pass-band in synchronization with modulation.

Current FCC regulations require that AM noise be at least -50 dB down, and that the measurement be de-emphasized. The reasons are related to the nature of the

first FM receivers. Early discriminator circuits were very sensitive to AM noise, resulting in additional signal at the audio output.

Better quality FM receivers had limiter circuits ahead of the discriminator to reduce this noise, but most sets did not. This is the original reason that the FCC set up stringent AM noise regulations. The reason for de-emphasized noise measurements should now be clear, since the AM component would have the same effect on the audio as the demodulated program material.

Static AM noise must first be minimized

before tackling synchronous noise problems. While the FM monitor will reveal AM noise level, you will need to connect an oscilloscope to the monitor's output to locate the source(s) of noise. If you can obtain a spectrum analyzer, so much the better.

By determining the frequency of the noise, the source often can be located. A 60 Hz noise can usually be traced to an off-center filament ground. Noise at 120 Hz often indicates poor filtering of the screen or grid supplies. Finally, if the transmitter is fed from a three-phase source, 180 Hz or 360 Hz ripple indicates problems with the plate supply.

**Noise is everywhere**

Other sources of noise may remain after the power supply is cleaned. One of the

*continued on page 26* ▶

## SBE Ups Dues; Chapters Riled

▶ continued from page 9

financial woes, according to Fast.

Ingram confirmed that last year's national SBE convention in Houston lost more than \$20,000. But, he argued, many trade shows suffered the same fate. He also said the Houston convention is the only national SBE convention that has ever lost money.

Fetrow also said that a highly-placed source in the SBE organization told him that much of the money lost in Houston was the result of inept budgeting, such as allocating no money for shuttle buses that wound up costing \$10,000 and underestimating postage costs by 100 percent.

**Membership needs**

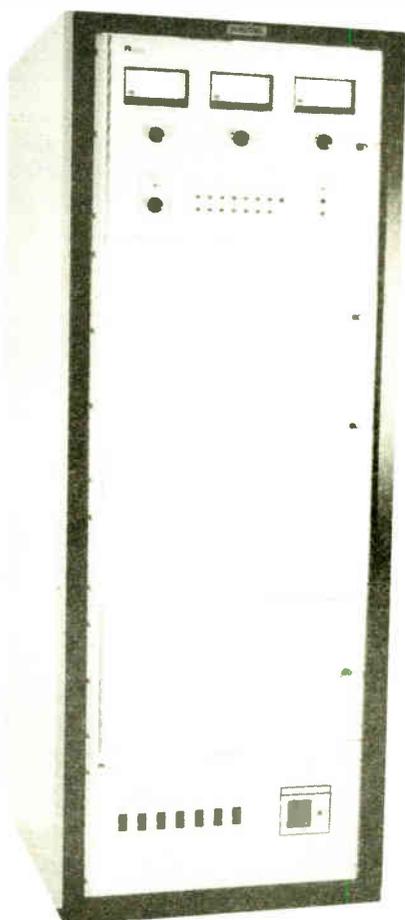
Apparently, the SBE national conventions have become a symbol to the average SBE member of the national organization's overreaching ambition—of its desire to be seen as an important player in the industry, instead of concentrating on the needs of the membership, chapter officials said.

Although some applaud the SBE's involvement with the FCC on regulatory issues as being of practical value to members, most believe national headquarters has completely lost touch with the average member. As a result, ill feelings have been accumulating slowly over the years, then they were ignited by the dues increase.

McGinley, who supports participation with the FCC, said that most of the national organization's activities are grandiose, including the national convention. "What they should concentrate on is regional shows and local chapters, instead of blowing money on annual conventions that are poorly attended at best."

As SBE's executive director, Ingram said he will do all he can to resolve resentment among the members and chapters by establishing more open communication, beginning with discussions at the Chapter Chair meeting on the 14th.

As for the direction the SBE has taken nationally, concentrating on conventions and regulatory issues in addition to its primary task of overseeing the broadcast engineers' certification process, Ingram said he will try to determine if the membership perceives value in advancing the profession and the society along those lines.



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# WORKBENCH

## Tips on Pinch Roller Restoration

by John Bisset

**FALLS CHURCH, Va.** I got involved in a replacement reel-to-reel head project recently, which put me in touch with some great folks in Texas. The heads supplied lacked the little brass "clips" to which the head leads are soldered. The clips are then pushed onto the pins sticking out of the back of the head.

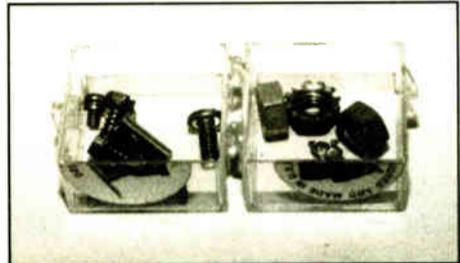


Figure 1.—Plastic boxes that hold stylii can double as handy parts containers

After several calls, I found I could buy a bag of these clips for \$250. I only needed 12! More phone calls routed me to American Media Services in Weatherford, Texas. This was the break I needed.

The company's down-home friendly approach was a 180 degree change from the others I had talked to. After finding out that

AMS stocked the clips, that I could buy 12 for only a couple of dollars, and that they would be shipped to me that day, I was eager to do more business with these folks.

Co-owner Genie Sims told me about the tape, carts, and accessories they supply. Somehow we got onto the subject of cart machine pinch rollers, and I knew that what she had to say needed to show up in the pages of *Workbench*. So here's a pinch roller primer, from the folks at American Media Services.

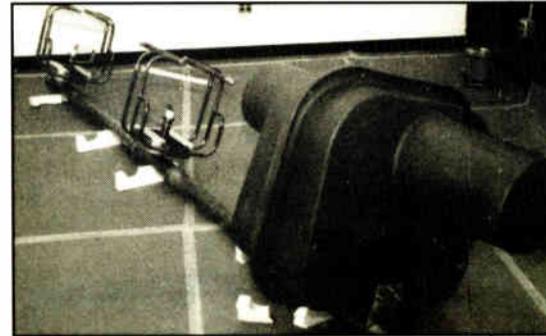
Did you know that inferior rubber can and is used on some pinch rollers? Furthermore, these boot-legged "look-alikes" can stand up to the closest visual scrutiny? It's only after hours of service that the rubber used in these imports will deteriorate—melt, if you will—and gum up your cart machine. Gosh, was this sounding familiar.

And did you know that the ITC 70 durometer pinch roller is made of some of the densest rubber available? The durometer is a means of grading rubber density, and many pinch rollers are rated at only 50. The result of the heavier rubber and brass center post construction as specified in the ITC 70 durometer is a longer wearing pinch roller.

Genie's advice wasn't just sales fluff. She speaks from experience. American Media Services also rebuilds carts, and has several cart machines playing rebuilt carts all day

long. In fact, it was from firsthand experience that AMS found it could slightly modify the center boring of the ITC pinch roller, to permit it to work with other cart machines.

For example, the 70 Durometer pinch roller, used in the Series 99 machines, will



fit on the shaft of a BE 2100, but won't turn easily. The inner boring of the roller can be quickly modified using a piece of emery cloth or grey machine cloth.

Roll the abrasive paper into a small tube, small enough to permit the pinch roller to slide on. By holding the ends of the emery cloth "tube," once the roller is in place, the pinch roller is rolled back and forth along a flat table—as you would a rolling pin.

As the pinch roller rolls around, the emery cloth grinds down the one- or two-thousandths of an inch clearance needed to permit the pinch roller to spin nicely on the cart machine shaft. Genie points out that you don't have to take off much, and the tolerances for some pinch rollers are such that no grinding is necessary at all. Using the tube of emery paper ensures against an out-of-round condition.

In the meantime, if you want to discuss your cart machine pinch roller problems with Genie, you can call American Media Services at 817-598-0985. If you'd like to get a free catalog, circle Reader Service Number 71.

By the way, Genie told me they have a real need for the old Fidelipac 300 series cartridges. AMS buys these for rebuilding, and

have several customers who need the older 300 series carts.

★★★

If you're assembling an antenna or radome—or for that matter, anything mounted on a tower—consider this tip from a seasoned tower professional. Insert any vertically-mounted bolts from the bottom. This way, if the nuts loosen and fall off, the bolt will drop out.

If the bolt is pointing down, with the nut underneath and the nut falls off, the bolt may still look like its doing its job. Missing bolts are a lot

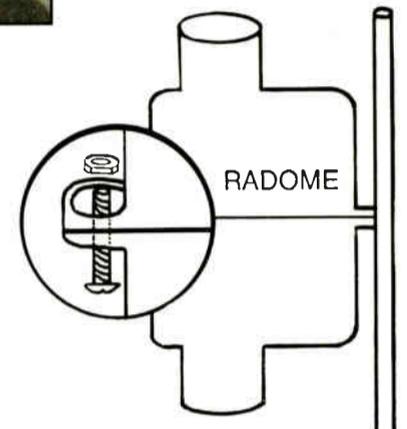


Figure 2.—Push bolts up from the bottom on vertically mounted parts. If the nut loosens, the bolt will fall out. This is easier to see when inspecting towers for missing hardware.

easier to see during an inspection than missing nuts. (See Figure 2.)

★★★

Speaking of re-cycling, the 35 mm film canister tips got you thinking (*RW*, Feb. 25, 1992). Now consider the little plastic box that stylii come in. Several engineers wrote to tell how useful these are for sorting nuts and screws (see Figure 1) or simply holding parts

continued on page 25 ▶

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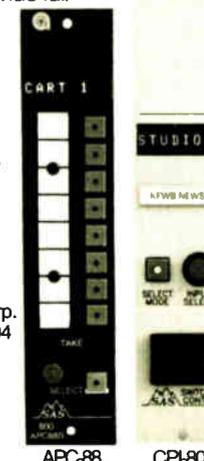
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# Dataworld Software Ready for AM Thaw

► continued from page 13

We could possibly improve our maximum allowable permissible horizontal radiation values by the use of measured data to determine what the actual conductive of the soil is in the directions that we are concerned with—in fact, the Commission requires the use of measured data where available.

But for now, we will assume that the M3 map is correct. A review of our permissible table shows that directions with a permissible value greater than our present radiation value (141 mV/m) are directions in which we can increase power. We also know that under the new allocation rules we must reduce the power in an arc beginning at approximately 215 degrees and extending to 270 degrees.

So with the use of the AMSTUDY program, we can determine that a simple

increase in power of the present operation of WPGS is not possible. The station management must then make the decision, if they wish, to pursue the possibility of a power increase by utilizing a directional antenna.

## Directional option

Using the data pulled by the software, station management can see that if they wish to consider that option, the area of increased power would lie to the north and northwest, and given the permissible radiation in the other directions, an increase of power above 500 W would most likely not be possible, without the design of a complex directional antenna system.

In order to provide a happy ending to this scenario, I've taken the liberty of designing a three-tower dogleg directional antenna system that meets the requirements of the permissible table generated by the AMSTUDY program. Utilizing this direc-

**The Commission requires the use of measured data where available.**

tional antenna (as shown in Figure 2), WPGS would be able to increase its daytime power to 500 W.

The population within the station's 0.5 mV/m protected contour increases from 294,627 to 443,539 persons, based upon data from the 1990 census—not too bad for an afternoon's work.

□□□

*Timothy Sawyer has been in the broadcast engineering field for more than 23 years. Prior to the establishment of his own firm two years ago, he was a staff engineer with the consulting engineering firms of A.D. Ring & Associates, and du Treil, Lundin and Rackley, both located in Washington, D.C.*

*For more information on GWAVE, AMSTUDY or other program services from Dataworld, contact John Neff at 800-368-5754, or circle Reader Service 83.*

# Improving Your FM Reception

► continued from page 12

TV's affected too. I'm not mentioning these things to try to convert you to become an FM DXer, but to show you how rewarding a decent antenna can be. And about completing the other end of a transmission circuit.

How will a TV antenna work for FM? That depends on what the TV antenna is, but in general, probably better than what you ain't got now. A typical TV antenna's frequency response is broad, to accommodate TV channels 2 to 6 (just below the FM band) and Channels 7 to 13 (just above the FM band). So FM frequencies are included.

## Rotatable pros and cons

But the antenna's pattern aperture, or directionality, can be zilch for some FM station directionals if the hardware is non-rotatable. If a good, outside TV antenna is rotatable, however, you're in for some surprises if you try using it on a good FM receiver.

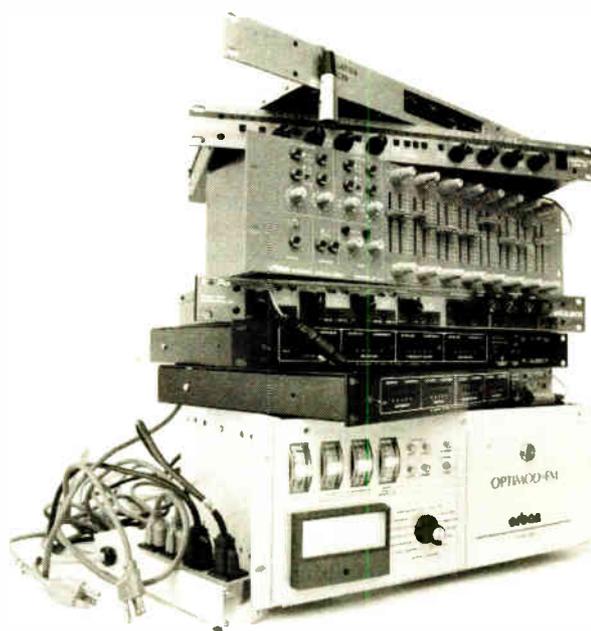
Some listeners might be better off if they were to pick up a Radio Shack antenna. The Archer model, Catalog No. 15-1636 is a 6 element Yagi-type antenna that sells for \$16.95. Catalog No. 15-1636 is a one-bay omni-directional type, and sells for \$11.95. If the FM receiver takes a 75 Ohm coaxial input, use a 300 to 75 Ohm matching transformer. (If you're real serious, you can even look into a professional type antenna.)

Stooping pretty low, get an indoor TV antenna that uses telescoping rods, and experiment with location and orientation to receive a wanted FM station. Here's a cheap deal: Make a folded dipole antenna from 300 Ohm twinlead.

For full-grown people, hold a length between your thumb and forefinger with side-stretched arms. That's about a half wavelength (velocity of propagation factor excluded) for the FM band. Short each end, fold to find center, cut one conductor, strip insulation and connect another length to the two points. Thumb-tack the thing to a wall.

□□□

*Howard L. Enstrom is a broadcast consultant. He has owned and managed an AM station and is president of FM Technology Associates, Inc., specializing in engineering design and sale of FM translator equipment. He can be reached at 904-383-3682 or by FAX: 904-383-4077.*



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## ENGINEERING MANAGER

# Management, Engineering and Performance

by John Cummuta

**DOWNERS GROVE, III.** Last month I introduced to you the consummate manager, Harold Geneen. I told you what miracles he worked at ITT, and about his so-called "G" theory of management. But probably the most telling attribute of Harold Geneen's approach to managing is his conciseness.

For example, here's his three-sentence course on Business Management: "You read a book from the beginning to the end. You run a business the opposite way. You start with the end, and then you do everything you must to reach it."

No fluff there. But maybe you don't run the whole business, maybe you run a department. Geneen would say that you should look at your department as a business within a business, so the same approach applies.

## Performance barometer

Whether you run the business or a department, you are still the person at the top. And the top executive determines the character and performance of the whole team. But again, Geneen says, the manager and his or her team should be evaluated on only one of those attributes—performance.

He preaches that what lasts in a business or department, after all the ballyhoo and promotion fade, is its performance. What did the company and its management do in comparison with similar companies?

How well did it perform in the economic environment? And unlike many other American corporate leaders, Geneen believes that performance can only truly be measured over the long haul.

This approach should be right up the alley for engineers. We're always fiddling with the components in the chain, looking for a certain result or output. That is exactly what Geneen is saying is the proper approach to, as he puts it, "Bare Bones Management."

When he took over the top job at ITT, most of the company's operations and assets were outside of the United States. It was a global business, with operating companies across Europe, South America and Australia.

To get a handle on what all these businesses were really accomplishing, he spent the first year in his job just analyzing financial statements and other *output* numbers. Then he hit the road to actually meet the people and see the operations.

From that base-line he began changing the way problems and opportunities were addressed. He and his managers would make a change then watch what it did to the numbers. Sound familiar?

## Manager/engineer

That's the same closed-loop process that you use when you make an adjustment to a piece of equipment. You change something then look at the output.

You're using your experience, instinct and a host of other conscious and unconscious pieces of knowledge to lead you

through a job, but the only *absolute* indicator of results is the output. It's either better or worse after the change is made. And whether or not you want to accept what the output is telling you, it is the *only* correct determinant of success or failure.

It's the same on the programming side. The PD may believe with all his or her

**Geneen would say that you should look at your department as a business within a business, so the same approach applies.**

strength that a certain change will build the numbers. But, if the surveys show otherwise, the fact is that the change worsened rather than improved station performance. While we could rationalize why it didn't work as hoped, those speculations are of questionable value. It's the result that is reality.

When he finally felt he had the ITT picture, Geneen determined the *result or output* he wanted for the company and said, "I was well aware of its ultimate importance. It was the end to which all my efforts at ITT would be directed, an end to which I would commit myself without reservation. It would serve also as a measure by which my own performance could be measured at ITT."

## Just like Joe Montana

As the chief executive, Geneen saw his role as the team's quarterback, showing them where the goalposts were and how best to get there. Finally, he saw himself leading them down the field. As the leader of your department, your quarterbacking responsibilities are the same.

You must make the call, lead the play and

then evaluate how many yards you gained each time. Then you make adjustments with the next call to correct whatever did not produce the desired result from the last play.

This system worked well for Geneen. His leadership produced an incredible 58 consecutive quarters, fourteen and a half years, of increased earnings. And those increases were between 10 and 15 percent per quarter.

But these increases were not surprises to Geneen and his managers. They were their goals. These were the outputs that he had determined were reasonable to attain. He and his team simply did whatever they had to, to produce the desired output—10 to 15 percent growth.

This is the same as when you're working with the audio chain. You want a certain distortion level or other output measurement, and you tweak or adjust components of the chain until you achieve the desired output.

Well, according to Geneen, that's the same way you run an organization. You make the goal clear, for overall achievement as well as for each task along the way, then you measure the results and make whatever adjustments are necessary to keep performance within specifications.

Those corrections and adjustments might mean you need to provide additional training, motivation, clearer instructions, pay increases, responsibility changes, demotions, promotions or any other tweaking that is within a manager's purview. It's your job to look at the problems in the work output or result from an employee or department, and then know what adjustments are likely to bring that performance back into spec.

Just remember that performance is the only spec that counts. When you're running a business, profit is the performance result that you're looking for.

In an engineering department it might be a reduction in equipment downtime, a certain level of audio quality or a given level of satisfaction from your customers—programming, sales and management. Whatever it is, that performance is your goal, and your job as a manager is to continually do whatever it takes to get your team to reach the goal.

□□□

*John Cummuta is an independent marketing and management consultant. He can be reached at 708-960-5999.*

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COLE'S LAW

# Don't Be Complacent about Payola

by Harry Cole

**WASHINGTON** One of the more serious of the multiple adverse side-effects of deregulation is complacency—complacency about rules and regulations still on the books.

The Commission threw out rule after rule, and declined (informally or otherwise) to aggressively enforce the rules that remained. Broadcasters found it easier and easier simply to assume that there was no real need to worry about complying with the rules, since it did not appear that anyone ever got punished.

While understandable, such an attitude is not the kind of thing that lawyers like to encourage. That attitude can be particularly troublesome for broadcasters if the regulatory pendulum is in fact swinging back toward a more enforcement-oriented position.

The rules and policies governing broadcast indecency and lowest unit rate charges have remained largely constant (if arguably less than crystal-clear) over a period of time. Yet suddenly, for some reason, a significant number of licensees have found themselves on the wrong end of some ugly fines and forfeitures for violating those rules and policies.

## Napping at the mic

Why? It is at least possible, if not likely, that those stations had become complacent, comfortable with the misguided assumption that a deregulation-minded FCC would not enforce the rules which are on the books. But the times are a-changin'.

All of this is just an introduction to the real topic today, which is payola. What does payola have to do with complacency? Maybe nothing, maybe something.

In early December of last year an edition of the CBS Television news magazine "48 Hours" focused on the radio industry. One segment of the show followed the efforts of a promotion company to get airplay for one of its acts. The segment included interviews with the company's executives and sales people, and also with one radio station which was being pressed hard to add the company's act.

The thrust of the piece was that recording acts need airplay. Radio stations are in a position to obtain various benefits in return for adding particular songs or artists to their playlists.

The "48 Hours" segment showed what appeared to be a kind of bargaining between the record promoters and the radio station. The station was expressing reservations about adding the artist to its playlist unless the promoter was willing to commit to assisting in the promotion of the artist through the availability of tickets.

## If it quacks like a duck . . .

Let's be quick to point out that what was shown in this segment may not have been payola. It is at least arguable that the station was making its decision to add or not to add the artist to its playlist on the basis of factors having nothing to do with the promoter's willingness to provide certain material incentives.

The problem, though, is that it was very possible to watch the segment and to come away with the conclusion that the station was willing to add the artist in large part because of sweeteners the promoter was willing to provide. And that at least begins

to *smell* like payola.

For the innocents among you out there, payola is the nickname for violations of Sections 317 and 507 of the Communications Act. Those sections require that, when a station (or any of its employees) is given "any money, service or other valuable consideration for the inclusion of any matter as a part" of any program or program matter to be broadcast, the station must broadcast an announcement to that effect at the time of the broadcast of the affected program or program matter.

The idea is that, if certain songs (or other program matter) are getting on the air only

because someone is paying money (or other consideration) for the airplay, the public is entitled to know that. It is important to note that these provisions were written by Congress, and not the Commission—as a result, no matter how deregulatory-minded the Commission may be, the payola laws will be with us until Congress changes the Communications Act.

Fortunately or otherwise, the FCC has demonstrated no substantial interest in payola questions for some time (perhaps because no such questions have come up). That, and a vague exception written into the payola law in order to permit the record

companies to provide stations with record service free of charge, may account for what seemed to be a relatively cavalier attitude in the "48 Hours" segment vis-a-vis the possibility that somebody might think payola was afoot.

## Just a reminder

Whatever may be the case, though, it's a good idea not to lose sight of the fact that, whether or not we like them or agree with them, the payola laws are still in effect. And, just as fines for indecency and political advertising violations have recently flourished, it is possible that the FCC's interest in payola enforcement may pop up again.

Which brings us back to the question of complacency. What was striking (at least to this communications lawyer) about the

continued on page 26 ►

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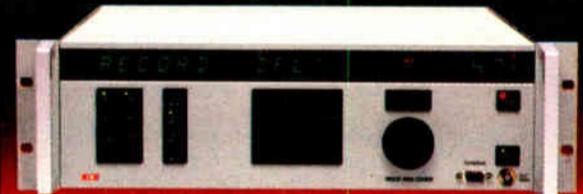
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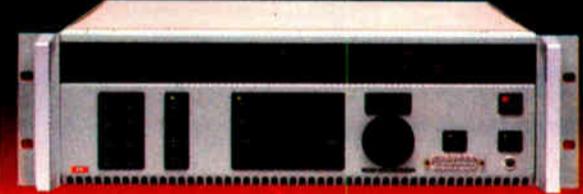
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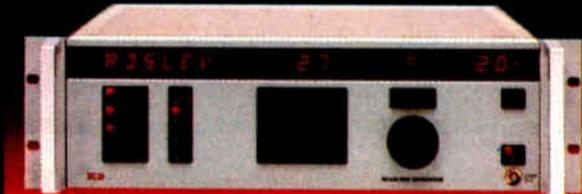
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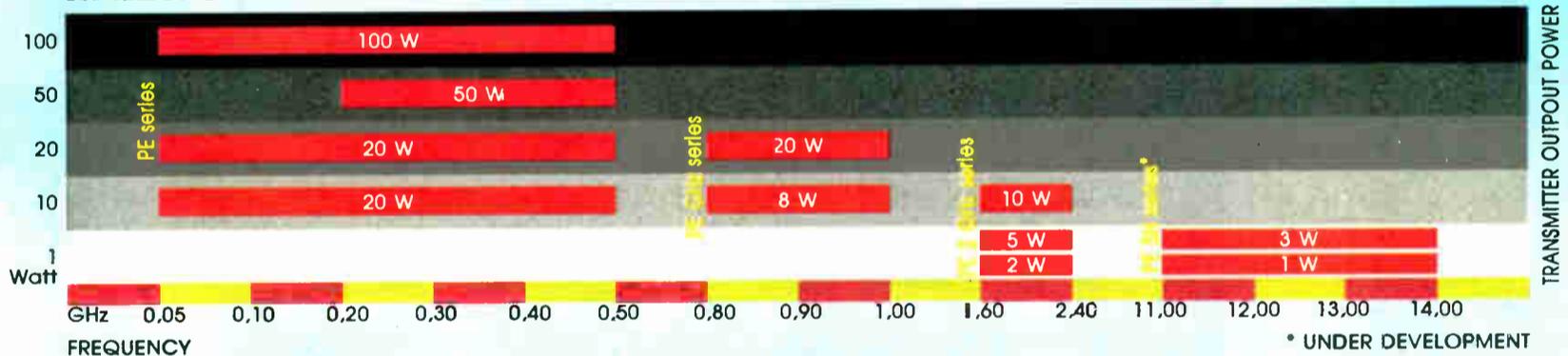
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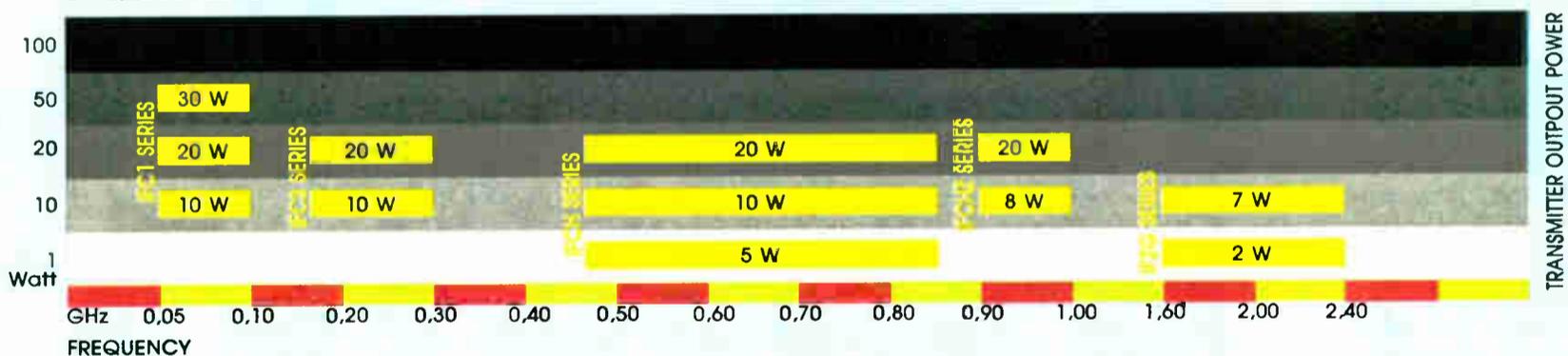


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FACILITIES SHOWCASE

# Unistar Leaves for D.C. with the DAWN

by Dee McVicker

**ARLINGTON, Va.** To those who know the news business, it came as no surprise when Unistar Radio Networks moved its news and sports operation from New York City to the Washington, D.C. area. "This is where the news is if you're in the news business," observed Richard Rieman, Unistar VP of news and sports.

Here, overlooking the Washington Monument, and just a few miles from the Potomac River, is also where Unistar reinforced its

position as a leader in technology with this product."

The project began in early 1990, when Unistar moved into its news facility near Washington, D.C. Previously used for an auxiliary team of 10 Unistar news reporters, with only one production studio and two editing rooms, the facility was refurbished to house an on-air studio, a production studio, a newsroom, and five editing rooms.

Unistar set up its news operation with the same considerations as any radio station—using Pacific Recorders & Engineering (PR&E) BMX consoles, PR&E Tomcat cart recorders and Sony APR 5000 recorders, as well as PR&E solid wood furnishings throughout. The driving force behind the choices, Unistar said, is to deliver its news and sports service on time and with as much quality as technology and budget will permit.

These efforts paid off, particularly in the on-air studio, which is furnished with a guest wing for live audio inserts by guest correspondents.

"The interesting part about the on-air studio is that it's a completely modular construction," said Whitney. "The walls are nine inches thick of different tested materials, which were pre-assembled at the factory, tested for sound integrity, disassembled, and brought here and assembled on-site."

The radio network's efforts also paid off in the newsroom, where the BASYS computerized news system resides along with rack-mounted Pacific Recorders News-mixers for the desk editor and several anchors.

The DAWN system is com-

prised of two 386DX file servers with over 700 megabytes of audio storage each. DAWN is used for sequencing commercials and newscasts. One file server is mirrored with redundant programming and storage for on-line backup of the system, which supports six PC workstations

live at 50 minutes, and then fed again at the top and the bottom of the hour—with up-to-the-minute news spots inserted into newscasts at the bottom of the hour—the potential for error was great. Added up, even small time errors could wreak havoc on Unistar's roughly 400 news subscribers, who depend on the radio network as an accurate timekeeper for their programming.

Fortunately, DAWN proved to be a reliable solution. Not only did the Novell-based automation system enable the radio network to automate timing of commercials and newscasts, it enabled



Kirsten Olson in one of Unistar's five editing rooms

throughout the news operation.

The biggest DAWN benefit realized by Unistar is the system's ability to track time accurately, according to Whitney.

With Unistar news and sports fed

Unistar to synchronize its network feeds to GOES (Geostationary Operational Environmental Satellites), the most accurate clock in existence today.

"We have a (computer) card

that takes the feed from that clock and sets it in the computer system, and each of the workstations update from that," said Whitney. "It's dead-on. It even compensates for the length of time it takes for the signal to get from GOES satellite to earth."

Unistar's news and sports operation stores its entire commercial and newscast library on the DAWN system at 48 kHz sampling rate. A selectable function in the system, 48 kHz sampling was selected because, said Whitney, "we wanted to retain as much quality as possible."

More than 10 hours of stereo audio storage are available on the radio network's existing file servers, thanks to DAWN's MUSICAM bit-rate reduction algorithm.

Still on tape are the actualities that are integrated into newscasts. But with storage not a problem, Whitney will be integrating these into the DAWN system as well. This next level of expansion into digital technology is currently underway at Unistar.

□□□

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



CE Kyle Whitney with the DAWN system

position as a leader in digital technology.

The news operation was completed in February when Unistar acquired Gentner's new Digital Audio Workstation Network, or DAWN, a PC-based system for digital storage and automation of programming. Commented Unistar Chief Engineer Kyle Whitney, who has been with the radio network since its RKO days, "I see us as reinforcing our posi-

CONSULTANTS CORNER

## Working with the New AM Rules

by Steve Crowley

**WASHINGTON** By the time you read this, the FCC's new AM rules should be in effect. After playing around with the rules, we've found some interesting things. Tighter technical standards make it harder to make station changes, but other rules, such as those to allow stations to buy and turn-off precluding stations, are, to some extent, offsetting.

The most significant changes to the rules are daytime and nighttime protection standards. The increase in the daytime protection ratio to 6 dB creates large areas of existing "prohibited" overlap. That makes it tough to get an increase in radiation in any direction, unless you do something about the station you are up against.

### Paying for coverage

Fortunately, the FCC is concurrently putting into effect rules that will make it much easier to pay a conflicting station to go off the air and then expand into its coverage area. The catch is that often more than one station needs to be neutralized. Still, this may not take a whole lot of money—five percent of licensed AM stations are dark anyway.

The power limit increase from 5 kW to 50 kW for the new Class B stations (the old Class III) is great, but you may not be able to do much unless you buy a lot of coverage. The Class B stations with the best chances of benefiting immediately are those along the coasts, because they can often increase power by blowing most of it over the ocean.

That sounds like a waste, but you can achieve dramatic increases in population served within high quality, high field-strength contours. This helps overcome natural and man-made noise and improves the ability of the signal to penetrate buildings. It may be possible to achieve this increase without any increase in prohibited contour overlap over land.

At night, applying the tighter first-adjacent protection ratios doesn't seem to make a whole lot of difference. The major concern is the notorious "ratchet clause" that is already causing sta-

tions to think twice about making improvements to their nighttime signals.

Ratchet is the name given to the rule that requires your station, if it enters into the 50 percent RSS of another station, to reduce radiation 10 percent toward that station if you make any changes. You might be willing to spend \$30,000 to fill a deep null, but not willing to pay the additional price of taking a hit in your main lobe.

The ratchet clause is the one provision most objected to in the petitions for reconsideration. Since market forces such as coverage negotiations can be an even greater help to reducing overall interference than forced coverage reductions, perhaps we will get some relief here.

### Expanded AM band

The expanded band? So far, not a whole lot of interest. A filing window will be opened for existing stations to file petitions for the expanded band, which the FCC will rank according to an improvement factor based on a ratio of interference to coverage. (Class IV, or Class C stations are not eligible.)

Many petitions probably will be filed, just as many letters of intent were filed earlier in this proceeding. Interest may wane, however, once stations seriously look at costs and benefits. The greatest interest I've seen is from daytimers that would get nighttime service at 1 kW in the expanded band. However, fulltime stations get a priority in moving to the expanded band.

The new rules aren't a cure for AM, but they weren't meant to be. The idea is to make the service as competitive as possible.

We're looking for improvement opportunities for our clients and have found some good ones. If the ratchet clause is wrenched from the rules, there will be even more.

□□□

Steve Crowley is a consulting engineer with du Treil, Lundin & Rackley Inc., 1019 19th Street, N.W., Suite 300, Washington, D.C. 20036. He can be reached at 202-223-6700 or by fax at 202-466-2042.

# WORKBENCH

► continued from page 20

until they are needed. One of our kin even told about his wife's Tupperware™ getting into the act by providing a sectionalized plastic container that works well for keeping RF connector/adapters sorted according to sex and type.

★★★

The folks at Coaxial Dynamics have taken the VSWR chart (offered by Elenos in RW, Nov. 24, 1991) a step further. For a number of years, Coaxial Dynamics has provided a VSWR chart or nomograph with a pressure-sensitive stick-on backing.

The chart is reduced in size so it will fit on the back of a wattmeter (either Coaxial Dynamics' or Bird's). In addition to this stick-on chart, the same chart has been enlarged and coated in plastic. The eyelet in the corner permits it to be hung on a screw near

the transmitter.

The larger, plasticized version costs \$6.00, but the pressure sensitive chart for the wattmeter is free. If you'd like a wattmeter VSWR chart, circle Reader Service Number 143, or drop by the Coaxial Dynamics booth at the NAB show next month. They'll be exhibiting in booth 12905, and will have the VSWR charts there as well.

By the way, if you thought all these folks manufactured was wattmeters and line sections, call for a catalog. A wide range of lowpass, highpass, and bandpass filters round out their product line. Coaxial Dynamics is located in Cleveland, Ohio. Call Bob Scott at 216-267-2233.

□□□

John Bisset is a principal with Multiphase Consulting, a contract engineering and projects company. He can be reached at 703-379-1665.

# Using AM Noise as a Diagnostic Tool

► continued from page 19

worst offenders in older transmitters is sliding contacts. I have seen improvements of 15-20 dB simply by cleaning and relubricating these contacts.

Fans and blowers also contribute to the overall noise picture. Temporarily disconnect the blowers and observe AM noise. If it drops, you might have loose components and other vibration-related problems.

Once you've gone as far as you can with minimizing static AM noise, begin on synchronous noise problems. If the passband of the transmitter, transmission line, and antenna is not flat for at least 150 kHz, ( $\pm 75$  kHz from the carrier frequency) then you

have a source of synchronous AM noise that will degrade overall performance.

The narrower the passband, the more that power is reduced during modulation swings, and the higher the synchronous noise level. From basic circuit theory we know that in a resonant LC circuit  $XL=XC$ .

For frequencies above resonance,  $XL$  is greater than  $XC$ ; below resonance,  $XC$  is greater than  $XL$ . When modulation is applied to a system with less than a 150 kHz passband, the load of the PA tube alternates between capacitive and inductive resonance. This varying reactance equals a varying phase shift in the circuit.

This is where the trouble starts. Phase

modulation is similar enough to frequency modulation to fool the discriminator, which will demodulate it as distortion in the composite signal. This distortion can result in degraded main-to-subchannel crosstalk figures, or leakage of the L-R into the SCA.

## Tuning for performance

Tuning for minimum AM noise is critical to good performance. Theoretically, the AM noise null and peak power output occur at the same point, but tuning for minimum AM noise is always preferred. Being off the peak power curve by a few degrees may result in an unmeasurable power loss, with an increase in synchronous noise of several dB.

To tune the entire transmitter for minimum AM noise, modulate it at 400 Hz, 100 percent modulation. Now go back and adjust all tuning controls for minimum noise. There will be some interaction, so this procedure may have to be repeated. Such retuning may change other operating parameters, so some compromises may have to be made. When you're all done, a -50 dB to -55 dB synchronous noise level should be possible.

It's interesting to note the effect that temperature can have on these adjustments. Optimal adjustments for hot weather may not be optimal for winter months. Usually this is a function of the antenna, and seasonal re-tweaking is advisable.

In the real world, the AM noise null and the peak power curve may not coincide. This indicates asymmetry in the system, which should be investigated. In such instances, tune for the null and not the power peak.

## Out of the norm

Some transmitters are possessed with more bizarre AM noise problems, such as a shift in AM noise null and peak power points as a function of varying power output. In these cases, a call to the manufacturer's customer service department may be in order.

As if all this weren't enough, the transmission line, filter, and antenna also can cause problems. This can be a function of older narrowband design, lightning damage, corrosion, or mistuning.

There are two paths to investigating antenna problems. The quickest is usually to substitute a dummy load for the antenna, and note the noise figure. Discrepancies between the dummy load and antenna figures indicate trouble. Another approach is to look for changes in the VSWR readings over the 150 kHz passband, as this also indicates problems.

Careful investigation and reduction of AM noise in the FM transmission system can yield vast improvements in the quality of the stereo signal. A systematic inspection of the exciter, transmitter, and antenna as subsystems should enable you to pinpoint the location of AM noise.

For a good discussion of spectrum analysis in the diagnosis of AM noise problems, see Tektronix Application Note 26AX-3582-3, "FM Broadcast Measurements Using the Spectrum Analyzer."

□□□

Tom Vernon divides his time between consulting and completion of a Ph.D. He can be reached at 717-367-5595.

## The future of entertainment was changed 43,000 feet over Greenland.

Garry Greth, chief engineer of radio station KLON, was on a flight from L.A. to Frankfurt. He didn't know it at the time, but he was about to make history.

Somewhere over Greenland, he was going through the SV-3900 Pro-DAT manual, when he first realized what he could do with this new technology from Panasonic. The SV-3900 was the system he had chosen to link KLON and the Eurojazz network for the first American produced continuous jazz programming ever heard on the Continent. Only then did it dawn on him how endless the possibilities were. And that they were to take him far beyond the applications he was used to.

What Garry did was create an automated network of SV-3900s which broadcast 22 hours of jazz every day for Eurojazz. Custom programming, recorded at KLON, was sent to Germany daily for automated transmission. Commercials, features and music were programmed on the SV-3900s to start and stop at precise times day and night, with no operator intervention. There was no room for error.

The SV-3900 provides *bidirectional serial remote control* via industry standard protocols. To Garry, this meant an unparalleled opportunity to excel in a game where you can make up your own rules, simply because there are none.

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For more information on the SV-3900, contact Panasonic, 6550 Katella Ave., Cypress, California 90632. Or call (714) 373-7278.



**Panasonic**  
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## Don't Ignore Payola Laws

► continued from page 23

"48 Hours" piece was the apparent lack of concern about the potential appearance of any possible payola problem. It was almost as if payola as a concept had no negative implications.

Why else would the participants be willing to allow themselves to be taped for broadcast on a prime-time network television news show—a show that might be watched by FCC personnel, members of Congress and competing broadcasters, among others?

If the "48 Hours" segment did indeed reflect some industry-wide complacency, it is probably time for the industry to recognize that the laws against payola are still on the books, and they *can* be enforced at any time.

□□□

Harry Cole is a partner in the Washington-based law firm of Bechtel & Cole, Chartered. He can be reached at 202-833-4190.

## PRODUCERS FILE

# A Mambo with Mackie's 1604 Mixer

by Ty Ford

**BALTIMORE** Flexibility, RF rejection and physical ruggedness are absolutely essential attributes for any piece of broadcast gear. My recent mambo with the Mackie 1604 mixer leads me to believe that it possesses these attributes. Even though it wasn't really designed to be a broadcast mixer, at a list price of \$1,099 it deserves a close look.

My interest in the Mackie 1604 doesn't stem as much from the main on-air use of a mixer as it does from production studio, MIDI rig or remote broadcast use. Like me, maybe you've noticed that there are a lot of musical instrument (MI) market devices like synthesizers and samplers that have been creeping into radio stations over the past 10 years. Fortunately, the specs are getting better and better on this gear.

Some of it, the Mackie included, even surpasses broadcast specs. Equivalent input noise for the mic preamps is  $-129$  dBm 20 Hz-20 kHz. Distortion is less than .025 percent, 20 Hz-20 kHz. S/N ratio is  $-90$  dBu, with all channels and master output operating at unity gain—not counting the relatively inaudible 4 dBm of hum due to placing the power supply inside the mixer instead of using a wall wart. Maximum output is  $+28$  dBu balanced and  $+22$  dBu unbalanced.

## As good as the best

I found the Mackie preamps sounded as good as preamps in other much more expensive consoles. The 1604 has six 48V phantom-powered mic preamps (16 with the optional XLR10). Line inputs on inputs 1-6 are TRS balanced, 7-16 are TS unbalanced. Each of the 16 inputs has an input trim.

Because of the somewhat exponential taper of the trim pot, close adjustment becomes more difficult the more you open the pot.

Also on each input strip is a peak flasher, insert/direct out jack, an "in place" solo button that lets you hear where your solos are panned and seven Aux sends (with up to four operating at a time per channel).

Each of the channels has three-band fixed Q equalizer consisting of  $\pm 15$  dB HF shelving at 12.5 kHz,  $\pm 12$  dB midrange peaking at 2.5 kHz and  $\pm 15$  dB bass shelving at 80Hz. There are four stereo (eight mono) returns, left and right channel bus inserts before the master faders, a master output mute switch and left, right and mono balanced main outputs.

With this kind of "Gozinta-Gozouta" design you can use all of your MIDI/synth/sampler gear at the same time, without running out of inputs. If you have a lot of this kind of gear, you can mix it all down to stereo on the 1604 and feed that mix to your main console.

## Worth considering

If your old production console is dying, think about using the 1604 as a full-service replacement.

The input/output module can be pivoted so that the jacks are on the face, top or back of the mixer; this allows it to be mounted in 12 inches to 17 inches of rack space, depending on the chosen configuration.

The 1604 has enough sends to feed phone lines and air-check machines, set up separate headphone mixes (with a headphone amp) and create separate mixes for live remote broadcasts all at the same time. You

can even do two different mixes simultaneously, routing one to the main stereo outputs, and the other to a pair of alternate stereo outputs.

The only hangup is, because the 1604 was primarily designed for live music and studio recording, it doesn't mute the monitors when you open a mic. If you can build a simple relay box, there are a number of ways to mute the monitors when the mic is on.



The Mackie 1604 Mixer

For on-air or combo work you could make a box with a switch and triple relay. Wire one set of contacts to a cable that plugs into the main mic channel access "insert" jacks on the mixer's back panel (any of the first eight channels, all of which have mic preamps, can be used).

The other side of the relay would break or make contacts that connect the main left and right bus insert jacks with the monitor amp inputs (yes, you'd need a monitor amp).

## More than one use

Because the Mackie 1604 has left, right and mono main outputs, you could also use the main mono output for monitors, if stereo isn't important. If you have a spare stereo distribution amp, hang it off the main outputs and wire the second side of the relay between one of the DA stereo outputs and the monitor amp input.

For cueing, just hit the "Mute Alt 3/4" button on each channel and hook an amp and speakers up to the "Alt 3/4" output busses and feed them to an amp and speakers. If you don't need or want cue speakers, hit the "Alt preview" button on the right side of the mixer and you'll be able to hear any channel assigned to the "Alt 3/4" busses.

I called on Ken Cardosa, CE at WBSB(FM) here in Baltimore, to help me check out how RF resistant the 1604 was. The parking lot of WBSB is atop "TV Hill," so named because, in addition to a number of microwave repeaters and other shortwave communications radio transmitters, there are three VHF TV stations and a class C FM on its 950-foot tower. Less than a mile away there's another tower with a megawatt UHF TV station, another FM and a few other sticks.

We plugged in a mic known to be very sensitive to RF. We first used it without its recommended double shielded cable, put on the cans and ran the fader up. We heard FM and TV interference, birds and traffic. Switching to the special shielded mic cable we tried it again. This time we heard no RF—just birds and traffic.

To make sure the balanced line out was as clean as the headphones, I ran a line out into a portable DAT and recorded the birds, traffic and some spoken word. Hearing no RF at the DAT machine headphone jack,

I rewound to the top of the tape, and plugged the unbalanced DAT machine outputs into the unbalanced 1604 line inputs. Still nothing but birds, traffic and our somewhat aimless vocalizations.

## Try and try again

Later that afternoon I tried the same test at Producer's Video, a video production facility across the street from our first test.

On the sound stage I was able to get the mic to faintly pickup some FM, but I really had to go out of my way to move the mic and cable around to make it happen. Knowing how RF sensitive the mic was, I'm sure the little noise I did get was due to the mic and not the mixer.

When I mentioned how well the RF test had gone to Mackie's marketing director Doug

Shauer, he explained that the 1604 is bandwidth-limited from front to back. Instead of going "from DC to light," coupling capacitors between stages throughout the mixer begin rolloff at 40 kHz and are 9 dB down by 80 kHz.

Back at the studio, the mixer performed very well. In fact, I switched to the Mackie during a recording of two acoustic finger-

picked guitars because the preamps of my own mixer were too noisy, even with relatively high output condenser mics.

The outputs of my Roland U-20 passed a very usable  $+2$  level to the mixer's meters with the input trims turned all the way down.

I did notice audible leakage at the headphone and main outputs when signals were applied to the mixer's line inputs and Aux returns, even when the faders and pots were turned all the way down. I don't have any applications that this small amount of leakage would compromise. If you're a stickler about this sort of thing, you're probably going to spend a lot more to find a mixer that has the same features with less leakage.

A steel chassis, sealed rotary pots and extra circuit board stand-offs backed by a three-year warranty are testament to Mackie's attention to detailed durability. They even include little features like designing the knobs so they transfer shock to the mixer surface, and not to the pot.

When I mentioned the lack of lip seals for the slide faders to Shauer, he said, "Lip seals often keep in as much dirt as they keep out. With no seals you can get to them to spray them out, even turn them upside down and shake them if they ever get dirty."

As always, every application is different. If price, space flexibility and performance are the issues, however, take a Mackie 1604 for a test drive. For more information call Doug Shauer at Mackie 800-258-6883.

□□□

Ty Ford is an audio producer/voice talent. Reach him by phone at 301-889-6201, via MCI mail (#347-6635), or via America Online (Tford).

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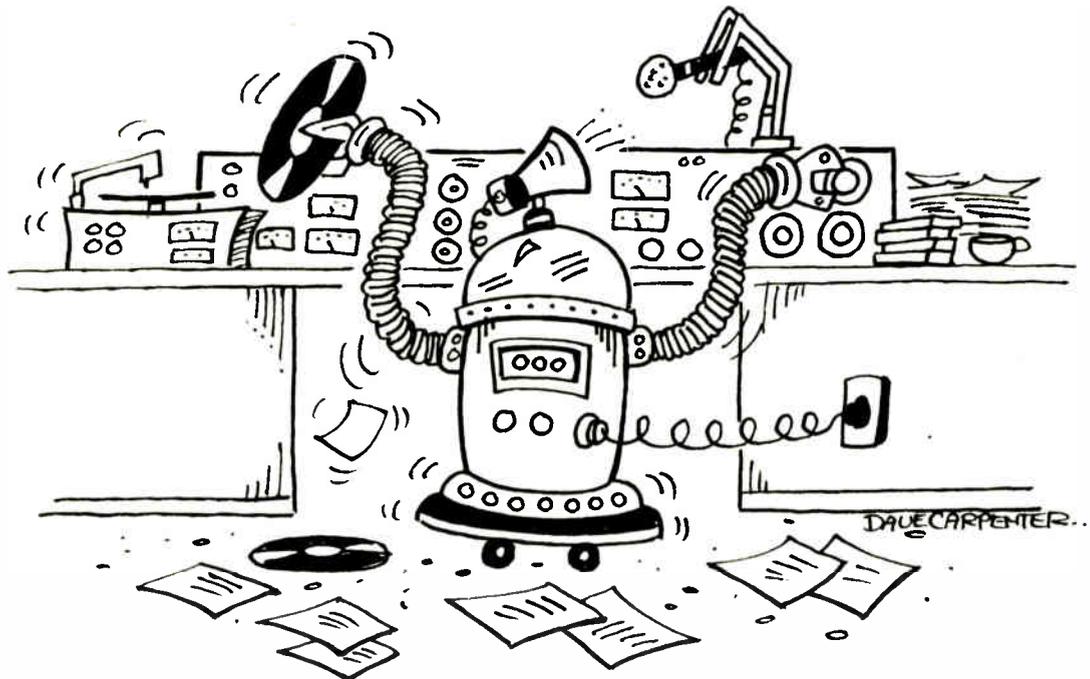
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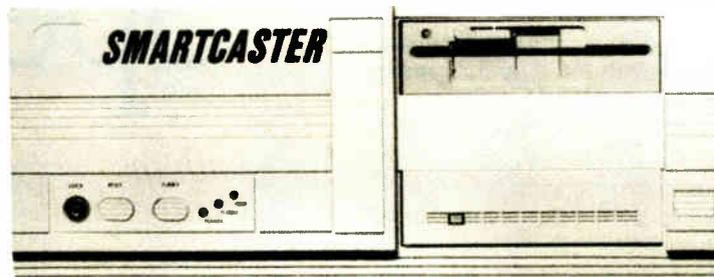
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## The Greatest (Broadcast) Show on Earth

**LAS VEGAS** NAB '92, the National Association of Broadcasters' annual convention and trade show, is to be held April 12-16 at the Las Vegas Convention Center and the adjoining Hilton Hotel. But the behind-the-scenes action actually begins April 11.

That's when the Digital Interface Standards Committee is expected to have its next meeting. An industry-wide gathering of concerned digital equipment manufacturers, the committee is attempting to establish a broadcast-specific standard for digital interconnection.

This meeting, however, is only one reason why more than 700 exhibitors are expected to participate in NAB '92. The association's annual convention is generally acknowledged to be the largest, most comprehensive gathering of its kind in the broadcast industry.

According to the NAB, the trade show's 440,000 square feet of exhibit space at the Las Vegas Convention Center represents a "10-mile walking tour" for attendees.

That's 10 miles of dense crowds, too. NAB '92's attendance is estimated to be approximately 50,000, of which a significant percentage is expected to be from outside the U.S. More than 5,000 attendees from 25 different nations attended NAB '91; the association anticipates a similar number for this year's gathering.

In fact, NAB spokesperson Doug Wills

predicted that international attendance will continue to be the growth area for future conventions.

These sessions will be held during the Radio Management Conference which, along with the NAB Engineering conference,



This year, the NAB trade show will benefit from the re-opening of the now-remodeled convention center rotunda.

To respond to this overseas interest, the NAB has organized three sessions for international visitors: "Assessing Investment Opportunities in International Media," "Rise & Shine: Morning Programming for Profit" and "Doing Effective Research: An International Experience."

will start the day before the trade show opens. (For a comprehensive look at the engineering sessions, see Andy Butler's overview elsewhere in this section.)

The SBE has cooperated with the NAB in developing three technical sessions for this year's convention. Slated for Tuesday, April 14, the sessions embrace new technology and regulatory concerns for broadcasters. SBE certification exams will also be held that day.

Part of the session schedule for this year is the return on April 14 of Sports & Events Marketing Day. Five sessions, including "Sports Marketing Money-Makers," will help attendees understand the finer points of event marketing.

A "must-attend event," according to the NAB, is the "table-topic luncheon" slated for Wednesday, April 15. Seventeen NAB Radio Board members and industry leaders will guide discussions at tables divided into areas of interest including LMAs, Spanish-language media and revenue-generating ideas.

Also on April 15, Tom Lewis, author of the book *Empire of the Air*, will address the engineering conference. Lewis, an English professor at Skidmore College in N.Y., will discuss his research into the careers of Lee de Forest, Edwin Howard Armstrong and David Sarnoff.

Finally, although not a radio event, "Trek-kies" attending the convention will want to catch the salute to "Star Trek." The television series has been named the 1992 television inductee into the Broadcasting Hall of Fame. Series cast members are expected to attend the luncheon presentation.

## Sessions Focus on Digital Topics

by **Andy Butler**  
NAB Staff Engineer  
Conference Programming  
Activities

**LAS VEGAS** Opportunities for radio engineers continue to expand at the NAB '92's Broadcast Engineering Conference. This year's schedule includes four full days of seminars with a fifth day devoted to hands-on workshops.

Attendees will be able to hear more than 100 papers and panel discussions on all aspects of broadcasting. The workshops cover topics ranging from FAA and FCC regulations to splicing fiber optic cable.

This year also marks the beginning of a new era of cooperation. The Society of Broadcast Engineers is programming all of the engineering sessions for Tuesday.

Engineers will want to get up early on Sunday. Dr. Larry Hinderks from Corporate Computer Systems will kick off the Digital Audio Systems Session (Convention Center, Room N113, 8:45 a.m.-12:15 p.m.) with his Introduction to digital audio. Fidelipac's Bill Franklin follows with a look at low cost digital audio storage utilizing 3.5-inch floppy discs and Paul De Wit from Phillips Consumer Electronics examines the audio coding technique used in the Digital Compact Cassette.

### RF considerations

After a coffee break, Richard Bell from Dolby Labs will discuss RF design considerations in the development of a highly spectrum-efficient multichannel all-digital STL. Bob Weirather from Harris will consider the digital audio interface and Steve Ly-

man from the Canadian Broadcasting Corporation will review digital audio production in the CBC, past, present and future.

Sunday afternoon the study of digital audio expands by a consideration of digital  
continued on page 31 ▶



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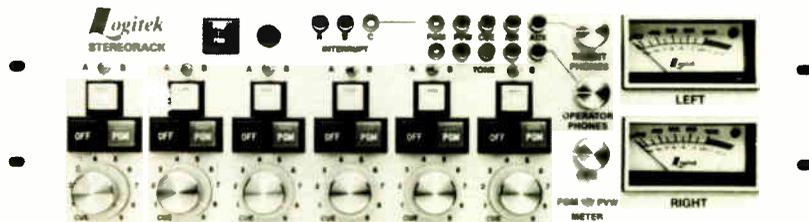
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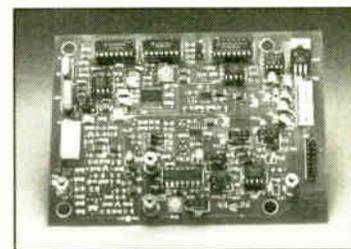
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# Sessions Highlight Digital Topics

► continued from page 29

audio processing (Convention Center, Room N113, 1:15 p.m.-5:00 p.m.). John Stautner from AWARE Inc. will discuss developments, standards and implementation of compressed audio test standards.

Stephen Smyth, Hamish Eassie and Michael Smyth from Audio Processing Technology, Ltd. in Belfast will profile their experiments in broadcasting on the ISDN. This system utilizes telephone company digital lines to deliver high quality audio services directly to homes.

Grant Davison and Marina Bosi from Dolby Laboratories will describe the development of AC-2, Dolby's audio coding for broadcasting and storage.

Dr. Gerhard Stoll from the Institut für Rundfunktechnik will conclude the afternoon by following the road from MASCAM via MUSICAM to ISO/MPEG/Audio Layer II, in a look at audio coding for the '90s and beyond.

On Sunday, the International Broadcasting session gets underway. Presenters will include updates on WARC, reports from the EBU, Asian-Pacific Broadcast Union, and Eurocrypt.

Monday is Digital Audio Broadcast day at NAB '92. During the day, every current DAB system proponent will be able to present its views. The session (Convention Center, Room N113, 8:45 a.m.-11:50 a.m.) opens with a report on interference tests for DAB in the FM band from Ken Springer of NAB.

## DAB and cars

Also on Monday, Mark Kady from Delco will consider the automotive impact on DAB system needs. Stephen Edwards from the Canadian Association of Broadcasters will then discuss Canadian Eureka test results, followed by Ted Schober from Radiotechniques Engineering Corporation with the American Digital Report.

The American profile continues with Perry Spooner from EMCEE Broadcast Products describing delivery methods for DAB. The morning concludes with Dr. George Plenge from IRT. Dr. Plenge will report on the continued growth of the Eureka system in Europe.

The digital parade resumes Monday afternoon (1:15 p.m.-4:35 p.m.) with Gerald Chouinard from the Communications Research Center in Ottawa. Chouinard will report on his experiments with digital sound broadcasting. Then the American proponents return, beginning with a report from Steve Kuh of LinCom Corp. Lloyd Englebrecht of Stanford Telecommunications follows with "Terrestrial Delivery of DAB."

Paul Donahue from Gannett Broadcasting will deliver the USA Digital report and Etienne Resweber will present the Synetcom report. The day concludes with a no-holds-barred panel featuring all of the system proponents.

Engineers can get tips on maximizing broadcast signal coverage on Monday afternoon (Convention Center, Room N111, 1:15 p.m.-5:15 p.m.). The session begins with Dick Biby analyzing contemporary signal analysis methods in a communications engineering tutorial.

Former NAB engineer Stan Salek, now with Hammett and Edison, delivers his analysis of FM booster system considerations, while Bill Ruck from KFOG/KNBR recounts the harrowing tale of "The Mount Diablo Booster System."

ERI's Tom Silliman will give some tips for maintaining FM coverage while reducing rooftop EMR exposure by examining the de-

sign process for the Prudential Building multiplex FM antenna project in Boston. Dr. Ali Mahnad from Jampro also considers shared sites in a paper titled "A New Multi-Channel Community Antenna for FM Broadcast."

## It's SBE Day

The Society of Broadcast Engineers takes over on Tuesday for SBE Day at NAB '92. During the "Radio: Coping with New Technology" session (Convention Center, Room N113, 8:45 a.m.-11:30 a.m.), past SBE President Brad Dick opens with "Radio in the 1990s: Challengers and Opportunities."



Don Lockett of NPR continues the look forward with "Digital Cable Audio, When and Where." Michael Collins from Motorola takes over to consider the expanding role of DSP in audio technology.

The morning concludes with the most often ignored part of today's radio station as David Cripe of Broadcast Electronics talks about improving transmitter performance through Class E operation. Broadcast consultant Jerry Westberg examines the dependence of AM stereo separation on transmitter load phase.

Tuesday afternoon the SBE radio session continues with "Broadcasters' Rules of the Road" (Convention Center, Room N109, 12:45 p.m.-5:00 p.m.), a session which will consider matters of importance to all engineers.

Jim Zoulek from the FCC's Los Angeles Field office continues that theme with "Beta Testing: A Self-Inspection Program."

John Windle from Stainless Inc. brings things back to earth with his presentation, "Changes in Structural Standards for Communications Towers." The chairman of the SBE Frequency Coordination Committee, Richard Rudman from KFWB(AM), then will explore new issues facing frequency coordination.

Things also are changing for EBS. Gerry Lebow from Sage Alerting Systems will describe the Sage I system for EBS, while Bill Ruck from KFOG/KNBR examines EBS' future. The FCC's John Reiser will conclude the formal presentations with "WARC-92: What Is It and Why Should I Care?" All of the panelists will then consider the challenge of "Dealing with a Changing World."

## Sounding good

How good can radio really sound? That's the question at the AM/FM improvement session on Wednesday morning (Convention Center, Room N113, 8:45 a.m.-11:30 a.m.). The NAB and Denon have joined forces to create a radio that allows listeners to hear radio that sounds as good as broadcasters know it can. Denon of America President Robert Heiblim will describe the design of the Denon/NAB SuperRadio.

Consultant Karl Lahm will examine the results of the FM technical study he supervised for NAB. Dietmar Kopitz from the European Broadcasting Union will provide an RDS technical update, describing the EBU's latest results in information broadcasting.

Tim Cutforth of Vir James Broadcast Engineering Consultants will help you improve the originating end of the chain in a paper titled, "Improving the Intermodulation Distor-

tion Characteristics of Your Present AM Transmitter."

Geoffrey Mendenhall turns to the FM side by considering "Optimization of FM Performance by Tuning for Symmetrical Group Delay."

## Honoring radio engineers

Engineering history takes center stage at the annual Engineering Luncheon at noon on Wednesday. Tom Lewis, the author of Empire of the Air—The Men Who Made Radio, talks about the role engineers have played in the building of the American broadcast system.

The luncheon will also honor three men who have made major contributions to broadcast engineering. Bill Hammett, Sr. and Ed Edison have distinguished themselves through their individual accomplishments as well as through the work of their consulting partnership. Also honored will be James C. McKinney, who served the engineering community's interests first through his work at the FCC and now as head of the Advanced Television Systems Committee.

All engineers will get help tackling one of the '90s toughest challenges on Wednesday afternoon during the Reducing Station Operating Costs session (Convention Center, Room N111, 1:15 p.m.-5:00 p.m.). Patrick J. O'Hare of Cost Analysis Inc. begins by discussing bargaining with the power company and other methods to reduce power costs.

Steve Pilling of Telecom Consultants tackles "How to Get the Most Out of Telephone and Data Services." Following, John

Sullivan of Econco has a number of practical suggestions on obtaining the greatest number of tube life hours, and John Jenson of Kinetech looks at "Demand Side Energy Management." You can get specific answers to your problems from all of the panelists as the session concludes with a cost reduction panel.

After worrying about cost containment all afternoon, engineers will be ready to cut loose and socialize. The 14th Annual Ham Radio Operators Reception is the perfect place. All Ham operators and friends are invited to share snacks, liquid refreshment, good fellowship and the ever-popular attendance prizes. This year, 32 companies and organizations have donated a variety of enticing goodies.

## Getting enough fiber?

On Thursday the emphasis shifts to practical hands-on experiences during the Fiber Optic workshop (Convention Center, Room N109, 8:45 a.m.-11:55 a.m.). J. Repi from AT&T Network Cable Systems Services will teach engineers how to route and connect fiber optic cables for broadcasting. FCC and FAA representatives will discuss individual attendee's questions at the FAA/FCC workshop (Convention Center Room, N113, 8:45 a.m.-10:30 a.m.).

Four veteran contract engineers—John Bisset, Mark Persons, Mike Patton and Grady Moates—talk about striking out on your own in the contract engineers workshop.

The Broadcast Engineering Conference at NAB '92 offers radio engineers a unique opportunity to stay up to date. Anyone with questions or suggestions about the conference program is encouraged to call me at 202-429-5345.

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# NAB and Denon Unveil Super Tuner at Last

by John Gatski

**LAS VEGAS** After four years of delays due to design changes, and difficulty finding a vendor, the radio industry finally will get a look at the NAB "SuperRadio" at the NAB convention here.

Denon, the super tuner's builder, is planning to host a session on the tuner, a nearly everything-but-the-kitchen-sink project on which the NAB spent more than \$75,000 since 1988. The Denon/NAB SuperRadio will be highlighted during the AM and FM Improvements session, Wednesday, April 15, in Room N113 at the Las Vegas Convention Center.

The tuner will be called the TU-680 NAB tuner; it is based on Denon's high-end TU-660 tuner that has been on the market a couple of years. Suggested retail will be about \$450.

Several preproduction models will be demonstrated at the convention; NAB said it will be selling the tuner to members by late spring. Later in the year, Denon will be selling the tuner through its retail outlets.

As the TU-660, the tuner already has quality performance and features, but Denon was able to add the latest improvements, including addition of the Electronics Industries Association/NAB's voluntary AMAX standard for improved AM performance.

Tuner technology consultant Almon Clegg said the TU-680's AM features will include expanded wideband AM (50 Hz to 7.5 kHz),

C-QUAM AM stereo, switchable noise blanking to reduce electrical interference, a wide/narrow bandwidth switch to reduce nighttime station interference, and external antenna connection.

Notably absent from the list of features for FM, however, is the FM stereo enhancing technology FMX, which was claimed by its inventors to improve stereo performance.

Clegg said no company is producing FMX chips on a large enough scale to meet NAB specifications for the tuner. The initial design with FMX was based on a chip that had been produced by Sprague Semiconductors, but is no longer made.

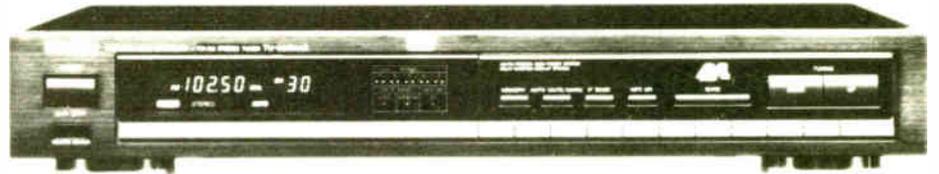
The NAB was a partner in the initial development of the technology and had navigated FMX through several super tuner

proposals. According to the association, a later version of the tuner could include FMX.

Although the NAB has decided to drop

higher frequencies.

The tuner also will not have the ID Logic technology. Radios equipped with such technology can lock onto a format based on an internal computer program of U.S. stations in the ID Logic unit. Unlike the Radio Data System, which is broadcaster-dependent, ID



The TU-680 NAB: Denon's AMAX-certified "Super Radio"

FMX, the FM section of the TU-680 will be slightly improved over the TU-660, Clegg said, with the additions of a higher grade FM decoder chip designed to lower distortion and improve stereo separation at

Logic programs have to be updated each year to accommodate format and other changes.

Clegg said it is possible that ID Logic could be added to subsequent TU-680 versions. RDS also could become a feature.

## Sorting Out the DAB Puzzle

by John Gatski

**LAS VEGAS** Digital audio broadcasting (DAB) again will be a popular topic at NAB—the third year the subject will be dealt with in numerous sessions.

One session, "Digital Radio Issues and Insights," will focus on the history and future of this technology and the numerous divergent proposals being put forward. The session is scheduled for Sunday, April 12 at 9:40 a.m. in Room N113 at the Las Vegas Con-

vention Center.

Skip Pizzi, chairman for the industry group Committee for Digital Radio Broadcasting (CDRB), and its technology chairman Robert Culver will sort through numerous factors that have to be considered for the eventual adoption of a U.S. DAB system.

Announcements will be made for the launching of two DAB surveys: a professional survey by Broadcast Engineering magazine and a consumer survey by an unnamed consumer publication, according to Pizzi.

One of the issues Pizzi plans to address concerns an emerging dichotomy of viewpoints as to whether DAB should be an enhancement to existing service or a new service.

From comments he has heard concerning DAB, Pizzi said management sees DAB as an enhancement to existing service via permanent simulcast while those on the engineering side look at it as an eventual new service with only temporary simulcasting on the existing bands.

Pizzi added that the DAB as-an-enhancement concept was solidified by NAB's backing away from its out-of-band L-band position and subsequent embracing of

in-band.

Also to be discussed at the session is the Electronic Industries Association's (EIA) efforts to arrive at a U.S. standard—possibly by 1993 or 1994.

With enormous resources to push for a standard (it was EIA that got MTS TV stereo approved), the organization formed a digital audio radio subcommittee last year.

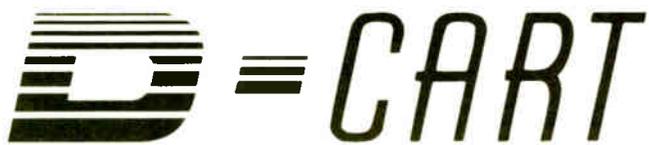
According to Culver, the subcommittee's five working groups are engaged in all areas related to the pursuit of a standard, including establishment of test procedures and facilities, and system selection procedures.

In personal comments about the issue, Culver, who heads Technical Working Group A (source coding, channel characteristics and coding), said that although there have been a lot of in-band systems proposals so far, there is no perfect one yet.

Culver noted that a standard could end up being a mix of technology elements from several system proponents that pool their resources together—similar to the coalitions of high definition television system proponents that have gotten together to develop systems being considered for U.S. standardization.

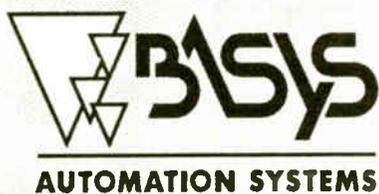
"I don't think any one (proponent) has all the ideas yet," Culver said.

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xL82S	8 mixer, dual channel	3,355
xL12/1S	12 mixer, single channel	4,043
xL12/2S	12 mixer, dual channel	4,358
RS4	2 mixer, 4 machine start/stop	263
RS8	4 mixer, 8 machine start/stop	325
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World Radio History

# Consulting Pioneers Win Achievement Award

*Editor's Note: The NAB has awarded its 1992 Radio Engineering Achievement Award to Robert Hammett and Edward Edison, partners in the noted radio and television engineering firm, Hammett and Edison, located in San Francisco.*

Hammett, 62, graduated from Stanford in 1942 and received his Master's degree in electrical engineering in 1943. From 1943-45, he worked as a research assistant at Harvard University, specializing in radar. After World War II, he became a partner in the Dallas-based engineering firm A. Earl Cullum. Hammett then opened his own consulting firm in 1952 and formed the partnership with Edison in 1957.

Edison, 62, graduated from the University of Nebraska with his electrical engineering degree in 1942. He worked in various capacities for NBC and RCA from 1942 to 1955, including engineering, sales and management. His accomplishments included submarine radar installations and managing the first RCA Service Company television receiver shop on the West Coast. Edison also lectured on television systems design at the University of California. He joined Hammett's firm in 1955.

RW News Editor John Gatski recently interviewed the two engineering leaders to get their perspectives on the industry.

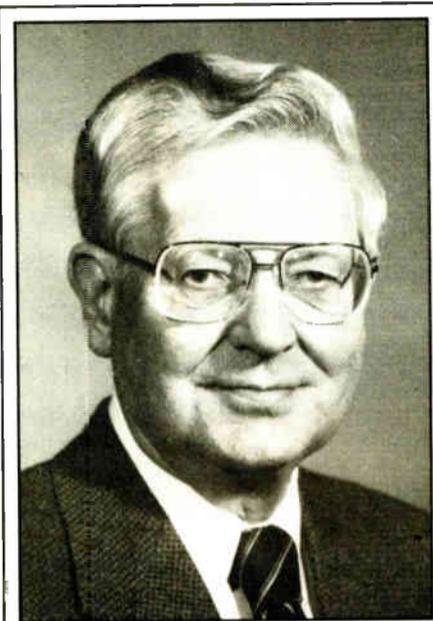
RW: Congratulations on being selected as the NAB's 1992 Radio Engineering Achievement Award winners. What was your reaction when you first heard the news?

Hammett: My reaction on hearing the news

from Mike Rau (NAB Science and Technology senior VP) was normal. Who wouldn't be pleased?

Edison: A complete surprise!

RW: You both go back a long way in the business. How did each of you get involved



"The analog world is not going to go away and we expect to see a fair amount of activity in consolidation of AM transmitting facilities . . ."

— Robert L. Hammett

in radio engineering?

Hammett: I first became involved in radio engineering at Stanford where I stud-

ied under Dr. Frederick Terman, one of the pioneers in radio engineering. His textbook, Radio Engineering, and subsequent handbooks are classics that I still refer to for concepts that I have either forgotten or never really understood in the first place.

I became involved in broadcasting through A. Earl Cullum Jr. who was associate director of the Radio Research Laboratory at Harvard during World War II. He invited me to join his firm at the conclusion of the war.

Cullum was one of the pioneers in directional antenna design and was very active in allocations and forensic engineering before the FCC. I handled a large part of the television work for that firm during the six years I was in Dallas.

Edison: My dad was a professor at the University of Nebraska who taught and practiced electrical engineering. He introduced me to the wonders of radio by way of crystal sets and early shortwave receivers that we built together.

In 1946, my RCA supervisor inquired as to my desire in converting from military electronics to RCA's civilian activities. Having just been exposed to the potential of commercial television at a lecture and meeting with V.K. Zworykin of television fame, I shot for the moon and suggested as my first choice the studio aspects of television—particularly the applications of the orthicon camera and thousand-line scanning to the production of motion pictures.

It was another 40 years before improved systems made television techniques fully competitive with modern picture film.

RW: In terms of RF engineering, what important changes have occurred since you both started?

Edison: Fifty years of evolutionary changes in broadcast technology are overshadowed by the revolutionary changes brought about by the invention of the transistor and its adaptation to microchips, television tube improvements, the development and application of digital computers to the solution

of broadcasting engineering problems, and the ongoing conversion of audio and video technology from analog to digital formats.

RW: Can you tell us about some of the advances your firm has been involved with, such as your airborne measurement system and AM diplexing?

Hammett: The firm has always tried to lead the industry in its capabilities. The roots of our airborne measurement system



"In my opinion, there will always be a place within our industry for competent engineers, technicians and operators . . ."

— Edward Edison

go back to 1949. I developed a system that used two radio altimeters as a transponder pair to maintain a constant radius, and used optical tracking with a motor-driven telescope to provide azimuth control.

Our accuracy was good enough to duplicate complex AM directional antenna patterns within two percent on successive runs. We also succeeded in persuading the FCC staff to accept our aerial measurements at that time.

Our present system, which we use for AM, FM and TV pattern measurements, no longer requires any ground-based equipment for navigation. It uses the global positioning systems (GPS) for navigation and collects field strength data on a portable computer. The data is analyzed later by computer programs written by our staff—who are younger and brighter software engineers than I.

Edison: Our first effort at AM diplexing was some 29 years ago when we combined KFWB and KLAC in Los Angeles on three common towers, with one station being directional and the other non-directional. The original filter system we designed is still operating with no problems. We have done many since, even diplexing radio stations in Alaska on FAA towers used for aeronautical communications, to get around aeronautical hazard problems.

We are just finishing two big diplexing projects. We moved WNYC in New York City to share three WMCA towers. The diplexing works fine. The reradiation environment is a problem for all directional antennas in that area. In Seattle, KULL is moving to the three-tower KING site. Both stations are 50 kW with different night and day patterns, which made for a challenging design. Several nearby stations also are being equipped with detuning filters.

RW: I understand the firm's computer capability is one of the best in the country for RF

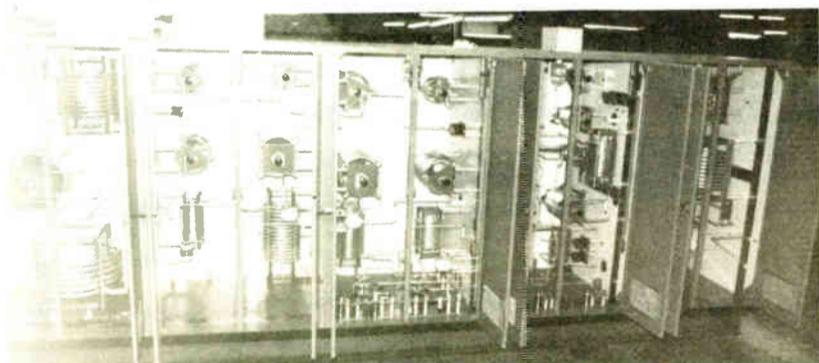
continued on page 39 ►



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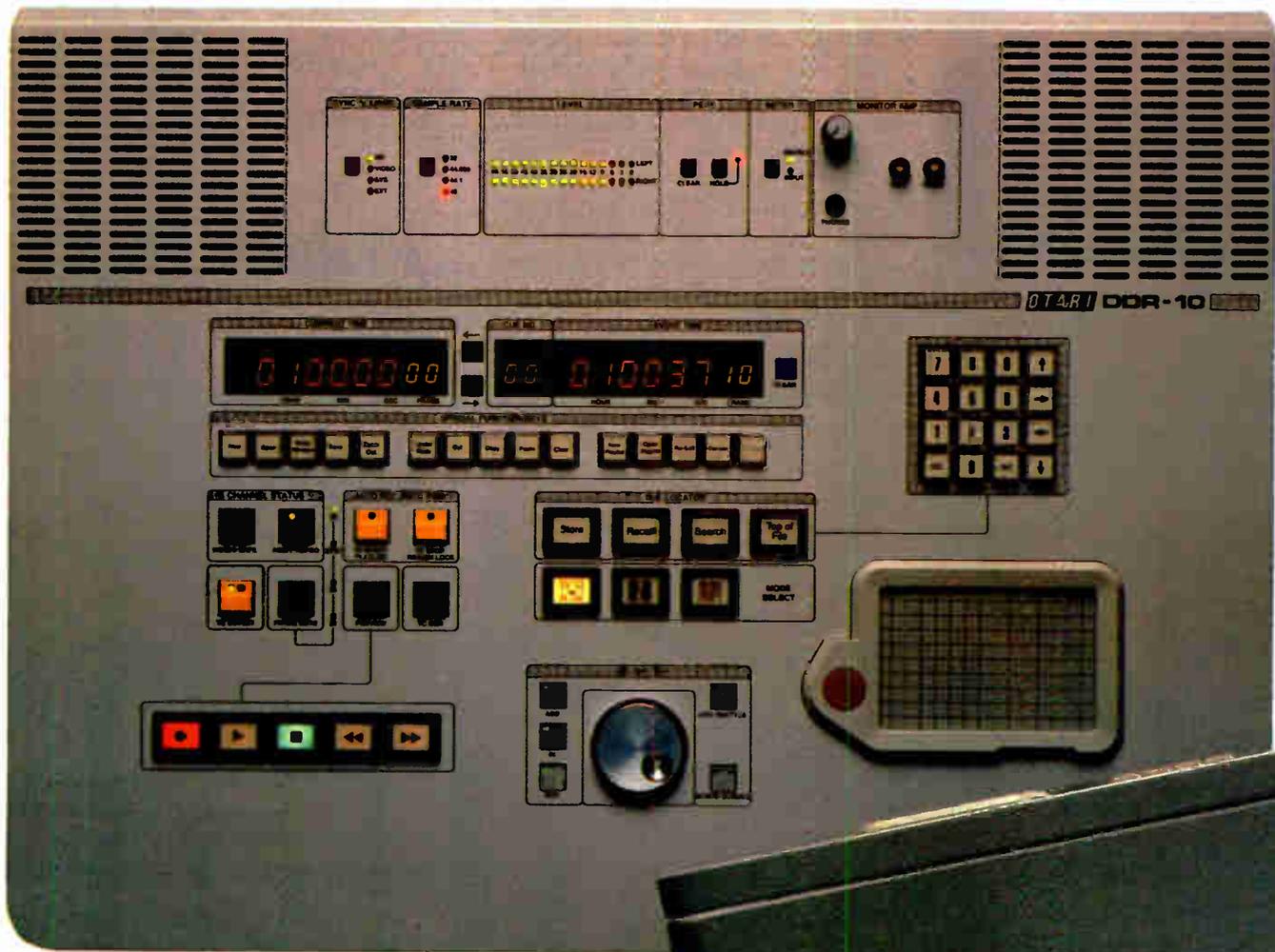
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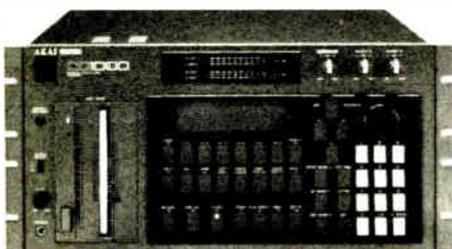
# Source Gear Develops a High Profile

by John Gatski

**LAS VEGAS** As digital technology improves, the number of professional source products continues to proliferate at the NAB spring conventions.

In 1992, scores of source equipment will be on display, including both analog and an ever-increasing inventory of digital products. This digital equipment includes CD players, recordable CDs, DAT recorder/players, and computer disk-based record and replay devices.

Featured in this latter category of computer-based source technology are such devices as digital audio workstations and the so-called



The DD1000 magneto-optical recorder from AKAI

"cart machine replacements"—systems that store digital audio on Bernoulli disks or floppy disks, and are configured to resemble cart

machines, to make the transition to digital technology easier for non-technical operators.

The proliferation of digital technology in source equipment has been so rapid and all-embracing that even systems whose primary function is station automation—like the ITC DigiCenter—feature some operational modes intended to work as "cart replacements." (For information on digital automation systems, see the related story, this issue.)

### The new carts?

Fidelipac's Dynamax DCR 1000 has created a quite stir in the industry. The recorder/player records digital audio on a standard 3.5-inch computer floppy disk with

variable sampling rates that allow different quality levels and recording times. A 32 kHz sampling rate allows more than five minutes of stereo audio.

Another floppy disk-based recorder will be on hand at the PEP booth. Like the Fidelipac unit, it too records on 3.5-inch disk. Further information was not available at press time.

360 Systems will introduce several new  
continued on page 42 ▶

## Reduce Your Power Costs

by John Gatski

**LAS VEGAS** Radio stations spend thousands of dollars a year on their power bills, but are they getting the best rate possible?

How to get the most economical electrical service is what Cost Analysis President Patrick O'Hare will be discussing in his presentation during the "Reducing Station Operating Costs" session April 15, 1:30 p.m., at the Las Vegas Convention Center's Room NI05.

According to O'Hare, nearly 75 percent of American businesses (including radio stations) are paying too much for utilities—especially electricity.

"Utility suppliers do not automatically supply customers at the lowest possible price," O'Hare said. "It is the company's responsibility to ensure they are purchasing all utilities at the best possible terms."

His firm has advised businesses for more than 12 years on where overcharges are incurred on utilities—through the incorrect submission of bills and non-application of the best rates. The company is headquartered in Sydney, Australia, but has several offices in the U.S., including California and New York.

O'Hare said that radio stations, like other businesses, need to be aware of the rates, discounts, rebates, incentives and special conditions that often apply to large users.

Cost Analysis keeps a comprehensive computer data base on utility costs and will advise a client in its negotiations with the power company to get the lowest rate possible, O'Hare explained.

To begin the service, a radio station must submit utility bill copies from the past 12 months. The firm then creates a computer profile of the station's utility consumption, from which lower prices can be sought, he said.

During the NAB session, O'Hare will outline some of the techniques and methods his company uses to save clients money. One area, he noted, is utility bills that are incorrect. "Mistakes can and frequently occur on utility bills," he said. "Cost Analysis unique software enables it to check every bill and to quickly uncover where the overcharges occur . . ."

The company claims that it saved clients more than \$4 million in 1991. If the service doesn't save a radio station on its power bill, Cost Analysis does not get paid, O'Hare added.

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**The Play Line**. Shows what's currently playing on-the-air, with a count-down timer.

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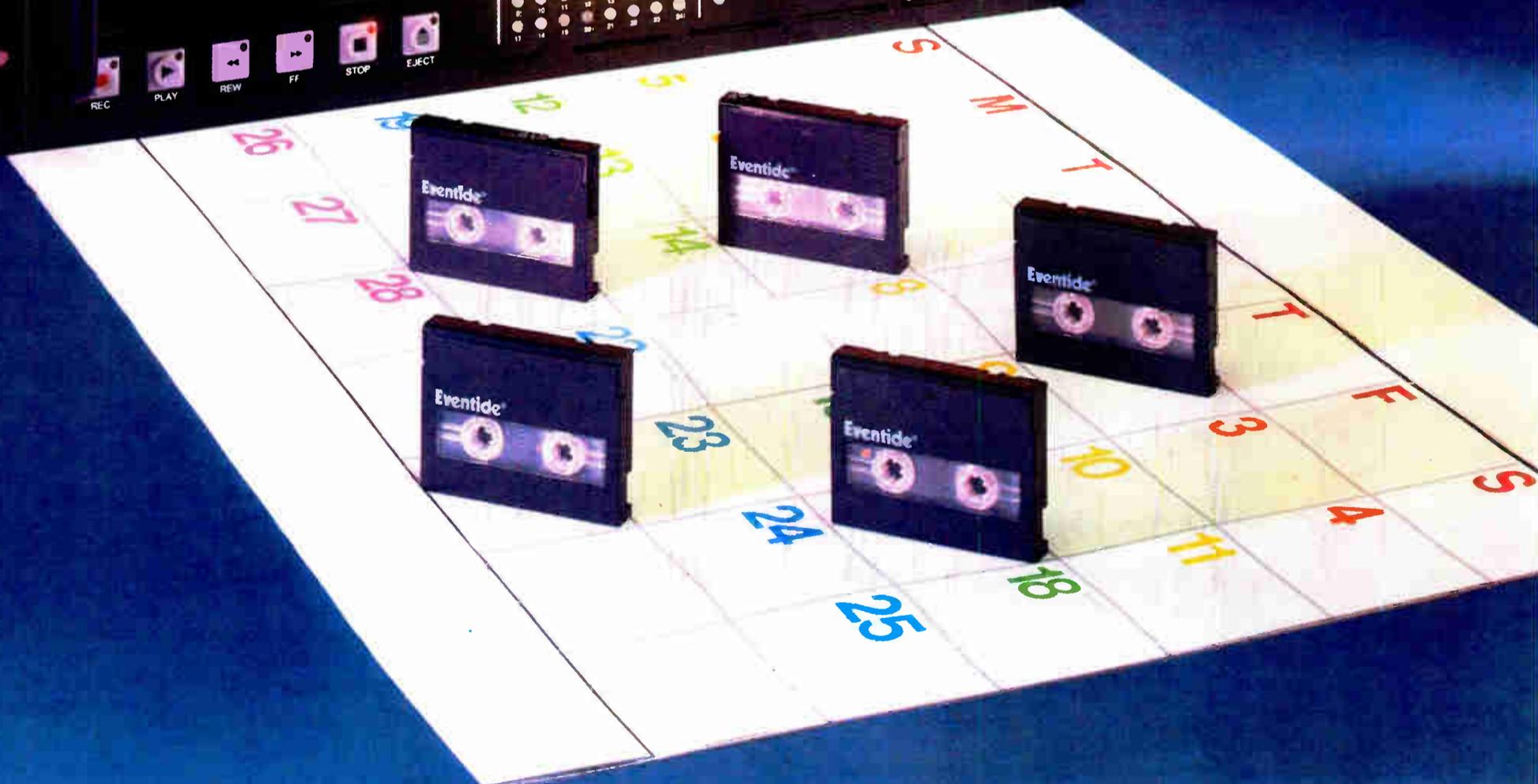
**W**ith analog cassettes or reel-to-reels, logging was a chore. With Eventide's revolutionary VR240 Digital Broadcast Logger, logging is a competitive weapon. Now you can store 168 hours of audio on a single DAT cassette. Record from 1 to 24 channels simultaneously on each tape. Find any audio segment on the tape in under one minute.

With power and speed like that, the VR240 can do much more than just log your own station. It's easy to monitor the competition. Keep track of the new songs in their playlist—and the new clients in their stopsets. Use other channels to record police, fire and aircraft frequencies to give your news department an extra edge.

With analog tape, logging was expensive and inconvenient. Now the VR240's digital technology slashes the cost of tape stock and eliminates the need for dedicated storage space. A week's worth of audio fits in your shirt pocket. A year's worth fits in a file drawer with plenty of room to spare. The VR240's optional label printer clearly identifies each tape with a time/date and ID stamp.

We don't have to tell you that staying competitive today means using every advantage you can get. So what are you waiting for? Call your broadcast distributor for more information on radio's newest secret weapon—the VR240 Digital Broadcast Logger from Eventide.

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World Radio History

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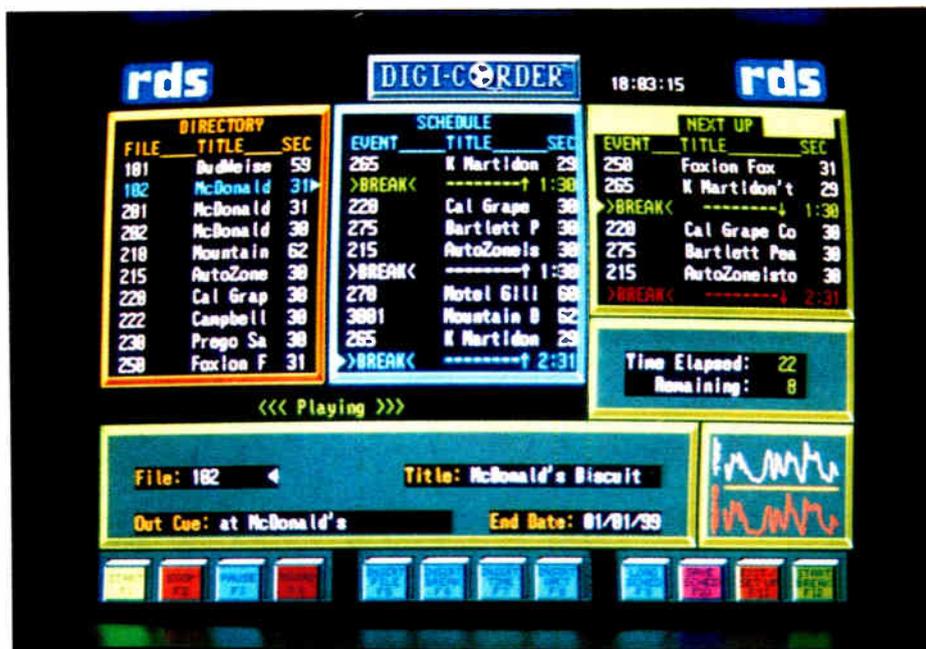
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# Achievement Honorees Discuss Radio

► continued from page 34  
engineering. How did the system evolve?

**Hammett:** Our firm's work with computers started in the middle 1960s. We have gone from punch cards on rented mainframes to our present local area network—a DEC

RISC-based UNIX platform, acting as a file and program server. Every engineer has a Macintosh on the local area network. We also use Macs for CAD work and reports.

**Edison:** Our first program was used to optimize directional antenna patterns for the minimum number of towers and best coverage. Since 1968, all of our DA designs have been optimized with the towers seldom in straight lines anymore.

Later, we digitized the U.S. M3 ground conductivity map to eliminate the need to manually calculate field strengths using the equivalent distance method. We sold that database and the associated programs to the FCC for them to use to check applications.

**Hammett:** We recently developed a very powerful program to predict VHF and UHF coverage in the presence of terrain obstruction. Stations find the maps we produce very helpful in choosing the best transmitter site or designing a booster. We achieved better accuracy because we could correlate the results of many proposed propagation algorithms with our 30-year database of field strength measurements.

**Edison:** Computers also have made RF radiation analysis much easier. For stations that are trying to comply with FCC rules on RFR exposure, we have written a program that calculates the power cutbacks required when a worker has to climb a tower. This program is particularly effective for antenna farms.

Another program for studying public RFR exposure draws maps of ground-level power flux densities.

**RW:** What are some of the new technologies (DAB, RDS, improved antenna designs) that radio engineers and engineering consultants will face in the next 10 years?

**Hammett:** We are following DAB and have been of some assistance to the NAB and to USA Digital Radio. It is, of course, obvious that the digital techniques will predominate in the years ahead, and that is where young engineers should seek to be proficient. However, we think the analog world is not going to go away, and we expect to see a fair amount of activity in the consolidation of AM transmitting facilities by diplexing and by migration into the expanded bands.

**RW:** The role of engineers at radio stations seems to be changing. No longer do all stations have an in-house engineer. Many groups and individual stations use consultants. What kind of impact is this having on station operations?

**Edison:** The continuing improvements in the performance, reliability, and cost of radio broadcasting equipment has sharpened the lines of demarcation between operations, equipment maintenance and the design/specification of broadcast electronic components and systems. Many excellent board operators know little about electronics, and many excellent repair technicians know little about the subtleties of equipment and systems design.

## NAB S&T Adds Staff

by John Gatski

**LAS VEGAS** For the first time in several years, the NAB's Science and Technology department is fully staffed—which has made preparations for the mammoth technical sessions at the 1992 NAB convention and other tasks much easier, according to NAB Senior VP of S&T Michael Rau.

With the recent addition of former WBAL engineer Andy Butler to the staff, the NAB now has six full-time engineers.

"We had been in a serious over-worked, understaffed position for two years," Rau said. "Now that we are at full staff, we are able to handle our workload."

Currently, the staff includes Kelly Williams, John Marino, Ken Springer, Lynn Claudy, Butler and Rau. All are degreed engineers; Springer and Claudy also hold master's degrees in electrical engineering.

Besides the planning and coordination of the annual NAB show in Las Vegas, which includes nearly a week of non-stop sessions from speakers all over the world, the department also will handle the high definition television (HDTV) conference, Radio Montreux this summer, and the fall NAB radio show.

The Science and Technology department also provides expertise in the area of FCC technical regulations, and service to NAB members, Rau added.

Rau said the full staffing of the department allows more time for planning of future projects. Currently, non-conference projects include finalizing the Radio Data System (RDS) standard, and completion of tests to determine protection ratios for FM with an in-band DAB system on the first or second adjacent channel.

Rau said future projects for Science and Technology will include research on technologies to enable radio stations to take advantage of data service, not just RDS, as a way to enhance their revenues.

In earlier days, all of these talents were maintained in-house by each broadcaster. Now the technology has progressed to the point that the major emphasis is rightly placed on the art and the economics of broadcasting. However, in my opinion, there will always be a place within our industry for competent engineers, technicians, and operators to design, install, maintain, and operate the tools to communicate with the world's listeners and viewers.

**Hammett:** As AM, FM and TV transmitter plants have become more reliable over the years, a reduction of in-house engineers has been inevitable. We fear that economic pressure will continue this trend, but we do not expect it to have much impact on the consulting work we do, which is in design and construction, rather than operations and maintenance.

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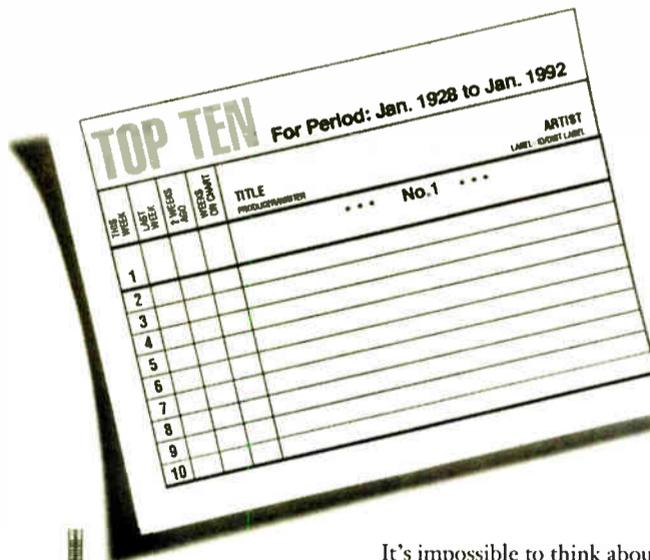
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# Computer Automation Technology Matures

by Alex Zavistovich

**LAS VEGAS** The fledgling technology of hard disk storage for digital audio radio applications has come to a fork in the road.

One of the branches combines digital audio workstations such as the Studer Dyaxis or Otari ProDisk 464, and recorders like the Fidelipac DCR 1000. This branch is most closely related to production equipment or source gear for radio broadcasting.

The second branch lies in automated station operation. This road embraces a variety of devices. New hard disk systems allow for the recording and playback of commercial spots and songs in a live, live-assist or walkaway automation mode.

The result is almost complete integration of all the day-to-day operations of a typical radio station, plus some of the same editing features available in digital audio workstations. All in a single PC—or in some cases, a local area network of PC substations.

The most recent entrant in the race is Pacific Recorders & Engineering. The company is expected to introduce a hard disk system at the NAB convention this year.

ITC plans to display its expanded DigiCenter system. DigiCenter has five operating systems, including digital cartridge machine, satellite automation control, live assist capability, program automation and interface to traffic/accounting/billing systems.

Broadcast Electronics will show two storage and automation devices the company first unveiled at last year's NAB. The AudioVAULT digital audio storage device and the

CORE 2000 program automation system each will be available for inspection at the BE booth.

Arrakis Systems will show the Digilink, which was introduced last year. The Digilink is a digital audio cart recorder that provides automation for satellite, CD and tape.

The Digilink will also be shown at the Harris-Allied booth. Harris-Allied also intends to display the MacroMedia Audisk, also a digital audio storage and automation system for satellite music, live assist or any combination.

Gentner Communications will show the DAWN (Digital Audio Workstation Network). A LAN-based system, DAWN ties together the basic station operations of traffic and billing with music and spot scheduling.

## Not So Hard

Wheatstone's booth will feature the Not So Hard Disk, a storage and retrieval system for music and spots. The monitor and keyboard can be located alongside the on-air console, separate from the hard disk recorder.

Prophet Systems is expected to return with its Audio Prophet CD automation system. The Audio Prophet is designed for live or walkaway operation, either as a stand-alone unit or interfaced with the Audio Prophet Digital Broadcast System. The device works with three 60-CD Sony CDK006 jukeboxes; Music Librarian software is included.

Custom Business Systems Inc. (CBSI) will introduce CBSI for Windows, which allows multiple tasking in CBSI programs. Also new is CustomNet, which provides consoli-

dated traffic/billing for multiple stations at one location.

The Management will be showing several established products, including the Digital DJ audio hard disk and satellite controller; EZ-Log, Simple Log and SuperLog traffic systems and Digital DJ interface; and Music Log, a computer music selector that interfaces to the Digital DJ.

On hand from BASYS Automation Systems will be a variety of integrated automation systems for radio, including newsroom computer systems, multichannel automation and turnkey engineering and design services.

Exhibit plans from Rodman-Brown & Associates include the Desk Jockey digital automation system, a PC-based digital audio

automation system with 14-day walkaway time and seven hours of stereo audio storage. Desk Jockey Lite, a similar system with scaled-back hardware, is also available. Both of these devices will be displayed at the Broadcasters General Store booth.

The TM Century booth will have on display the company's satellite commercial player, a hard disk digital audio commercial player for live radio, and computerized six-pack CD players with hard disk digital audio for spots. A computerized CD jukebox with hard disk digital audio will also be featured.

Register Data Systems will show the R-DAS digital automation system for record and playback of spots, jingles, liners and IDs. R-DAS can be interfaced to satellite systems as well as any of the five different sales/traffic/billing/accounting systems

continued on page 44 ▶



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# Source Gear Develops High Profile

► continued from page 36

upgrades for the DigiCart including the Model DRC remote controller, data compression software allowing six times more storage, a digital audio interface for AES/EBU and SPIDF interfaces and Software Release 2.0 for video post production.

Denon will showcase the new DN-951FA CD cart player, the upgraded version of the DN-950FA.

Not all of the cart products to be displayed are digital, however. Some are the tried and true analog format, like those available from Broadcast Electronics, Radio Systems or Pacific Recorders & Engineering. Each of those companies will display its trusted cart machine lines at the show.

ITC will debut the Series 2 cart machine and introduce the DPR-612 digital program repeater that allows quality storage of mono programs.

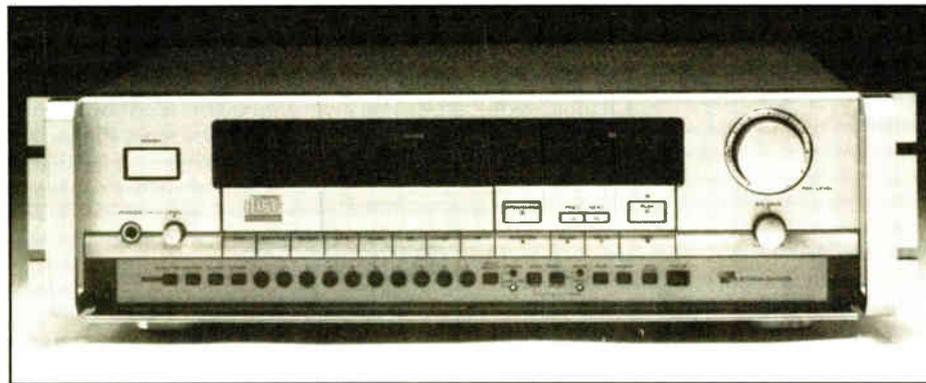
Audio Dynamics plans to show its AD-401 retrofit board for the ITC Type-99 cart machines. It features DNR noise reduction and an exclusive equalizer design that boosts frequency response. The company's other products will include the AD-302 retrofit for the ITC Delta Series.

## Workstations

DigiDesign will debut its Sound Tools II, a stereo hard disk recorder/editors systems. It features the Sound Design II audio editing software, a new high speed sound accelerator and a pro audio interface with four analog in/outs and two digital in/outs.

At the AKG booth, the DSE-7000 digital audio workstation will be on display. The DSE-7000 features eight-track multichannel record capability, scrub wheel editing and new software.

Bradley Broadcast also will show the AKG DSE-7000 digital audio workstation; the company also will introduce the Middle Atlantic Series of equipment racks.



The Marantz CD recorder brings this technology into a more affordable price range.

Otari Corporation will feature the ProDisk 464 digital audio workstation and the DDR-10 digital two-track replacement.

Distributor Crouse-Kimsey will display several digital audio lines including the Otari Pro-Disk 464 multitrack digital recorder, Otari DDR-10, and the Denon DN-970FA.

ASC Audio Video Corp. plans to show the Virtual Recorder, a random access player/recorder with re-writable optical disk. It is controlled by RS-422, allowing it to

interface with any existing edit controller, according to the company.

New England Digital will highlight the latest version of its MultiArc, a Macintosh-based audio editing software, as well as demonstrations of the LucasArt SoundDroid. Established products will include the New England Digital audio workstations: PostPro and Post Pro SD.

Pacific Recorders & Engineering would give advance details on the planned introduction of its new ADX digital audio production system, but demonstrations are planned at its booth, the company said.

Sentry Systems brings to the digital recording realm, the DS-1, an economical solution for storage of commercials, jingles, liners, etc., the company said.

Studer will introduce the new Dyaxis II, the D820 DAT recorder, D740 CD recorder and the Digital Cartridge Replacement Center. The Studer Dyaxis Lite, with its new hardware controller will also be shown, as will the Dyaxis MacMix software upgrade. Also on hand will be the Studer Digitec NUMISYS digital audio cart replacement system.

Smart Broadcast will show its Smartcaster digital audio system, the Smartcart digital cart machine and its line of CD-based digital audio. Broadcast Supply West will feature equipment lines from 360 Systems, Digital Audio Labs and Studer.

WaveFrame will introduce time compression/expansion for the WaveFrame 1000, a

digital mixer for the WaveFrame 400 and a compact disc recording interface for the WaveFrame 1000.

Siemens will have several new lines at its NAB booth including Siemens audio processing systems, the Mitsubishi X-880EX digital audio multitrack recorder and Mitsubishi X-862E master recorder. The AMS AudioFile PLUS 16 hard disk digital audio recording and editing system will be shown in a 16-output version, along with the AMS Logic 1 console, designed to work integrally with the AudioFile system.

From AKAI, new products will include the DD1000 Version 2.0 software (for the DD1000 magneto-optical disk recorder) with compression/expansion capability and RS 422 machine control with DAT backup; and the S1100 Version 2.0 software (for the S1100 digital sampler), that adds digital recording directly to magneto-optical disks.

Corporate Computer Systems has announced the CDO-2000 digital MUSICAM codec with AES/EBU input and output. The CDQ-2000 MUSICAM codec and the Micro line of mono codecs also will be on display.

Audio Processing Technology will introduce the DSM-100 two-channel duplex system that utilizes apt-X 100 SCSI100 and SDS100 stereo encoder and decoder boards, plus modem and telecom interfaces with ISDN multiplexer. The unit is said to provide full bandwidth audio transmission over single or multiple 56/64 kbps data lines.

## CDs and DATs

Harris-Allied will be showing the new Marantz CDR600 stand-alone CD recorder that will sell for less than \$8,000. It represents "a breakthrough in price/performance for compact disc recording," according to the company.

Broadcast Services will feature its full digital audio product line including digital cart machines, CD players, digital audio work stations, and headphone amp for monitoring digital sources.

Sony will debut its PCM-7010 time code DAT recorder and the DPS-M7 sonic modulator that features modulation-based effects, advanced 20 bit, HDLC pulse D/A converters, 32-bit processing with 100-factory and 256 user preset capability. Other Sony products on display will be the CDP-2700 CD player, PCM 2300 and PCM 2700 DAT recorders.

Alesis has announced it will display the ADAT digital audio recorder, AI-1 ADAT to AES/EBU and SPDIF digital audio interface with sample rate conversion, and Model 1622 mixer. Of particular interest is the ADAT recorder, which allows eight-track digital audio recording on an S-VHS video tape format.

Look for Yamaha's new YPDR 601 professional CD recorder and its DMC 1000 all-digital, automated mixing console as well as the PM 4000 console.

Radio Systems will have its RS-7000 DAT machine, which is less expensive than the RS-1000, but still offering exceptional performance for on-air and studio use.

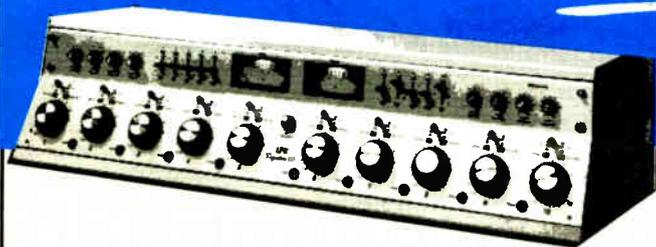
Fostex will introduce the Fostex Model PD-2, a portable timecode DAT recorder, featuring internal generator for all four formats with jam sync capability and timecode loop and output jacks, video sync and work sync I/Os.

Panasonic will exhibit its well-established lines of DAT recorders including the SV-3900 computer controlled recorder, the SV-3700 professional recorder and the SV-255 portable recorder.

Revox will show its new C221 professional CD player as well as the C270, C274, C278 reel-to-reel recorders.

Besides its established line of turntable equipment, including cartridges, mats, continued on page 47 ►

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# Analog Still Strong in Processing

by Alex Zavistovich

**LAS VEGAS** As with most categories of equipment in broadcasting these days, the digital craze has swept through the field of audio processing. Despite this surge in digitally-based products, however, a number of manufacturers are showing processing equipment that operates in the analog domain.

Following is an overview of products expected to be on hand, in both analog and digital formats, in the categories of audio processing, routing, switching, and amplification.

A European manufacturer, T.C. Electronic of Denmark, will display the M5000 digital audio mainframe, a user-expandable digital signal processor. The M5000 uses the company's DARC™ (digital audio reverb co-processor) technology. Programs include reverb, ambience and pitch shift effects. Standard interfaces include MIDI, RAM card and SMPTE (in).

A lot is going on under the banner of AKG Acoustics. BSS, Orban and dbx, each a division of AKG, have a wide range of new audio processing products.

BSS will unveil the FCS 928, a digitally controlled parametric EQ system that displays both systems RTA and the computed response curve of combined filters. The company also will exhibit its complete line of graphic and dynamic equalizers, limiters and other signal processors.

Orban will show the new Orban 460

compressor/limiter. The product will be displayed alongside the Orban 8200 FM digital processor, Optimod-AM, -FM, and -TV audio processing systems, and a range of compressor/limiters, equalizers, and mic processing.

As for dbx, the company will show its Production, Performer and 900 Series signal processing equipment.

## Under the umbrella

Another umbrella company, JBL, will have product introductions from JBL Professional, UREI and Audio/Digital.

JBL Professional, in addition to its line of loudspeakers, monitors and power amplifiers, intends to feature the M44 four-channel noise gate and the M712 two-channel gating compressor/limiter.

UREI will show the LA-10 single channel compressor/limiter, the LA-12 dual channel compressor/limiter and the LA-22 dual channel parametric compressor/limiter/expander. Audio/Digital plans to display the TC-4 broadcast digital processor with 6.5 second profanity delay.

Siemens Audio, parent company to Neve and AMS Professional Audio Products, will show the AMS S-DMX dual-channel digital delay, the AMS RMX-16 digital reverb and the Neve HRC-1 digital stereo high resolution A-D/D-A converter.

Alesis, a company previously best known for audio processing in the musical instrument and recording industries, will show the Quadverb and Midiverb III simul-

taneous effects processors, the MEQ 230 dual 1/3 octave precision equalizer, and the 3630 RMS/peak dual channel compressor/limiter with gate.

Circuit Research Labs (CRL) will display the Amigo, a low-cost stereo processing system with built-in stereo generator. Also on hand will be CRL's complete line of processing products for AM, FM and shortwave applications; the dynafex single-ended noise reduction system; a programmable four-band stereo processing system; and a programmable mic processor.

A real-time event sequencer will also be displayed by CRL.

## A real square wave

Radio Systems will introduce what they say is the first broadcast audio processor incorporating Dolby "S"-type technology. Dubbed the RS-SQUARED, the unit is a stand-alone, encode-decode system for broadcast noise reduction. It is designed to improve the noise performance of any brand of cart machine, as well as other tape sources and STL links. The RS-SQUARED also incorporates Radio Systems' single-ended stereo phase correction.

Dolby Labs plans to display the Model DP90, a two-channel Dolby AC-1 digital encoder for point-to-multipoint and direct-to-consumer broadcast applications. The company also plans to show the DP501/DP502 encoder/decoder units for its AC-2 digital audio coding process, as well as the 430 series background noise suppressor system.

Gentner Communications will show the Lazer 2.0 digital FM limiter/stereo generator, and the Prizm 2.0 digital audio proces-

sor. Each has fiber optic I/Os to keep information in the digital domain. The company also will show its full line of teleconferencing, pro audio and broadcast products.

Audio Animation, makers of the paragon-transmission digital audio processor, will introduce an FM stereo generator card option for the device. The paragon-transmission also will be operating the new Version 2.2 system software, including six-band parametric EQ and phase matrixing.

Aphex Systems will show a host of its effects processors, such as the new Model 400 Digicoder stereo generator and the 9901 parametric EQ. Other products to be displayed by Aphex include the 320 Compellor compressor/leveler, the 720 Dominator II peak limiter, the 723 Dominator II transmission limiter, and the I24A level matching interface.

New from Eventide is the BD1002 digital video delay, a video/audio delay for obscenity protection during live broadcasts. The H3000B UltraHarmonizer for broadcast and post-production will also be on display, offering 70 broadcast presets.

## Squashed and stretched

Symetrix will use the NAB convention to debut the 425 dual compressor/limiter/expander. The 425 operates in stereo or dual mono modes, employing downward expansion and compression with peak limiting to guard against overload distortion. The company also plans to show the 528 voice processor and 511A single-ended noise reduction.

Studio Technologies, Inc. will display the Generation II stereo simulator and AN-2 stereo simulator, in addition to the Mic-PreEminence two-channel microphone preamplifier for broadcast and recording applications.

continued on page 55 ►

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## Computer Automation Matures

► continued from page 41

Register Data has developed for broadcasters.

A new digital editing option has been added to Computer Concepts Corporation's Digital Commercial System (DCS). The system is a PC-based product that allows digital recording to a hard disk, editing and on-the-air playback of a station's inventory of commercials, liners, jingles and other spots. APT's apt-X compression is available as an option.

Tennaplex Systems is marketing the Music Manager, a PC-based music storage and scheduling system that can interface to traffic and accounting programs. The Music Manager uses technology from Pristine Systems and Antex.

Pristine Systems will itself be exhibiting a product at the NAB: the Pristine music management and commercial control system (Pristine MMCS). The MMCS is a PC-based scheduling and on-air playback controller utilizing CD and DAT players, hard disk audio and relay-triggered sources.

New from Decision Inc. is Version 6.0 of

the company's Broadcast System III, a management information system for radio and TV. The traffic, scheduling, logging, sales and financial software can run on any MS-DOS, OS/2 or UNIX, as well as new models of the IBM RISC System 6000 computers.

## Touch the music

Gefen Systems will display "Touch the Music," a picture database background music system that employs a touchscreen and 100 CD changer. The CDJ Classic Pro Music System, a background music system for broadcast will also be available, as will the M&E organizer system and computer interface for the Panasonic SV 3900.

Sentry Systems will not be on the main show floor, opting instead for a suite in the Hilton next door. The company will unveil the new DS-1 digital audio recorder for storage of commercials, jingles and liners. Format Sentry PC-based automation system will also be available.

Media Touch will display the MediaDisk networked mass storage digital audio system, which operates on a Novell network and uses Dolby compression. The OmniPLAY automation/live assist system and the OpLOG will also be on hand; all three can be integrated with MediaDISK digital audio.

Visitors to the Columbine Systems booth can expect to see the Columbine Sales system, which provides spot and media scheduling, logging and inventory management and sales analysis. Also, the Columbine Master control system automates the operation of any size broadcast or cable television station.

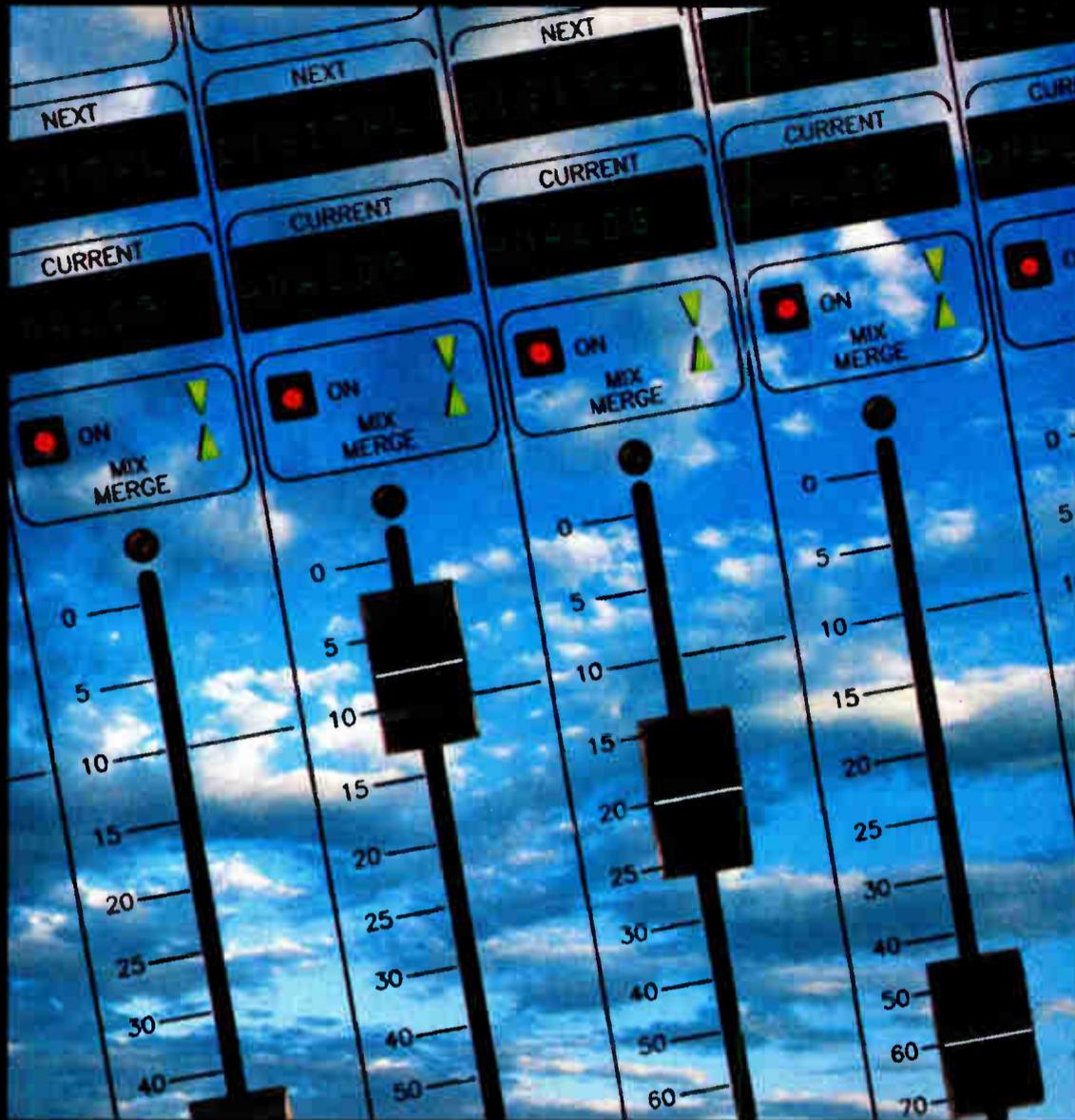
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World Radio History



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# Microphone Technology Is Picking Up

by Arthur Cole

**LAS VEGAS** The next generation of microphones, monitors and headphones is expected to debut at NAB with a host of companies parading their latest wares.

Shure Bros. will show its FP410 portable automatic mixer as well as the VP64 ENG handheld mic. Also available will be the VP88 MS stereo condenser, the L series wireless system and the AMS automatic system.

beyerdynamic products will be out in force, including the new MC833 stereo ENG/EFP microphones as well as its MCE 52 and 53 miniature instrument mics for wireless applications. Also, there will be the DT211, 311 and 411 monitoring headphones. Beyer's existing lines of microphones, headsets and related accessories will be available as well.

## Stereo mics

Siemens Audio Inc. will present the AMS Soundfield Mk V microphone, a coincident M/S stereo mic that uses the advanced B-format. The AMS ST-250 portable M/S stereo mic also will be available.

Telex Communications Inc. will display its new Micromini series of lapel mics, as well as the Microneck line of goosenecks. Also, lightweight V-100 headsets and the FMR-100 wireless mic receiver will be available.

Electro-Voice will present a range of new microphones and monitors. On the microphone side, the RE27N/D combines patented

N/DYM and Variable-D technologies for better high- and low-frequency quality. The RE38N/D puts the same N/DYM technology into a high-performance dynamic cardioid. The CP212 and 218 are miniature back-electret condenser mics designed for high-quality broadcast.



EV's new CP212 mic, with gooseneck

Switek Communications will present its new wireless lapel and handheld mics for UHF and VHF as well as its new VHF full-duplex intercoms. The company's existing lines of wireless end clips for handhelds as well as its four-channel wireless audio switch and encrypted microphones will also be available.

## Up on wireless

Vega Wireless Systems will roll out its IFB-4 wireless IFB/PL transmitter as well as the new PL-2 miniature belt-worn receivers. The company will also display the UHF "600 Series" wireless microphone system as well as the "Q" Plus wireless intercom system.

Neumann will also be on hand, showing its new vocal microphones, the KMS-140 and the KMS-150. The company will also display its KMR81 and 82 shotguns and the RSM191 stereo shotgun.

Distributor Crouse-Kimzey Co. will present Audio Technica's AT 4033 microphone along with numerous other offerings.

Tannoy/TGI North America will show Bruel and Kjaer Series 4000 mics, including omni, hi-intensity omni and cardioid designs.

Tannoy's System 8 NFM reference near field studio monitor will be available as well.

AKG Acoustics Inc. will roll out its Tri-Power vocal and instrument mics, as well as its C647 condenser gooseneck. AKG's existing line of mics, headphones, stands and accessories will also be on display.

Quested, a division of AKG, will also be on hand displaying its line of monitor systems.

## New mics

Meanwhile, Audio-Technica U.S. Inc. will present a host of new microphones, namely, the AT831E remote-powered miniature cardioid condenser, the ATM63HE "Hi Energy" hypercardioid dynamic mic and the AT4033 studio condenser. Also available will be the CP8403 multiple mic stand clamp, as well as the company's existing lines of condensers and DAT recording mics.

Altec Lansing will be on hand showing its 11674C automatic mic mixer, a hands-off, gain sharing, multiple mic system. The 8553B tamper-proof, programmable equalizer will also be available.

Crown International will show its CM-230 tridundant microphone, which contains three supercardioid capsules in a single housing. Also on display will be the CM-31 supercardioid condenser microphone equipped with a tubular power supply.

Crown also will show the SASS-P MK II stereo condenser mic featuring the company's PZM technology, and the LM-300 gooseneck supercardioids with a low-cut switch that reduces breath pops and handling noise.

Gotham Audio Corp. will highlight the Microtech Gefell microphones for which the company is the domestic distributor. This includes the so-called "Perestroika" microphone from East Germany.

## Folding back

Studio Technologies Inc. will display its new IFB Plus series, a highly integrated, two-channel interruptible fold-back system for ENG and SNG trucks. Also, the company's Mic Pre-Eminence pre-amp will be featured, as well as the AN-2, ISS and Generation II stereo simulators.

From RTS comes a range of new products, including the new V-Series headphones, the SSA324 system-to-system in-

terface, the SAP612 source assign panel, the 2250 quad galvanic isolated buffer amp, the TIF950 series telephone interface and enhanced editing capabilities to its System Management and IKP950 PCS production control stations.

Systems Wireless Ltd. will show off its System 800 UHF wireless intercom system that features a tone security circuit. The company will also feature the new Lectrosonics DR195 diversity system that operates in either VHF or UHF.

Sennheiser Electronic Corp. will unveil its HMD20 supaural broadcast monitor headphone and the HMD250 circumaural studio monitor headphone. Existing products

continued on page 58 ▶

## High Profile Source Gear

▶ continued from page 42

preamps and headphones, Stanton Magnetics has announced it will introduce the CD-22 professional CD player at NAB.

## Tapes and accessories

audiopak plans to show its full line of broadcast cartridges including the A-2, AA-3, and AA-4. The latter is designed for recording audio that has extended frequency response and expanded headroom.

DIC Digital's display will feature its standard line of DATs including the MQ Series, a professional DAT cassette that has an extra two-minute capacity so test tones and pre-roll ID's can be mastered without cutting into program time.

Accurate Sound Corp. will introduce the AS-4000 standard cassette logger recorder that allows 24 hour recording on one 90 minute cassette, and the AS-0100 tape handler reel to reel.

Garner Industries will show its new 682 Series of bulk degaussers for audio, video and computers, and the established Eliminator 4000 degausser.

Research Technology International (RTI) plans to have its full line of tape degaussers as well, the company said.

Russco Electronics will show the MARK VI turntable, the CD1000 CD adapter, and its line of amps, preamps, mixers and distribution amps.

3M will unveil a new line of magnetic film tape and show its line of professional tape and accessories including the 3M 275 digital audio mastering tape, 3M PRO DAT and 3M AUD DAT cassettes.

Redwood Marketing said it will display its line of broadcast and studio audio consoles.

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Engineers have helped make the CD10 a hot seller because it runs cooler than any other CD cart player. They like the way we mounted the Sony optical pickup and tracking assembly on a heavy duty servo-driven hinged platform, eliminating spring clamps that lose strength with heavy use.



The cartridge port door that keeps dust and contamination out of empty players got their attention too. But it's the CD10's rugged construction that *really* caught their eyes—broadcast-ready XLR outputs and remote interface, three-across rack mount design, heavy aluminum deck plate, edge-mounted circuit boards with extender cards.

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# Console Products Exhibit Variety

by Arthur Cole

**LAS VEGAS** Console manufacturers will make a strong showing at the NAB convention this year—a number of companies are introducing new product lines.

Some console manufacturers also build studio furniture, and will also have that equipment on display. For example, Wheatstone's line of custom, pre-wired studio furniture will be available at the company's booth. Arrakis plans to display its Modulux, Modulux II, Supreme Systems and Modulink furniture.

These and other companies are competing with the manufacturers of furniture only, who will market their product at the convention.

Murphy Studio Furniture will again display its line of Avante-Garde and Elite series furniture.

The Express Group will exhibit its 6000 and 5000 series furniture at the ITC booth, while the 5000 series will also be shown at the Audiotronics booth. The company's 4000 series will be at the Broadcast Electronics booth.

## On the air

Whether for on-air, production, audio-for-video or multitrack recording applications, attendees at this year's NAB convention will see numerous console introductions, as well as established product lines from familiar companies.

Radio Systems plans to debut the RS-

24, a new console with 48 inputs, offering 24 linear faders for stereo or mono sources. The company is also making available a four-bus mix-minus card for its console line.

Audiotronics Inc. will introduce its new 850 Series audio console, designed to work equally well as a sweetening console for workstations or as an on-air console. Signal processing and input preselection is physically above and electrically in-line with each input module.

The company also will show its 210 on-air console and the 310 and 400 series production consoles. The 210 is available in four standard mainframe sizes (six, 12, 18 and 24 dual input modules), while the 310 and 400 each come in six standard mainframe sizes (16, 24 and 32 input modules).

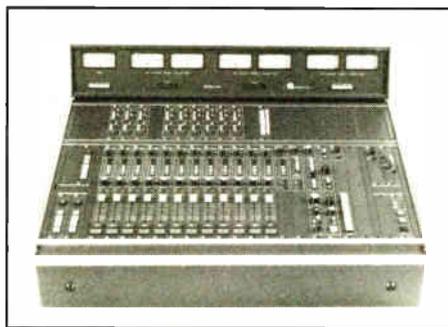
Wheatstone Corp. will feature its line of on-air radio consoles, the A-20, A-32, A-50 and A-500 boards; as well as stereo production consoles, the SP-4, SP-5 and SP-6; and the TV-600 for radio or TV master control.

Fidelipac Corp. will introduce the MX series modular console that features eight to 12 mixers in both the rotary and slide fader versions.

Broadcast Electronics Inc. will make available its Air Trak 90 (AT-90) modular on-air console, first unveiled at last year's National Religious Broadcasters convention. The company will show its line of transmitters and storage devices.

Audio Technologies Inc. (ATI) will present its new six- and 12-channel on-air boards and a new MXM dual mix-minus add-on adapter for its Vanguard consoles.

Arrakis Systems will provide its 150, 500, 2000, 2100, 5000, 10,000 and 12,000 series consoles.



The 850 Series console is new from Audiotronics.

LPB Inc., meanwhile, will show its Citation II audio board, as well as the Signature II series console.

On hand at the Winsted Corp. booth will be the System/90 post production console and the company's desktop production workstation, which features a recessed monitor. These products will be shown along with the company's established products, the System/85 modular editing and post production console and space-saving videotape storage systems. Logitek will have on hand its water

resistant Mariner on-air console, as well as its Stereorack six-channel rackmount console and the TR2 12-channel rackmount console.

## New consoles

Autogram Corp. will unveil two new consoles: the PM 1644 with 16 channels and 44 stereo inputs, and the Mini-Mix 8 that offers eight channels and 16 stereo inputs. Also at the show will be the AC-8 eight-channel console.

Klark Teknik will exhibit its new Midas XL3/16 broadcast console, the follow-up to its Midas XL 88 mixer.

Meanwhile, Ward-Beck Systems Ltd. will display its "R" series console.

Zero Stantron will make available its new line of wood trimmed consoles and the Epoch 2000 series of racks and consoles.

Siemens Audio Inc. will display the new AMS Logic 2 console, the company's follow-up to the Logic 1. The Neve 66, 44 and VRP series consoles will also be on hand.

Soundcraft will debut the BVE 100 audio-follow-video console as well as the Vienna and Europa stage production consoles. In addition, the company's SAC 200 and Delta series consoles will be available.

Yamaha Corp. of America will introduce its PM 4000 audio mixing board and will show its existing DMC 1000 digital, automated audio mixing board.

AEQ (Aplicaciones Electronics Quasar, S.A.) will debut its new BC 1000 console and the System-3000 board. Its established BC-2000 board will also be available.

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# Solid State RF Gear Excites Industry

**LAS VEGAS** At least 30 companies will be exhibiting radio transmission equipment at the NAB convention this year. Following is just a sample of what trade show attendees can expect to see in the way of AM and FM RF gear, including transmitters, exciters and related products.

Harris Allied will feature information on its new line of high power DX Series digital solid state medium wave transmitters, in 300, 600 750, and 1,000-plus kW models.

According to the company, the models feature a "power block" architecture that combines multiple 100 kW block modules in a parallel/redundant configuration. The transmitters also achieve typical overall efficiency of 83 percent to 86 percent.

Harris will also display established products, such as the Harris Gates One, Gates Five FA, and Harris DX10—1 kW and 5 kW (frequency agile) polyphase PDM all-solid state medium wave transmitters.

The Harris booth will also have room for the PT 5FM 5 kW all solid state Platinum series FM transmitter, also available in 2, 4, 8, and 10 kW models. The Harris HT 10FM and HT 35FM, 10 kW and 35 kW single tube FM transmitters also available in 3.5, 5, 7, 20, 25 and 30 kW models.

CCA Electronics is bringing two new transmitters and one new exciter to the convention. The company will display the FM 35000G 35 kW single cabinet transmitter and the FM 12000G 12 kW transmitter, as well as the FM 50G, a 50 W FM exciter. On hand as well will be the company's FM4000G,

FM20000G and AM10000F model transmitters.

QEI Corp. will exhibit its line of FM transmitters, ranging from 10 W to 35 kW. The transmitters feature all solid state or single tube final amplifier design with automatic power control, single phase power supplies; a complete spare parts kit is provided at no extra charge.

International Broadcast Supply Inc. will be showing Italy's CTE equipment. Among the new offerings: a 1000 W FM amplifier, VL-1000; KT-24 FM exciter; KT-3000 250 W FM transmitter; and S-500, a 500 W solid state FM amplifier. Established products on display include the VL-5000, 5000 W solid state linear amplifier FET devices; VL-30 FM exciter; S-22 FM exciter; RX-10 STL receiver (300-1000 MHz), and TX-02 STL transmitter.

## The Maine line

Nautel Maine will introduce the AMPFET AM transmitter with built-in C-Quam stereo, as well as a new model AMPFET FM4, a 4 kW transmitter. On display at the Nautel booth will be the company's line of AMPFET solid state AM and FM transmitters.

Low power AM broadcast transmitters will be on display at the LPB booth. You can check out the new ASE-2 C-QUAM AM stereo exciter at the Delta Electronics booth.

Broadcast Electronics will officially introduce the AM-5, 5500 W AM transmitter at Las Vegas. BE also will display the AM-1, and all of its FM transmitters. The new BE

AM transmitters come with a built-in C-QUAM exciter.

Continental Electronics Corp. plans to introduce new products at the NAB, but information on the products was unavailable at press time. The company also will display their complete line of AM and FM transmitters along with related broadcast equipment.

Energy-Onix will introduce a series of solid state, 1000 to 10000 watt FM transmitters, named "The Legend Series," as well as the new "SSTP" line of portable, solid state, 100, 300 and 500 watt FM broadcast transmitters and amplifiers and the SST-25, a 25 watt frequency agile solid state exciter.

Established products on display include the "MK" Series of single tube FM transmitters featuring field proven zero bias grounded grid design with zero bias HI MU triode PA tubes, solid state drivers and IPAS. The company will also display its conventional high level plate modulated AM broadcast transmitters with vacuum tube modulators and PA, solid state RF and audio drivers.

BEXT Inc. display a full complement of exciters and a high performance transmitter at this year's NAB. The company will show the P2/P10 programmable exciters ranging from 1-10 watts of output power; the TEX 20, a PLL programmable FM exciter with an adjustable 2-20 watts output; the PTX 30, a programmable FM exciter with an adjustable 2-30 watts output, and the PTX 80, a PLL programmable FM exciter with 5-80 watts adjustable output power.

The company will also feature the HPT-FM, one of a family of transmitter/translators for 88-108 or 945-953 MHz.

Marti Electronics will display its RPT Series transmitters and other remote pickup equipment.

Motorola will display its line of C-QUAM AM stereo broadcast exciters and related products.

TTC plans to display its digital-quality, Model X FM exciter. The company also will offer its tube-type FM transmitters (10 kW, 20 kW, and 25 kW), as well as 1 W, 10 W, 100 W and 250 W translators, and its solid state FET FM transmitters, in output powers ranging from 1 W to 8 kW.

## Goods and services

Engineers looking for power tubes for AM and FM transmitters can check out the EEV Inc. booth. The company's offerings will include the 15 kW tetrode-type 4CX15,000A, the 35 kW tetrode-type 4CX35,000C and CY1637/4CV100000C for higher power AM transmitters.

Varian will display its EIMAC brand of power grid tubes, including the high MU triodes and compact tetrodes for FM broadcast—the 4CX20,000A, a power tetrode, will be shown as well.

Altronic Research Inc. will introduce an expanded line of air-cooled dummy loads. New product names and specs were not available at press time, but you can also check out the established models on display: model 6725, a 25 kW air-cooled dummy load; model 6705, a 5 kW air-cooled dummy load; model 640105, a low power static air-cooled dummy load, and model 9725, a 25 kW water-cooled dummy load.

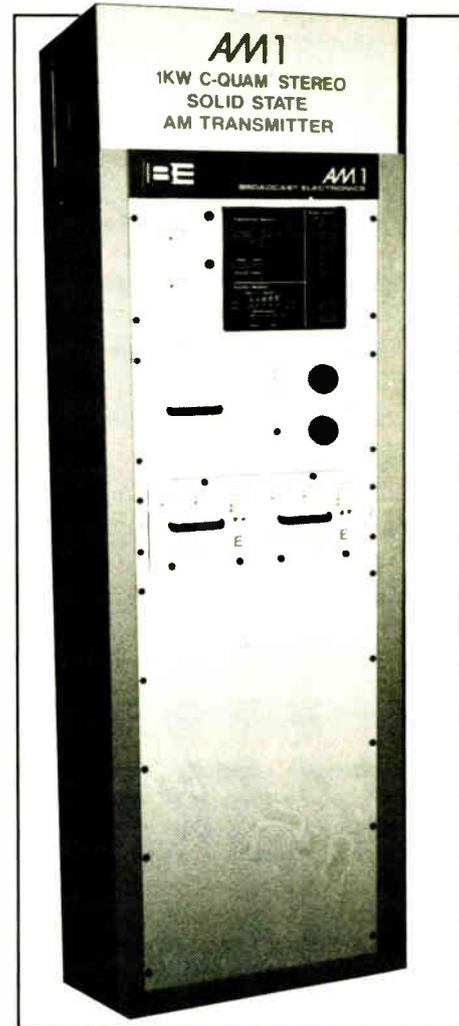
Coaxial Dynamics will display its complete line of terminating loads: dry from 5 W to 500 W; liquid dielectric, 600 W to 10 kW, and water-cooled and heat exchanger from 10 kW to 100 kW. Coaxial will feature several models of wattmeters and loads ranging from 0.1 W to 100 kW.

Richardson Electronics will introduce

MMD FM broadcast modules, including 700 W, 300 W and 150 W models, as well as the Amperex 3-500Z, a power triode for AM transmitters. Richardson will display its power grid tubes and rectifiers for AM and FM, and cavity amplifiers for AM and FM applications, and klystrons and TWTs for studio transmitter links, vacuum capacitors and RF transistors.

Emcor Products/Crenlo Inc. plans to show its modular lines of electronic enclosures, EMI/RF shielded cabinetry, packaged blowers, fan trays and fan panels.

SCA Data Systems will display a prototype of the RD-57, combined Radio Data Systems (RDS)/paging generator that offers nine RDS functions and digital signal processing. Also



BE's AM1 solid state AM transmitter

new is a broadcast monitor receiver to work in conjunction with the "Music 4" system.

SCA Data Systems also will display established products including: "Music 4/Data 4" four-channel audio and data system; PG 57-3, a phase lock paging generator, and 9600 bps subcarrier data system, with optional addressing and data security features, built-in error detection and correction.

Rohde & Schwarz will display RDS encoders and decoders. TransAmerica International Broadcasting—OMB America—will display radio links for FM, as well as low and high power FM exciters and transmitters.

Scientific Atlanta will display its line of analog and digital transmit and receive products, including SEDAT™, Spectrum Efficient Digital Audio Technology.

ComStream Corp. will display its full line of network systems for satellite digital audio distribution including the multirate, multimode integrated receiver/decoder and uplink electronics, along with the full monitoring and control ComStream Audio Network Management System.

The company's ABR200 receiver delivers 20 kHz CD-quality stereo audio in 128 kbps (180 Hz), and can be configured over the air. One to 50 audio channels can be operated and controlled simultaneously, and the receiver features a low speed, asynchronous data port and relay closures.

# POWER TO THE PRESS.

Being the best in broadcast journalism means being the best equipped to gather information. At a press conference, the task of physically gaining access to that information can become an impossible feat for even the most seasoned pro. Whirlwind's PRESSPOWER active press box provides the superior solution.

The PRESSPOWER takes two transformer isolated XLR mic/line inputs and distributes them to sixteen transformer isolated XLR outputs (12 mic/-50dB, 2-line/0dBV, 2-line/variable). Enough so that everyone in the room can get a clean feed. Additionally, a headphone output is provided with a level control, plus, to expedite setup, a 1kHz tone is available.

Powered by four 9V batteries or AC (110/220), the PRESSPOWER can be rack mounted or used with the included carrying case. This makes it ready to go for any situation.

Whirlwind's affordable PRESSPOWER gives you the power to get the news... not waste your time figuring out how to.

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# STL, Remote & Telco: Loud and Clear

**LAS VEGAS** STL, telco and remote equipment manufacturers are sending out signals loud and clear: there'll be plenty of new equipment to look over at this year's NAB.

Dolby Laboratories will bring along its DSTL system, a 950 MHz digital STL for transmission of two audio and two auxiliary channels in 250 kHz bandwidth. Dolby AC-2 coding is used in the STL.

TFT will debut its frequency synthesized STL transmitter with built-in stereo generator, the 9200/9205 frequency synthesized monaural STL transmitter and receiver, and a new IF interface STL system.

Moseley Associates will feature the new PCL 6060 STL for high RF environments; FTI-3000 Digital Audio for Fractional TI applications; and CDO 2000 Digital Audio-for-Video STLs.

Marti Electronics' booth will boast information on its STLs and remote pickup equipment, including the RPT series transmitters and STL 10.

BEXT, Inc. promises upgrades in several areas, including the addition of MOSFET technology to its amplifiers.

Scala Electronic Corp. can provide you with STL and RPU systems, professional antennas for off-air monitoring of FM signals, FM boosters and translators, and general radio communications and telemetry systems.

QEI's exhibit plans include the CAT-Link digital STL/TSL system, which utilizes DS-1 phone lines, fiber optics, 18 GHz or 23 GHz microwave links.

Corporate Computer Systems/Audio Products Division will show the CDO-2000 Digital, a stereo MUSICAM codec with AES/EBU digital input and output.

Burk Technology is adding to its remote control systems with the introduction of the AutoPilot, which permits fully automatic transmitter operation when used in conjunction with a Burk ARC-16 remote control system.

Hallikainen & Friends Inc. will bring out its new DRC200 programmable multisite transmitter control system, as well as the TEL171 digital telemetry adaptor for the Moseley TRC-15A.

## Talk, talk, talk

Those lucky enough to have to deal with telephone lines likely will find their lives have been made a little easier via a few developments from the telephone interface folks.

Telos Systems will show two advanced digital telephone hybrids. The Telos 100 DELTA offers full duplex performance. All hybrid functions, as well as dynamically controlled AGC and equalization, are performed digitally, according to the company.

The Telos ONE plus ONE offers two digital hybrids in a single rack unit. They can be used individually or, using the internal mix-minus matrix, as part of a multi-hybrid system.

Also featuring Telos products will be Broadcasters General Store.

Comrex Corp. will feature the Talk Console, a complete talk studio in one small package, in addition to its digital audio codecs for 7.5 kHz, frequency extenders, wireless cue system, telephone couplers and hybrids.

RTS—A Telex Communications Product will debut the TIF950 Series telephone interfaces, IKP950PCS production control stations and its full line intercommunication products.

In addition to its console products, Aplicaciones Electronicas Quasar, S.A. (AEQ) will

show its digital multiconference system Systel-3000, which handles up to eight lines in full-duplex configuration, and its telephone hybrid TH-OZ.

## Seeing the light

ADC Telecommunications will showcase its new line of American Lightwave System fiber optic links, which feature analog and digital transmission formats and can be used for broadcast quality applications.

Lester Audio Labs will feature the new DAS-3000 fiber transmission system, which passes AES/EBU at the output stage instead of converting back to analog.

Intercom company Clear-Com will display the new PS-22: PS 454 power supplies for party lines, and the CS-222: MS-222 two-channel master stations for party lines.

Vega will highlight its "Q" Plus wireless intercom system and wireless microphone systems.

Studio Technologies will introduce the IFB Plus Series, which provides a highly integrated, two-channel interrupted foldback system for ENG and SNV trucks.

Gentner Communications Corp. will show the new PeopleLink System One full duplex teleconferencing system along with its complete line of teleconferencing, pro audio and

broadcast products.

Audio-Technica U.S. Inc., which will have a number of new microphone products, will also exhibit the DT100 Digital Teleconferencing System.

Intraplex Inc. will introduce the TI "Smart Mux" for terrestrial and satellite transmission of network, fly-away, studio-to-studio, simulcast and satellite transmission of digital program audio with remote control of transmission parameter. Other products on display include the new TDM-163 T1 multiplexer terminal and the TDM-165 T1 drop/insert terminal, as well as the company's established products.

## Introducing an All Star Line-up!

Twenty-seven years ago, **Russco Electronics** began designing and building broadcast turntables. We used good old-fashioned American ingenuity and became the industry standard by building turntables better, stronger, quicker and quieter. **Russco Electronics** continued to grow and add new products to the line-up.

Much has changed in the broadcast industry since 1965, from changes in technology to the names of the players. We're proud of the fact that in 1992 we're still in the game...still building turntables....still manufacturing state-of-the-art audio equipment....and still making "Made in the USA" products! Make room in your NAB schedule to stop by and see us. For product information, contact **Russco Sales** at (209) 291-5591.

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### Studio Pro & Cue Master Turntable

The Industry Standard! Sturdy, reliable and built to last.

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Full power amplifiers available in 25 and 75 watts! Dual channels with superior channel separation, low distortion at true wide band range.

### HA20 Headphone Amplifier

Amplifies the level of your headphone! Can power any unit from 8 to 600 ohms using only a single 9 volt battery.

### DA2816 Distribution Amplifier

Total of 16 channels fed from 2 separate balanced inputs, delivers a powerful 18dBm into a 600 ohms line.

### Fidelity Pro Preamplifier

These tough phono preamps are the industry standard! Stereo, balanced.

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Compact, solid state stereo mixer with 5 mixing channels. Fifth channel accepts one of five additional hi-level (balanced) inputs. Available in mono.

### Telemote 321 Remote Mixer

Hassle-free remotes! Set up remotes wherever there are available telephone lines!

### CD100 Compact Disc Adapter

Match up a consumer-type CD player to a broadcast console. Matches any high impedance output consumer product to a 600 ohm line, balanced or unbalanced.

### IMD-24 Match Master

Allows you to match consumer-type equipment to your studio equipment with 600 Ohm input or output lines. Use anywhere AC power is available!

### MLD-22 Preamp

Multi-purpose, self powered, dual-channel preamp capable of driving a 600 ohm line to a maximum of 16dBm. Multiple uses!

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# DIGILINK

*...a revolution in radio studio technology .....*

## **THE DIGITAL AUDIO ADVANTAGE...**

Introduced in April of last year, Digilink is a digital audio workstation that saves your station money. There is no more routine maintenance, it has a 15 year average life, *and* you have total automation capability for nights... weekends... or whenever you need it. It comes complete in a 5 1/4" high, rack mounted cabinet that converts ordinary analog audio to CD quality digital audio which is stored on a computer hard drive. It does this just like you would store a business letter on your home computer. Digilink can then call up and play any digital audio file in milliseconds off its internal hard drive. Basically, you can think of Digilink as a huge multideck cart machine or cart carousel where you can line up and play thousands of carts or audio cuts sequentially. A single Digilink can therefore replace all of your cart machines in production, On Air, or in automation.

## **Digilink is a perfect cart or reel machine replacement...**

Digilink is the perfect replacement for magnetic tape based cart or reel machines. With Digilink, you can replace your cart machines with CD quality digital audio that requires no calibration, no maintenance, and the media has a 15 year average life. You can replace your reel to reel machines, razor blades, and tape with fast, nondestructive, CD quality, on screen waveform editing. You can cue virtually instantaneously. Digilink even costs less than comparable analog cart or reel machines. Digilink is the perfect audio record and play system for professional radio broadcast applications.

## **Digilink performs ALL types of automation...**

With Digilink you can operate fully live or mix various automation types into your daily programming. You can store all of your audio on hard disk at an incredible price or you can use hard disk for only commercial material recording. Digilink has an internal audio switcher with machine logic control. Digilink therefore supports satellite automation, reel and DAT tape automation, CD automation, and full hard disk automation all out of one compact box. Because Digilink is a computer, you can print out a log of what you have scheduled to play *or* print out a log of what really did play. With Digilink, you can be live on the air with full CD quality audio or program the system and walk away forever. Digilink even interfaces with all major traffic and billing systems through a Digilink import-export routine.

## **Digilink is engineered and manufactured by Arrakis...**

Digilink is not simply a hardware package assembled from parts built by *other* computer manufacturers and run under our software. Arrakis is the *only* manufacturer to build nearly all parts of the digital system in-house. We build our own *Arrakis* DSP board, SCSI board, I-O board, switcher board, cabinet, and cabling. Because Arrakis builds the system and doesn't simply mark up someone else's hardware, Arrakis can offer you Digilink with broadcast features and performance unmatched by anyone *and* at a truly remarkable price !!!

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- reducing maintenance,
- reducing staff demands,
- improving On Air sound,
- improving Production,  
*and improving all areas of your station performance !!!*

## FEATURES

- Simultaneous record- play !!!
- Uncompressed CD quality audio  
*or mix 2:1 or 4:1 compression*
- Use keyboard, mouse, trackball,  
or even a touchscreen
- Digital Waveform Editing
- Mix mono and stereo files
  
- Live Cart Machine replacement
- Reel to Reel machine replacement
- Satellite Automation
- Tape Based Automation
- CD Automation
- Hard Disk Based Automation
- Traffic and Billing Interface
- supports digital networks

## SPECIFICATIONS

*all tests performed at 1:1 compression*

### Digital Signal Processing System (DSP)

Sampling System- 16 bit linear PCM, 2 channels  
Sampling Rates- 44.1,32,22kHz, fixed filter on routing switcher  
Compression- 0,2,4...adaptive differential PCM

### Controller -

Floppy Disk- 3 1/2" 1.44M capacity, System Hard Disk- 40MB  
Printer Support- IBM compatible, parallel port

### Audio Performance- Digital Record playback

THD- .008%, Dynamic Range >85dB,  
Freq Response- (+)(-).5dB 10Hz-15kHz

### Physical Specifications

Dimensions- 19" Rack mounted- 19"W x 5 1/4" (3RU)H x 16"D  
Weight- 60lb's , Power- 110/220VAC, 50/60Hz, 100W

### Audio Performance- Routing Switcher

THD- .005% typ, S/N < 100dB below +4dBm  
Dynamic Range- >120dB,  
Freq. Response- (+)(-).1dB 20Hz-20kHz

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# Antenna Products Tower in Importance

**LAS VEGAS** Admittedly, the category of antennas, towers and cable carries a less glamorous aura than other broadcast gear such as recording or processing. But the best of studio gear would be useless without the antenna end of the RF system.

At the 1992 NAB radio exhibits, a wide range of antenna, tower and cable products will be shown.

## Satellite gear

For showgoers with satellite gear on their shopping lists, Antenna Technology says it will display an improved version of its Simulstat multibeam antenna. According to the company, the antenna can now receive up to 35 C- and Ku-band satellites within a 70 degree arc simultaneously. The an-

tennas are available in three-, five- and seven-meter sizes.

Micro Communications will have its latest gear on hand, including a new FM all-band antenna, a new FM inter-digital bandpass filter, and new 7/8-inch and 4 1/16-inch EIA coaxial transfer switches.

Will-Burt Co. will highlight a new low-profile 12 VDC pan and tilt positioner with variable speed. The positioner sits two inches above mast height and offers pendant-mounted controls for remote operation. Also on display from Will-Burt will be a new mast extension warning kit.

## The price is right

New prices for "cost effective installations" will be announced at NAB by Stain-

less Inc., in addition to new tower designs for guyed towers to 1,000 feet. Stainless offers a complete line of guyed and self-supporting towers for broadcast, microwave and communications applications.

Utility Tower Co. said it would bring to NAB samples of tower sections for AM, FM, TV, CATV, LPTV and microwave communications.

Magnum Towers said it would be highlighting its line of radio and television towers at this year's NAB.

Central Tower Inc. (CTI), designers, fabricators and installers of both guyed and self-supporting towers, promises it will be on hand to discuss its line of "all-solid" self-supporting towers (Series SS-STX).

FWT Inc. (Fort Worth Tower) says it will

come to NAB to discuss its line of guyed and self-supporting towers, turnkey installations, communications buildings, mobile buildings, standby power systems and antenna mounts.

Dielectric Communications will be on hand displaying its range of ring-style and panel antennas, including a new TCB-cavity-backed, circularly-polarized antenna designed for single or multi-station use.

Comtech Antenna Systems unveiled plans to introduce a 1.8 meter flyaway antenna system. The Ku-band device is a multi-panel antenna on wheels and will be available with transit cases for airline baggage checking.

## Cable and line

If you happen to need flexible audio cable, Nema Electronics will have some at its booth, alongside its line of electronic cable, connectors, and patching products for broadcast, audio, video, data and RF applications.

The Belden Division of Cooper Industries said it would have on hand new dual-channel audio cable in zipcord construction (#1504A) alongside Belden's series of 24 gauge multi-pair snake cables (#1508A-#1519A).

Clark Wire and Cable plans to introduce a mini microphone cable that, says the company, is well suited to console wiring. Also new will be a Super-Flex RGS-type triax cable that is available in five colors; Neutrik audio connectors; and in-house termination services.

Among examples from its lineup of 1,000-plus products, Wireworks Corp., makers of industry standard, multi-pin audio cabling components, will announce that it has established a new re-fit/repair department for cable investment protection.

Convention introductions from Canare Cable include the BCJ-XJ-TR and BCJ-XP-TR impedance transformers for digital audio lines. The units convert AES/EBU

continued on page 58 ►

# Analog Still Strong in Processing Technology

► continued from page 44

Somich Engineering will unveil the HPX PRO high performance headphone amplifier, and also plans to exhibit the DBE-1000 dynamic baseband enhancer, the PL-1 Pilot-Lok stereo pilot protector, and the OSC-1 overshoot clipper.

The Altec Lansing booth will have two established audio products on hand: the 8553B tamper-proof programmable equalizer for control rooms and studios, and the I674C automatic mic mixer.

While there will be no new products from Midas, the company will nonetheless display several established products, such as the DN 300 series of graphic equalizers, the DN 400 series of parametric equalizers, the DN 500 series of dynamic processors and the DN700 series of digital processors.

Cutting Edge Technologies, makers of the Unity 2000 digital audio processor, have a number of upgrades planned to the product. They include improved processing algorithms, built-in daypart scheduling software, RS-232 compatibility and improved factory-installed format presets (user-defined presets have been expanded from four to 50).

Other Cutting Edge products—all of which will be available for inspection at the Broadcasters General Store booth—include the Dividend composite filter and the Vigilante limiter.

A number of distributors will have their own booths at the NAB convention, displaying and demonstrating products the companies distribute for other manufacturers.

Broadcasters General Store will have a variety of processing products available, including the Tailor 10-band dynamic equalizer, the CRL Audio Signature, the full line of Cutting Edge products and the Lazer and Prizm from Gentner.

Harris-Allied also will show a range of products. The Optimod FM 8200 digital FM processor, the Eventide H30000B UltraHarmonizer and the Gentner Lazer and Prizm are among the products to be demonstrated at the Harris booth.

## Routing, switching and amps

Benchmark Media Systems will introduce the RS-414, a four-in, four-out mixing routing amplifier module for the System 1000 modular audio processing and distribution system. The RS-414 can be operated from either the new RRC-16 remote router control station or by computer control. The LLD-102 stereo long line driver and the MP-1 mic preamp module

are also expected at the Benchmark exhibit.

Henry Engineering plans to unveil the TWINMIC dual stereo mic preamp and the TWINMATCH dual stereo level converter. The LOGICONVERTER studio equipment control interface will also be available at the Henry booth.

OpAmp Labs will introduce the Model MS/8x8/VSA stereo audio/video matrix switcher; Any input can be assigned to one, two or more outputs; all outputs are buffered. The company' line of network feed boxes, routing switchers and amplifiers—audio, video, VCA, mic line and power amps—will be featured as well.

Sierra Automated Systems will offer its AOC-88, an eight-character alphanumeric console-mounted control panel with eight source-assignable hot punch push buttons for use with the SAS 32000 routing switcher. Also on display will be the DCA-8 digitally controlled audio input level amplifier. The SAS-32000 mixing and switching system and console-mount panels will be featured, as well/

J.N.S. Electronics will show "The

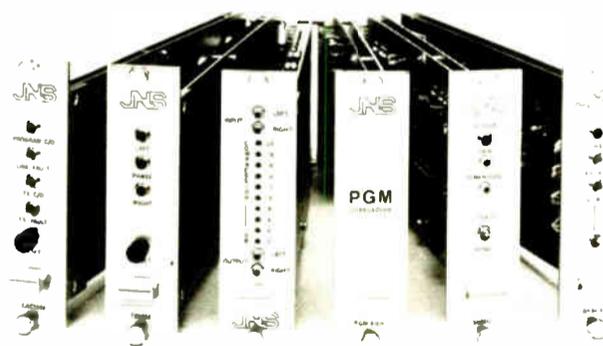
FRAME," a modular system that allows audio, RF and video capabilities within the same rack frame. The company also intends to display its CD-quality audio routing switchers: the 9000 Series with up to a 120x120 matrix and the 8300 Series, with stereo to 100 inputs.

Datatek Corp. will show its D-890 digital audio distribution amplifier and the D-891/D-892 digital audio DAC and ADC converters. Audio and video distribution amps and routing switchers also will be exhibited by Datatek.

Radio Design Labs will display its ST-AM line amp, ST-SH1 headphone amp, ST-DA3 and STM-DA3 distribution amps, STM-1 and STM-2 mic preamps, and the rest of the company's line of amplifiers, dividers and attenuators. The ST-EQ3 three-band equalizer and the ST-CLI compressor limiter is also slated to appear at the Radio Design Labs booth.

ADM Systems will show its stereo and mono audio distribution systems, as well as its stereo audio console and post-production audio console.

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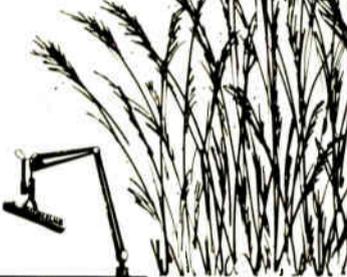
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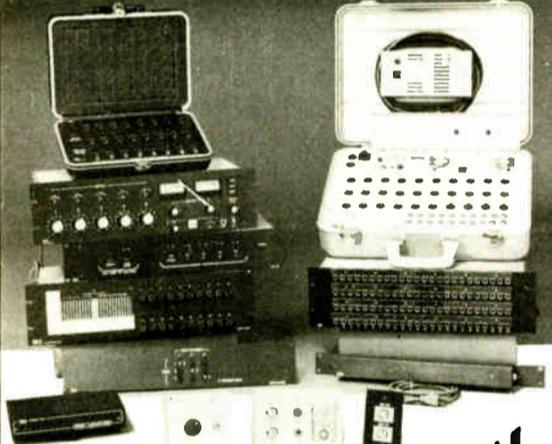
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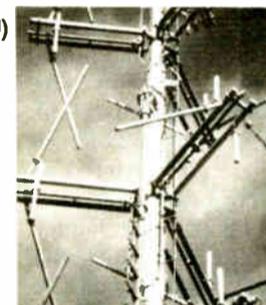
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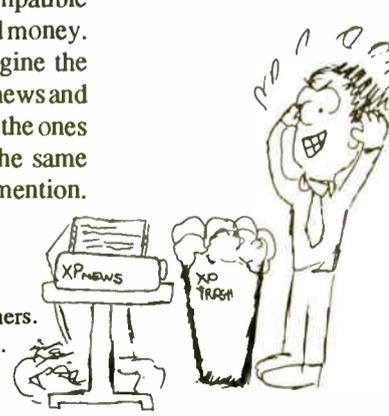
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# Companies Provide Diverse Services

**LAS VEGAS** Product services play a key role in keeping a radio station competitive, and this year's NAB exhibit floor will host a significant number of important service providers.

Among them will be weather services. Accu-Weather promises the new AccuCall 900# Service Bureau, which includes forecasts and current conditions for 2,000-plus cities. In addition, stations receive their own 900 number and obtain access to the InstaSports scoreboard and sports information, lottery results, horoscopes and more.

Alden Electronics and Zephyr Weather Information Service will display the Alden WeatherWorks Display System. It features color weather radar imagery from the National Weather Service NEXRAD program. The system can provide weather charts, satellite and weather text information. All data is provided by Zephyr Weather Information Service.

**And a-one and a-two . . .**

Music and sound effects libraries are a must for any radio production studio, and this year there will be a number of new libraries at NAB.

Sound Ideas will debut the General 6000 Series, consisting of more than 6,000 digital sound effects on 40 compact discs. Two years in the making, the library includes new and expanded sound categories such as an extensive animal collection, transportation sound, crowds, long ambience effects from around the world, weather, aviation, military, Foley sounds and more. The collection also includes sounds produced by four award-winning sound designers.

Valentino Inc. will exhibit new releases to both its Production Music and Sound Effects libraries. Currently, the Music Library consists of 60-plus CDs; the Sound Effects Library consists of more than 40 CDs.

ProMusic Inc. will highlight the Producers Sound Effect Library, produced by the com-

binated talent of renowned Hollywood sound designers. The company says it will supply new releases to the library on a regular basis.

Also expect new products from Capitol Production Music (a division of Capitol Records), whose offerings include the Production Music Series, a 60-CD production music library.

Associated Production Music will offer the KPM, Bruton, Sonoton and Themes production music libraries, as well as the "Broadcast One" and Broadcast Two" packages. The booth also will feature Sound FX—The Library from KPM.

FirstCom will have on hand a number of its packages, including Sound Designer Library, which helps you score spots in minutes; the Custom Production Library, which enables you to create your own production library; and Direct Results Radio, which helps you develop effective, research-based creative advertising campaigns.

On the promotional front, Communication Graphics says it will now offer the services of a creative artist to help you design a new look or updated logo for your station.

**For the birds**

Satellite service providers also will maintain a high profile at the show. IDB Communications Group services include those for network and cable sports, news, syndicated and special event programming, and more. IDB controls 20 transponders on five satellites.

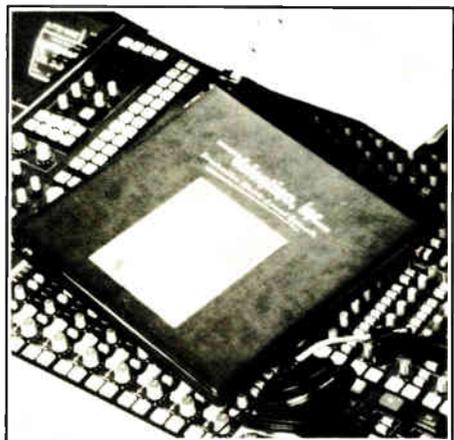
National Supervisory Network will demonstrate its new ABR200 Digital Audio VSAT Network technology from ComStream, with live digital audio via satellite from Colorado and other sites. The system allows stations to feed group members, affiliates, translators, etc., nationwide in digital stereo, according to the company.

GE American Communications satellite communications facilities include five C-band and two high-power Ku-band satellites

in addition to several interconnect facilities with international satellites.

NPR Satellite Services offers a wide range of satellite interconnection services, including uplinking, downlinking and SCPC audio channels.

Marketing services will also be found at NAB. RPN Inc. will offer local retail mar-



Production music from Valentino, Inc.

keting programs for radio, including its SMARTcash Retail Marketing System and the Instant Auction System. A new product from RPN will also be on display: a cause marketing program called Seed Money CHALLENGE.

**The Marketplace**

Marketron will show its FirstRate system for inventory and rate management. It combines the most accurate demand pricing with Arbitron audience information for schedule delivery and cost efficiencies. It automatically collects all pertinent information on a spot-by-spot basis both in the past and in the future.

Strata Marketing promises new products at NAB, but couldn't give specifics as of press time. The company provides computer software for qualitative and quantitative analysis.

Tapsan, Inc. will be on hand with its ratings analysis software and MusicScan music scheduling software.

**Software developments**

DATAWORLD will highlight several new offerings, including its collection of new AM rules, 1990 Census data and zip code maps. Other services of the company are comprehensive data bases and computational programs for AM, FM, TV, LPTV and wireless cable, directories, allocation and interference studies, population counting, FCC flag service, terrain elevation retrieval, area-to-locate studies, AM daytime and nighttime channel studies and more.

Tennaplex Systems Ltd., best known for its line of broadband panel antennas, combiners and filters, also has a fourth generation antenna pattern PC computing program.

Communications Data Services, Inc. will show its new Real World Propagation Workstation, Land Use and Land Cover data on CD-ROM. It can also provide 1990 population data and 3 Arc Second Terrain data on CD-ROM, FCC and FAA data bases, and on-line services.

A.F. Associates will be on the floor, ready to discuss how it can help your station with engineering and fabrication projects, either in a turnkey or a consulting capacity.

And for those of you who can't afford all new equipment, GE Support Services/RCA Broadcast will be on hand to discuss your equipment refurbishing needs.

If you want to expand your knowledge of new technologies and marketing techniques, you may want to stop by Focal Press' booth. New books available from the company include "The Art of Digital Audio" (second edition); "Broadcast Technology Worktext"; "Selling Radio Direct"; and "Practical Radio Promotions." New videotapes to check out are "Basic Field News Coverage" and "Behind the Scenes at the Local News."

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**READER SERVICE NO. 94**

# Innovation in Antennas, Towers and Cable

► continued from page 55

signals from 110 ohms to 750 ohms, which suits all professional DAT equipment. Also new from the company will be the TS-4C ("The Stripper") coax cable stripper.

Audio Accessories will be showing its established lineup of audio jack panels and jacks; pre-wired audio patch panels; patch cords; patch cord holders; Polysand; video panels; RS-422 patching; and Edac connectors and accessories.

Wiring and cable, patch bays and cable reels also will be found at the booth of Connetronics Corp.

Gepeco International will be introducing the Series GEP-5524 low-cap 100 ohm digital au-

dio cable. Cable assemblies, breakout boxes, custom panels, direct boxes and cable reelers will also be displayed by the company.

Andrew Corp. will display its Heliac coaxial cables and waveguides; Macxline rigid lines; and its Dryline Series. New Macxline inner conductors will also be shown by the company.

Cablewave Systems will show: new microwave parabolic antennas (6.875-7.125 GHz) along with its fully established Flexwell foam dielectric copper corrugated coaxial cable; the Flexwell elliptical waveguide; RF connectors; rigid line and components; mounting hardware; FM antennas; and STL and AML parabolic antennas.

MYAT plans to show its established rigid co-axial RF transmission line and components for radio and television.

Kintronic Labs plans to debut rapidly tunable AM/MW antenna matching networks, an HF open-wire transmission line switch, an HF balun, an HF open-wire feed line and an HF feed-through panel.

## Tuning In

If all of this weren't enough, there is still more new antenna fare to be had at the show. Jampro Antennas revealed its product introductions would include: the JLST Series of CP translator antennas; the JLHP Series of HP translator antennas; and a line of YAGI antennas.

A DIP-2 FM antenna and YAGUI-900 antenna will be on display at the booth of International Broadcast Supply.

LDL Communications will demonstrate a monitoring system for eight FM stations operating into a broadband antenna/combiner system manufactured by Alan Dick & Co. The system, designed by LDL, monitors the SWRs and reflective powers for the complete antenna system. LDL also says it will display a full-size panel of ADC's low-windload FM CP antenna, which is a wideband antenna capable of single-or multi-channel operation.

Broadcast Microwave Services will have a wide range of gear to show, including microwave transmitters and receivers and antenna systems for portable and fixed applications; ground and airborne auto-tracking systems; antenna pedestals for central receive towers; helicopter systems for ENG; low-noise amplifiers; diplexers and additional microwave accessories.

Trompeter Electronics Inc. will display its established line of patching products, including: standard and miniature patch jacks; "normal through" jacks; paralleling jacks; patch plugs; patch cords and cable assemblies. Also available will be the company's 50/75 ohm BNC connectors; the 20 Series coax, wrench crimp connectors; and the 220 Series tool crimp.

Systems With Reliability reports it will come to NAB to exhibit its HP, LPTV and FM antennas.

Shively Labs will show its established line of FM broadcast antennas and multi-station combining systems. The company will also feature related gear such as rigid coaxial transmission line, band-pass filters and pressurization equipment.

New at the show from Electronics Research Inc. (ERI) will be a medium-power FM panel antenna array. With reduced weight and wind load, the product is targeted at medium and small radio markets. Another new development from ERI will be a low-power modular FM combiner, which is a compact, enclosed unit that, when coupled with the company's new medium-power panel antenna, is suited to moderate-power master antenna systems.

Tennaplex Systems Ltd. will show broadband panel antennas for television and FM radio; combiners and filters for transmitters; a new design of quarter-wave splitters; and a fourth-generation antenna pattern PC computing program.

Gorman Redlich Manufacturing plans to show its established Model CM digital antenna monitor for AM directional arrays where remote control is not required; the Model CMR digital antenna monitor for AM directional arrays, which will operate with any remote control; the Model CRW N.O.A.A. weather radio; and the Model CEB emergency broadcast system encoder/decoder.

Lightning Eliminators & Consultants will show products that include dissipation array systems for protection against lightning strikes to towers, power lines and buildings; rechargeable Chem-Rod grounding electrodes to minimize ground resistance through continuous soil conditioning; and surge and transient protectors to protect against power surges, transients and RF bursts.

## Lightning and lighting

All components of the company's Stati-Cat lightning prevention system will turn up at the NAB '92 booth of Cortana Systems.

Obstruction lighting manufacturer Flash Technology Corp. of America will show: its FAA-approved FTB 205 and FTB 204 high intensity aviation strobe obstruction lighting; the FTC 110N and 110R controller; and the FTB 301 AC-operated medium intensity and FTB 339 DC-powered medium intensity strobe obstruction lights.

TWR Lighting reports it will show aviation obstruction lighting for towers, including fixtures and kits, controllers, parts and service, FAA-approved beacons, sidelights, and medium-intensity strobes.

Meanwhile, the crew at Lightning Master Corp. will be spotlighting several new products. Highlights include Lightning Master transient voltage surge suppression equipment; Accu-Scan electrical environment monitors; Ground Alert ground bed monitoring systems; and the Strobe Master strobe lighting monitoring system.

And last—but by no means least—Hughey & Phillips promised it would be showing its FAA-approved obstruction lighting; safety climb devices; and remote monitoring of tower lighting (with automatic reporting).

## Microphones And Monitors

► continued from page 47

include the MD441-U supercardioid dynamic microphone, the MKH40-P48U3 cardioid RF-condenser mic, the MKE4032-P3 supercardioid back electret condenser mic and the HMD224 closed headphone/supercardioid dynamic microphone boomset.

JBL Profession will display a pair of two-way, console-top studio monitors, the 6-inch Model 4206 and the 8-inch 4208. JBL will also show its 4400 series studio monitor.

### A host of others

A variety of other microphone- and monitor-related accessories will likewise be available.

Panasonic Professional Audio Systems (Ramsa) will provide the WS-A70 and WS-A10 magnetically shielded monitor loudspeakers along with its lines of power amps, mixers and DAT recorders.

Wohler Technologies will unveil its new DAM-1 desktop audio monitor that combines a stereo power amp, level metering and phase indication with switching and/or mixing capabilities.

Alpha Audio Acoustics/Acoustical Solutions Inc. will show its Sonex Alpha Pyramid acoustical foam, as well as Soundtex and AlphaSorb fiberglass panels.

Amco Engineering Co. will be on hand with its full line of monitoring cabinets and enclosures in 19-inch to 24-inch widths.

Wireworks Corp. will display its multipin-based audio cabling components, featuring Jensen microphone splitters.

Karl Heitz Inc. will bring out its line of microphone fishpoles that extend up to 12 feet as well as clamp adapters to attach the fishpoles to tripods, monopods, etc.



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World Radio History

# Test, Measurement Products Proliferate

by Arthur Cole

**LAS VEGAS** Test and monitoring equipment will be in ample supply on the NAB floor with nearly two dozen companies displaying their latest monitors, clocks and timers.

QEI plans to show its modulation monitor/test set, with a variety of test and measurement features. One or two SCA channel monitoring and VPDTO is available in the test sets, to enable the user to measure accurately peaks of varying lengths.

Belar Electronics Labs Inc. will show its line of modulation and frequency monitors, including the FMM-2 modulation monitor, the FMS-2 stereo monitor and the AMM-4 and FMM-4 frequency monitors.

Modulation Sciences Inc. will have on hand its ModMinder digital FM peak deviation monitor. The company will also show the ModMinder Remote and Advanced Remote and its StereoMaxx spatial image enlarger.

Tektronix will display its 760A stereo audio monitor and the audio component of its VM 700A video measurement set.

**Desktop audio**

Wohler Technologies will exhibit its new DAM-1 desktop audio monitor, as well as its TDM-1 time delay meter that displays time delay, or phase shift at a given frequency, between two audio channels.

Delta Electronics Inc. will show its line of stereo monitors among displays of its operating impedance bridges and NRSC measurement equipment, including the Splatter Monitor and stereo noise generator. Delta also will show its ASE-2 AM stereo exciter, which it describes as low-cost and high performance.

Inovonics will bring back "The Sentinel," an all-mode station monitor receiver with audio diagnostics. Inovonics will also show "David," a low-cost FM audio processor/stereo generator combination unit.

From Eventide Inc., there will be the VR240 digital broadcast logger that can record more than 252 hours on 24 channels on a single 90-meter DAT cassette. The device can be used to record your own signal or that of competing stations.

**Antenna monitors**

Showing its line of antenna monitors will be Gorman Redlich Manufacturing Co. Featured at the booth will be the CM digital antenna monitor in remote and non-remote control versions.

Potomac Instruments Inc., will present its 1900 series directional array antenna monitors, as well as its line of audio test systems and analyzers, field strength meters and AM receivers.

At the Asaka/Shibasoku booth, attendees will see the company's line of audio analyzers, auto setup monitors and envelope delay measuring sets.

ESE will exhibit its new ES-236 digital audio DA and its ES-246 quad 1x6 DA with terminal block or XLR connectors. ESE will also have its ES-215 rack-mounted audio level indicators for mono, stereo or dual stereo.

Audio Precision will show its System One portable measurement set, including a DSP version and a dual domain ver-

sion. The company will also display its Portable One Plus that features sweeps, graphs and a printer port.

**Portable options**

Meanwhile, AVCOM of Virginia Inc., will present new options for the PSA-65A portable spectrum analyzer: an AM detector, an oscilloscope interface and the RFP-24 pre-amp.

Amber Electro Design will debut its model 7000 sine-wave generator that offers a host of new digital features, such as arbitrary waveform generation and editing capabilities, 24-bit parallel output and

internal and external sync'd sampling rates.

Meanwhile, Jensen Tools Inc. will present its Fluke Model 97 Scopemeter as well as the established Fluke Model 87 digital meter.

Sescom Inc. will show its new line of handheld test equipment as well as field pro and audio SIPs.

Holiday Industries will debut a new RF body current meter that incorporates the latest ANSI RF exposure standards. Also, Holiday will display its new broadband isotropic RF field strength meter and three-axis ELF magnetic field

strength meter.

Dorough Electronics will show its new Model 380 loudness meter and will also have on hand its established line of audio meters and test sets.

T.C. Electronic of Denmark will display the TC8201 AES/EBU digital audio interface test generator and analyzer.

Leitch Inc. will also be on hand displaying its line of amplifiers, sync and test generators and clock systems.

To round things out, Radio Systems, a company best known for consoles and cart machines, will present its new analog clock system.

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## Radio Sessions Tailored For All Size Operators

by **Lucia Cobo**

**LAS VEGAS** The Radio Management Conference at the NAB Spring Convention begins on Sunday, April 12, and runs through Thursday, April 16. Owners, operators and managers can choose from a va-

### Radio Management Conference Schedule-at-a-Glance

- Sunday, April 12**
- 1:30 p.m. - Best of the Best Small Market Promotions
  - 1:30 p.m. - How to Work Effectively with Your Local Banker
  - 3 p.m. - Working Leaner Means Greener
  - 3 p.m. - Local Audience Measurement Issues
  - 4:30 p.m. - Radio Reception
- Monday, April 13**
- 9 a.m. - Sell to Car Dealers-Sell to Anybody
  - 9 a.m. - Marketing with Local Research
  - 10:30 a.m.- Myths and Methods for Managing
  - 10:30 a.m.- Multi-Media Marketing
  - 12:15 p.m. - All Industry Lunch
  - 2:15 p.m. - Future of Advertising: Where will Madison Ave. Spend Its Money?
  - 4 p.m. - Programming and Production Exposition
  - 5:30 p.m. - Research Directors Reception; International Reception
- Tuesday, April 14**
- 9 a.m. - Sponsorship Proposals Clinch the Deal
  - 9 a.m. - Off-Air Sports Marketing Can Make Money
  - 10:30 a.m.- Dos and Taboos of Small Market Event Marketing
  - 10:30 a.m.- Parlaying National Sports Events into Local Dollars
- Wednesday, April 15**
- 12:15 p.m. - Radio Table-Topic Lunch
  - 2:15 p.m. - What Our Clients Really Think About Us
  - 2:15 p.m. - A Cache of Collection Ideas
  - 3:45 p.m. - Breaking the Mold
  - 3:45 p.m. - How to Deal with Bankruptcy; Ham Radio Operators Reception
- Thursday, April 16**
- 9 a.m. - Selling without Numbers
  - 9 a.m. - Assessing Investment Opportunities and International Media
  - 10:05 a.m.- Rise & Shine: Morning Programming for Profit
  - 10:30 a.m.- Database Marketing to Raise Revenues and Ratings
  - 10:30 a.m.- American Broadcasters Answer Questions
  - 11:10 a.m. - How to Do Effective Research Around the World

riety of sessions, all designed to address varying needs and topics pertinent to all size radio stations and markets.

This year's convention will mark the debut of the "Radio Table-Topic Luncheon." The session (a working lunch) will provide managers an opportunity to mix lunch with discussion on topics ranging from sales, promotions and new revenue sources, to cost-cutting and recruiting personnel. The session will be formatted with separate tables for small market issues, and NAB radio board members will lead discussions about successful concepts.

Managers looking for new ways to deal with the financial community can stop by the session, "How to Work Effectively with Your Local Banker." Panelists will share advice and pointers on how to build a strong relationship with a local banker. The advice is designed to give attendees pointers on how to develop and keep long-term relationships with banks, especially during times of financial duress.

Radio station owners and managers that are having a tough time collecting advertising bills can learn new approaches to the collection problem. "A Cache of Collection Ideas," will discuss motivational tactics that tie sales compensation to collections as well as creative ways to show fast-paying clients appreciation.

Cutting costs is one way to save money, but not necessarily the right way if you sacrifice quality. Managers can pick up pointers on specific ways to trim programming costs and streamline operations at the "Working Leaner Means Greener" session.

A key session for smaller radio stations will be "Selling Without Numbers." The panelists will discuss street-tested techniques that sell radio advertising without dominant ratings, signals or facilities. The session will teach you how to sell ideas, use custom local research and quality.

Small market radio managers and owners can also attend "The Do's and Taboos of Small Market Event Marketing," a session geared to novel ideas and tactics that can be used to make a station's promotions and events more successful.

Successful small market promotions will be discussed when winners of the NAB's Best of the Best awards showcase the ideas that gave them results.

Managers can also select from sessions targeted to specific sales areas, such as "Sell to Car Dealers—Sell to Anybody," and "The Future of Advertising: Where will Madison Ave. Spend Its Money?" If you are shopping for programming ideas, the two-hour programming and production exposition will provide a common meeting ground for you to browse and syndicators to sell.

Finally, the NAB will be offering, once again, sessions geared towards helping station capitalize on sports. Managers can choose "Off-Air Sports Marketing Can Make Money," or "Parlaying National Sports Events into Local Dollars."

## Where We're Headed

### NAB's Radio VP Lynn Christian Discusses LMAs, the FM Freeze and the 1992 Convention

*Editor's note: Lynn A. Christian is senior VP of radio for the National Association of Broadcasters, a post he has held since May 1989. Christian brought 36 years of radio industry experience to the job, from his start as on-air personality at KFRD(AM) Rosenberg, Texas, to executive vice president of Century Broadcasting Corp. Along the way, Christian managed and put on the air some of the country's leading stations: KODA-AM-FM Houston, WPIX-FM New York (now WQCD) and KMEL(FM) San Francisco. Christian's work in developing the FM band earned him the first individual award from the Armstrong Foundation at Columbia University in New York.*

*it wasn't, is there anything that you have done to give the convention your personal mark? How do you feel you've improved the overall tenor of the convention?*

**Christian:** You know, there is a misconception in the industry that the NAB spring convention is a television conference. It is more a television exposition, but not more a television conference. Traditionally, there are more radio sessions than TV sessions at the spring convention.

We do a variety of things. From a conference standpoint, we feel that we have really beefed up the show. For example, we are working with the legal department on the law and regulation conference, scheduled from noon Tuesday, April 14, to noon Wednesday, April 15. All five FCC commissioners are going to be there.

**RW:** *Let's talk about the NAB convention. Coming from the broadcasting trenches, as you have, and knowing what an NAB convention was and what*

continued on page 64 ▶



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## Compatible Formats Are The Secret to Happy LMAs

by Ed Shane

**HOUSTON** When Mother said, "Marriage has its ups and downs" there was no way to know whether she was offering advice, caution, or philosophical resignation. No way, that is, until we kids got into our own marriages.

Mother's words ring especially true for radio today as more stations become "married" through joint ventures. Radio's marriages are often shotgun weddings, the result of convenience or need. Combinations of programming, sales or operations are attempts to survive hard times, to maximize the position of a dominant partner, or to minimize the weaknesses of a lesser partner.

Local marketing agreements (and other marriages like local sales agreements and joint operating agreements) come at a time when programming options are plentiful.

### A plethora of programming

Long-form satellite networks are the most efficient means of adding programming to a radio station. The two major music networks offer formats as mainstream as country and oldies, or as niche-oriented as Satellite Music Network's Z-Rock.

Local origination is more cost effective with the use of digital studio equipment and "jukebox" CD players. Because technology has already made it possible, I envision banks of "desk top radio stations" feeding LMA programming to several stations at once.

Some competitive situations require full-time live operations. It's the most costly option, but cannot be dismissed until a strategy is established.

It's tempting to choose a delivery system before choosing an LMA partner. Like marriage, however, that's dangerous. The effective LMA creates a combination that enhances each partner station. The ideal agreement broadens demographic impact and, therefore, sales opportunities. LMA partners should seek compatible, but not competitive formats.

### Some happy couples

Happy LMA marriages are based on market dynamics and careful strategy. Here are format combinations that most often create a solid union:

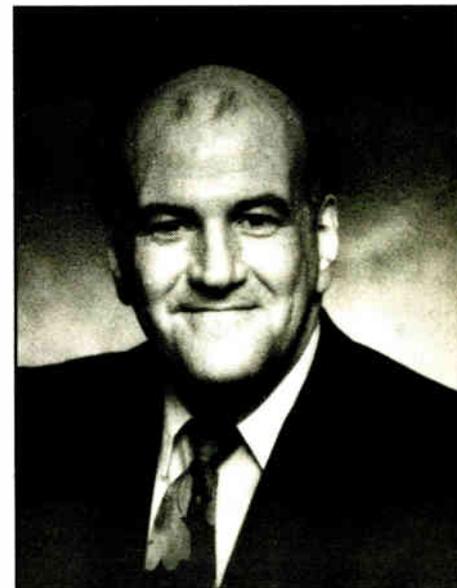
- *Country and CHR*. CHR captures a demographic audience aged to about 34. Country starts just above age 20 and attracts adults to 65. It's a great sales combination with little cume duplication.
- *Country and Hot AC*. Another great sales combination, but there is a chance for some cume duplication in the 25-39 bracket. There's a psychographic difference in the two audiences, and that's a strength that can be sold to advertisers.
- *Country and Urban*. This combination offers virtually no audience duplication. From a sales standpoint, there is a real numbers impact and a broad demographic spread.
- *CHR and Soft AC*. This combination offers another opportunity for a broad demographic spread, especially since the combination can be defined and marketed as "contemporary."
- *CHR and Oldies*. There's a clean break between the demographics here offering the opportunity for the CHR to add adults or for the Oldies station to add Teens-to-34.

Good marriages can also be made by stations that are more closely aligned

demographically if the LMA strategy is to offer all the nuances of a particular format. Consider the following:

- *AOR and heavy metal/hard rock*. The hard rock is confined to one station. The AOR format can be more broad-based, featuring lots of classic rock. The end result is that you own the rock image and the rock advertising money in your market.

- *Urban and Black AC*. Urban serves a younger audience. Black listeners aged 25-54 provide the core audience for Black AC



Ed Shane

formats such as SMN's "Touch." The combination offers the opportunity to tie up all of a market's dollars that are targeted to the black consumer.

- *Country and Traditional Country*. This combination is not as effective as the combinations just mentioned because Country hasn't truly fragmented into distinct formats. The strategy of this combination is to preempt a new Country entry into the market.

LMA ventures with high audience duplication may be in for a rocky marriage. For example:

- *Country and Oldies*. The 35-44 cell is the most important cell for each format. Because the psychographics of each format are remarkably similar, you can expect to share much of the audience. That will hurt the sales effort.

- *Country and Classic Rock*. Each format has strong male appeal and significant strength 25-39. Expect to share a lot of audience, especially in the Southeast, Midwest, and Southwest.

- *CHR and Hot AC*. Of all the marriages I've analyzed here, this may be the most dangerous liaison. For CHR to survive as a format, it must shift to serving an older audience. This will make it collide head-on with the hot AC audience.

The analogy to marriage is a good one, because stations that enter joint ventures are structuring long relationships. They must learn to live with Mother's "ups and downs."

A rule of thumb for approaching an LMA or other agreement: Make sure it's more than infatuation.

□□□

Ed Shane is a broadcast adviser and founder of Shane Media Services, which provides management, programming, and research consultation to radio. His second radiobook, *Cutting Through: Strategies and Tactics for Radio*, is available now at 713-952-9221.

# Home Shopping for Radio Listeners?

by Bruce Ingram

**CHICAGO** Though it hardly qualifies as a widespread trend, a number of stations in small and occasionally medium markets have been returning to the tried and true concept of the radio store, spreading out their mats and hawking discounted wares direct to their listeners.

"I think the return to this particular sales strategy is fairly isolated," says Radio Advertising Bureau President Gary Fries. "It's part of the overall problem of stations, particularly struggling stations, trying to come up with creative ways of increasing revenue."

The radio store concept is nothing new, of course, but in these tough economic times it is exhibiting fresh appeal. And in some instances, it has been quite successful.

## Everyone wins

Radio stations earn new revenues, advertisers increase their exposure while saving money on spots and listeners save big on fast food, tanning salons, restaurants, car washes, furniture, fitness centers, just about anything that can be hustled for a quick sale.

The basic idea is simple, although in actuality a radio store can be just as difficult to run as any retail operation, requiring tight inventory control and cash-handling procedures.

Businesses supply the station with merchandise that can be sold at a discount to listeners. A fast-food restaurant, for instance, might offer \$500 worth of \$5 coupons, which are sold on the air for \$2.50 apiece.

The station keeps the cash and credits the restaurant with \$500 worth of on-air inventory. The station also talks about the restaurant in a casual, non-commercial way for as long as the coupons hold out, describes its menu, its amenities (if any), and even chats with the manager and staff on the air.

"How can an advertiser say no to a deal like that?" asks Tony Quartarone. Quartarone, a former program director for WRKS-FM New York, bought 3000 W WRKE(FM) Ocean View, Del. in 1989 and has successfully implemented a one-hour daily "Radio Store." He hosts the program himself, generally featuring as many as 40 products per hour.

## Following the leader

Quartarone's show is so successful, in fact, that he says three other stations in his broadcast area have started up their own radio store programs—including one that directly copies his approach, which is to emphasize fun with sponsors and listeners on the air.

"All of these guys told me I was nuts when I first went with this idea," Quartarone grumbles. "Now they're going after my audience."

Ideally, if a radio store show is entertaining enough, it can become popular enough with listeners to be a viable programming option in its own right, as Quartarone discovered, not just extended commercial breaks.

Art Ortega, operations manager for news/talk KQEO(AM), Albuquerque, N.M., and co-host of the station's "Super Saver" radio store says that after only six months, the program has achieved ratings parity with KQEO's other programs. "It's definitely not a tune-out," Ortega says. "A lot of people listen without participating."

Just as Quartarone does in Delaware, Ortega and his partner attempt to establish a rapport with their listeners and develop relationships resulting in a regular cast of characters for the show.

For example, Sue Without Wheels. "She's an older woman, she doesn't drive, so she calls herself Sue Without Wheels," Ortega says with a laugh. "When she calls, we say, 'Sue! Got any wheels yet?' and she says, 'Nope. Still looking.' The other customers call up and say, 'How's Sue? Any wheels?'"

## Having fun

Business considerations aside, Ortega, who has been worked in radio for 20 years, says the "Super Saver" program is more fun than he has had on the air in a long time. "We make jokes, social and politi-

cal comment, talking to just plain folks," he says. "It's what radio was meant to be—a two-way communication device."

that are news/talk stations or the stations in small markets where it can help distinguish you from competitors."

**"All of these guys told me I was nuts when I first went with this idea, now they're going after my audience."**

Even so, Ortega doubts the radio store's viability for the majority of stations. "I'm not sure this particular strategy is appropriate for 90 percent of the stations in America," he says. "Maybe the 10 percent

Quartarone confirms that the Radio Store concept was definitely a good way of setting himself apart from his Ocean View competitors—until his competitors decided

continued on page 67 ►

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World Radio History

# NAB VP Assesses Radio's Future

► continued from page 61

We've also added things like the sports and event marketing section, and the small market promotion idea exchange. This year we are going to have "table-top luncheons," where we have sections for people interested in different aspects of the business: the future; LMAs; Spanish language radio; promotions; sales and marketing. This makes it a more interactive conference.

In conjunction with that, on Thursday, April 13, we will do two or three sessions on the international arena. On Monday afternoon we are sharing sessions with television, which is a follow-up to the futures conference we had at the board meeting in Palm Springs.

Overall, I believe this year we will start to see more large market stations come back to the spring convention. ABC Radio's Satellite Music Network will have a suite at this convention—they've not had one for a couple of years.

In the past, many in the industry have felt that radio should completely get out of this show—that it should all be at the fall radio show. I will tell you that when I first got here, I was headed in that direction.

But when I saw how much the engineers and the owner-operators got out of the show and how they liked the Las Vegas show, I changed my mind. We tend to get a somewhat different radio market than in the fall. I think it is important that we continue to do this show.

What we have really done with the spring show—and this was John Abel's plan—is to build a series of conferences around a giant exposition. Sort of like the sports "Super Show" in Atlanta. We have BEA there with its conference, the TVB there with its conference, the SBE there with its conference, and HDTV World as well.

**RW:** Let me ask a few questions that will tap into your solid experience as a broadcaster, before you came to the NAB. The NAB is supporting an FM freeze from a number of different standpoints, one of which is the perceived oversaturation of FM stations in a variety of markets. From your background as a broadcaster, what is your opinion about that situation? Do you concur that it is an oversaturated market?

**Christian:** Yes. I think that the 80-90 addition of nearly 1,000 FM stations, conceptually, was correct at the time that they were doing it. I don't think that anyone realized the economic impact that it would have. Most of them came on-line at about the same time, and because of the economic condition of the country, the value of existing stations was reduced.

And we just came off a period when a lot of people paid overinflated prices for radio properties and are now carrying too much debt. The combination of the two has created

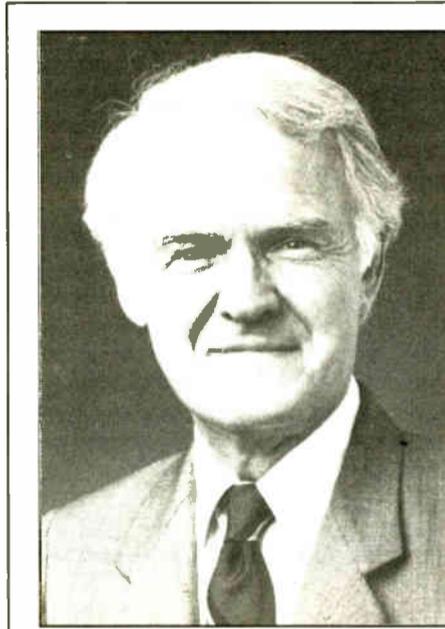
a tremendous financial burden on stations—to the degree that we are seeing radio station sales at prices we never thought we'd see. On the AM band, we are seeing a lot of stations going off the air.

If you really look at the number of radio stations in our country, and look at the international situation—we are very saturated with radio stations. Totally saturated, not just

reregulation, would help considerably. Especially on the duopoly issue, which would allow stations to own and operate more stations in a market. I do think that, somewhere along the line, if a station can't make it, maybe the frequency should be deleted.

It is a very complicated issue, and if I were now where I was 20 or 30 years ago—running stations and groups—I would look around and say, "If I can't put together three or four stations that I can sell in combination, I'm going to be in serious financial trouble in the years to come."

And I'd either have to think about selling,



"It (DAB) is not as close as we thought it was. But NAB's putting the discussion on the table was very healthy because we all had to stop and think about the future. Sure it was a giant debate, but it was healthy for the industry."

— Lynn Christian

FM. You have to question the viability of the industry with so many stations.

To some degree, it reminds me of the way the petroleum business was. A few years ago in Los Angeles, almost every corner had four gas stations; today, you go through five intersections and find one gas station with multiple pumps. It is a business that has just had to weed itself out, because there just isn't room for everyone. In our case, you can't weed it out.

If the business goes under, the license goes on. Somebody else takes it and they try it and their business goes under. You have to take a look at the overall picture and say, "How many licenses can we afford to have?"

I think that the freeze, in combination with

or putting together some sort of a cooperative venture with stations in similar condition in that market. It is going to take some reasonable people and some logical thinking on the part of the commissioners and the broadcasters for them to come together on this.

**RW:** With the freeze, do you envision an open-ended situation? Perhaps a better question is, when would you expect the thaw?

**Christian:** I think that Jeff Baumann could probably better answer this. I've never talked to him about it, but from my vista, we want the freeze to stay in effect for quite a while.

Maybe, when the new regulations come down, with the easing up from the FCC that we expect, and by allowing more stations to be owned by one operator in a market—perhaps there will come a time when it could be lifted. A lot of it will have to do with how the FCC acts.

**RW:** You mentioned LMAs. From your remarks, can we gather that you favor LMAs? What do you think of their value to the industry?

**Christian:** I think that it really varies by market. I think there are some markets where LMAs would be sensible.

I have to wear two hats on this. I am, by nature, very conservative. My roots in radio were so founded in service that the thought of owning a station and letting someone else operate it would be difficult for me personally.

But I understand why station operators today, in order to survive, have to do this. So I am compassionate about that.

I have this vision down the road—and I don't know if the reps will get into this or not—that there will be local sales organizations set up like the rep firms, but they will represent the stations in their market and sell them on a retail basis.

I also had a vision back in the '60s in Houston, and I tried to put it together

continued on page 91 ►

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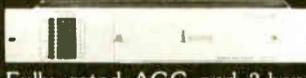
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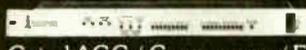
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World Radio History

# How to Know When Your Station Is Due for Repairs

by Jon Banks

**ROCKVILLE, Md.** No station manager wants to worry about engineering; the perfect station would have a flawless technical operation. Maybe that's a quick job description for your engineer . . . make sure the station is on the air and sounds good, all the time.

But a thousand things make it impossible. Power failures, thunderstorms, equipment failures, human error, and acts of God lead the list of problems. No radio station can keep its listeners without a reliable technical operation.

It's unrealistic to have triple backups for every system, or crack technicians on duty around the clock. Of course, good management is a matter of achieving the most objectives with the least resources. You can't solve all the problems, so just focus on the most important ones.

## Assessing reliability

I'm going to suggest a method for analyzing the reliability of your station and finding the weak links in your system. Your engineer can use it to help you set priorities and justify your spending plans.

Ask him to make a list of what can affect your ability to stay on the air and sound good—both individual things like failure of a microwave antenna, and larger events like a loss of the main transmitter site.

This takes some creative thinking, and the first draft won't be complete. But his knowledge of the facility will help as he reviews the problems that have come up in the past. Include equipment problems like transmitter failure, coax failure, antenna failure; and system problems like a power failure at the transmitter, a fire at a studio and a tower collapse.

Consider problems that affect your revenue stream, too: If you have special sponsored programs (sports, traffic and weather reports, remotes, etc.) consider what could go wrong with them.

## Develop spreadsheet

Your engineer can complete the analysis by listing all those problems down the left hand side of a page, and using another five columns labeled: Severity, Interval, Duration, Cost of Prevention, and Total Score. (See Figure 1.)

A value of one to five is assigned to each spot on the grid, using the following guidelines:

### ■ Severity:

1. Not apparent; backup as good as the main
2. Noticeable to a critical listener
3. Some degradation
4. Reduced power or coverage; poor audio
5. Station off the air or unlistenable

### ■ Interval:

1. 10+ years between problems
2. Four to 10 years between problems
3. Two to four years between problems
4. One to two years between problems
5. Less than a year between problems

### ■ Duration:

1. Immediate, automatic backup
2. Manual switch to backup by regular operator
3. Fixed as soon as engineer gets to site
4. Up to a day to fix
5. More than a day to fix

### ■ Cost of prevention:

1. More than \$50,000
2. \$20,000 +
3. \$5,000 +
4. \$1,000 +

### 5. Less than \$1,000

When the spreadsheet is completed, calculate the total scores. Multiply the four numbers in each row and enter the product in the last column.

Severe problems that happen often, take time to repair, and can be cheaply prevented will have the highest scores. These are the ones that should be your top priority. If the results don't look right, go back and double check the values entered in each column.

You should find at least a half dozen problems that stand out with very high scores;

these are the ones to focus on. This analysis should highlight some problems that you didn't expect.

In the example shown, failure of the air stu-

standby, so its score is also low.

But both microwave systems use a common antenna, and failure of the antenna or coax would be serious. It might be good to put a

Figure 1.

Failure	Severity	Interval	Duration	Cost of Prevention	Score
Air studio console	3	2	4	2	48
Electrical power at studio	1	5	1	3	15
Microwave STL transmitter	1	3	1	3	9
STL Antenna/Coax	5	2	5	3	150
Main FM Exciter	4	3	5	4	240

Reliability Spreadsheet

dio console scored low because the production studio can be used as a backup. A power failure at the studio isn't serious because the emergency generator will come on line automatically. The microwave transmitter has a hot

spare antenna up as a standby. And a failure of the main FM exciter would force the station to use the low power backup transmitter, reducing coverage; that pushes the

continued on page 66 ▶



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## American Urban Radio Networks Formed

**NEW YORK** Sheridan Broadcasting Networks and the National Black Network recently merged to form the American Urban Radio Networks, the largest radio network company targeted to Black consumers. The company offers five products, the American Urban Radio Network, the STRZ Entertainment Network, the SBN Sports Network, the Urban Public Affairs

Network and the SPM Urban Network. For more information contact Fred Mattingly at 212-714-1000, or circle Reader Service Number 145.

## Sports Collector In New York

**NEW YORK** "The Sports Collector's Radio Show" signed WGBB(AM) New York as an affiliate, marking the program's entry into the nation's top market. The

hour-long program can be picked up via satellite, Sundays 9-10 a.m. EST.

The Sports Collector's Radio Show is designed to examine different aspects of sports collecting, and features call-in participation, advice and insight from collectors and dealers of baseball cards and memorabilia. Each week, listeners can call in to win autographed baseballs and similar prizes.

The program is hosted by John

L. Raybin, publisher of "Baseball Autograph News," and Jay Brustman, sports talk show host and attorney. For more information, call Steve Bass at 800-775-TEAM, or circle Reader Service Number 127.

## New L.A. Service Offered

**LOS ANGELES** Creative Media Consultants has launched a new venture in news and program gathering from the entertainment

community. "L.A. Bureau" promises to deliver high quality, satellite-delivered audio interviews with celebrities, film makers and recording artists.

"L.A. Bureau" is a digitally-equipped studio that features digital lines to the satellite link-up, as well as the "switched 56" digital lines. For more information, contact Michael Binstock at 310-204-2262, or circle Reader Service Number 57.

## Women on the Radio

**CLEARWATER, Fla.** Operators trying to reach female listeners with topical issues, can turn to the latest offering from the Independent Broadcasters Network (IBN), "Woman to Woman." The weekly, hour-long program, is available via satellite, Wednesday 1-2 p.m., EST.

"Woman to Woman" touch on topics as diverse as relationships, career development, politics, parenting, lifestyles, health, beauty and fashion. For more information, contact Steve Weigner at 813-573-4402, or circle Reader Service Number 86.

## Preparing For Repairs

► continued from page 65  
score up. A relatively inexpensive exciter switch would give some protection.

The spreadsheet is useful because it reduces these complex technical problems to a single number based on cost and severity. All the problems are compared side by side in a format that makes sense. You can use it to justify your planned expenses to higher management. They don't need the technical details, but they'll have confidence that the analysis was done in a consistent, logical way.

Reviewing this with your engineer and business manager will help you agree on a list of priorities. It'll let you plan facility improvements on a top-line basis, without getting into the technical details. Your engineer will appreciate you focusing on these operational problems, and you'll be able to work off the same list of priorities.

Your business manager will be glad to have an objective way to weight the cost of prevention against the risk of failure.

There is another plus: This type of analysis naturally leads to a cooperative question, "How much do we want to spend to prevent problems?" This approach helps you avoid a confrontational discussion of whether you need to spend any money at all.

□□□

Jon Banks is CE of WLTT(FM) Bethesda, Md. (Washington, D.C.)



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Circle (92) On Reader Service Card

# Back to the Future: A Return to Radio Stores

► continued from page 63 to follow in his footsteps.

Regardless, he says the show has more than fulfilled its purpose by establishing his credibility with advertisers and listeners in a market where he was previously a new kid in the neighborhood.

### Breaking the rules

Quartarone was hesitant at first to employ the radio store concept, because the notion of interrupting his music format—a blend of dance hits and tunes by the likes of Willie Nelson and Kenny Rogers designed to appeal to women—went directly against all he had learned in his major market experience.

"I didn't think it would work to stop the music for 60 minutes," he says. "In the major markets, you don't stop the music. Period."

After considering the needs of his new community, however, and his notion that few things appeal to women more than shopping for bargains, he decided to give it a try.

Immediately, Quartarone found the pro-

gram a pragmatic approach to local advertisers who do not have the time to consider ratings and demographics. Suddenly, the manager of the local fitness center was confronted with real flesh and blood human beings walking in his door because they had heard about it on WRKE.

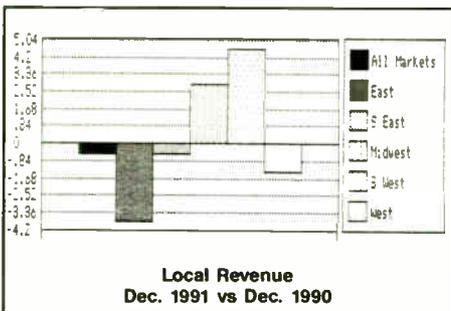
"It's a great way for advertisers to size up the demographics of the station," Quartarone says. "They can see that this person is 38 years old, female, married, two kids, just the kind of customer they want."



WRKE Owner Tony Quartarone

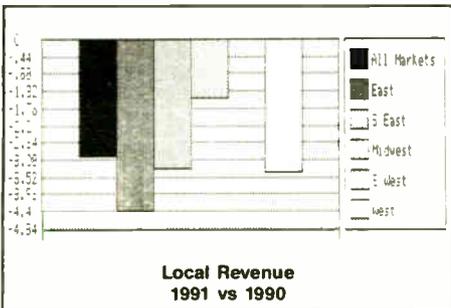
# Radio Ends The Year on High Note

**NEW YORK** Once again, the radio industry has shown itself to be more resilient than other media, according to numbers released by the Radio Advertising Bureau. An optimistic tone was set for 1992 with the industry showing a modest gain in December of 1991 versus



December 1990.

1991 defied all trends with a series of positive- and negative-growth months. Combined local and national spot sales finished 1991 with a decrease of 3.1 per-



cent over 1990 revenue figures, while network revenue grew 1.6 percent over its 1990 figure. Local ad revenue declined 3.0 percent overall, while national was down 3.3 percent.

continued on page 91 ►

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3750 Old Getwell Road, Memphis, TN 38118  
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See Us At NAB '92 Booth 3902

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World Radio History

The 1992 NAB Exhibitor Directory is a listing of information provided by exhibitors who responded to an RW NAB questionnaire. Past and potential NAB exhibitors were asked about new and established products scheduled to be shown at NAB this year.

Questionnaires returned by the deadline are included here. N/A for booth number means a booth assignment had not yet been made.

**Company Booth**

**360 Systems 1018**  
Intro: Model DRC digital remote control for use with DigiCart. Data compression software for DigiCart provides 6 times more storage than normal recording. Digital audio interface for DigiCart provides AES/EBU and SPDIF interfaces. Software release 2.0 for DigiCart provides video post production software features.  
Also: AM-16 series audio routing switchers: 16x16 with remote control. "Permanent Playback" digital audio message players: EPROM-based players. "DigiCart" digital cart machine: CD-quality audio on removable magnetic disks. Model HDS hard disk system provides up to 50 hours of audio storage with DigiCart.  
Contact: Robert Easton, Pres  
18740 Oxnard St.  
Tarzana, CA 91356  
818-342-3127

**3M Magnetic Media Division 18012**  
Intro: 3M 393 and 395 Full Coast magnetic film.  
Also: 3M 996, 226, 227, 806, 807, 808 and 809 audio mastering tapes. 3M 275 digital audio mastering tape. 3M PRO DAT. 3M AUD digital audio cassettes. 3M 8206, 8207 and 8614 audio logging tapes. 3M professional audio cassettes. Line of audio and video accessory products.

**a**

**Accu-Weather Inc. 13727-13729**  
On Display: FeatureFone, a voice information system for marketing information available by local telephone access 24 hours a day. AccuCall 900# Service Bureau includes Accu-Weather for forecasts and current conditions. InstaSports for sports information, lottery results, horoscopes and more.

**Accurate Sound Corp. 2604**  
Intro: AS-4000 Philips cassette logger/recorder. AS-100 tape handler reel-to-reel.  
Also: AS-200A high speed audio tape duplicator. AS-6000 tape conditioner, audio and video reel to reel.

**Acoustic Systems 1119**  
On Display: Prefabricated broadcast and recording studio. Self-contained, pre-engineered constructed of steel panels with custom finishes and isolated acoustical floors, sealed doors, pre-wired electrical services and ventilation systems. Eleven models or custom design. Can be constructed on-site and moved/reinstalled.

**ADC Telecommunications, Inc. 19652**  
Intro: American Lightwave System fiber optic links with analog and digital transmission formats.  
Also: Audio and video patching, termination, and distribution frame equipment. Audio and video components.

**ADM Systems 18442**  
Intro: Post-production audio console.  
Also: Stereo audio console. Stereo and monaural audio distribution systems. Stereo source selector. Bar graph metering system. Serial controlled interface.

**AEQ 1300**  
Intro: BC-1000 broadcast console. SSR-10 digital line identifier. Console for Systel-3000 control.  
Also: BC-2000 broadcast mixing console. Digital multiconference system Systel 3000. Telephone hybrid TH-02. MP-10 broadcast mixer. Line terminal equipment, LE-01 line equalizer. AM-01 amplified monitor. PS-01 power supply. LA-01 line amplifier.

**A.F. Associates 19634**  
On Display: Turnkey systems, engineering and fabrication, engineering consulting services.

**AKAI/International Music Co. 1002**  
Intro: DD1000 Version 2.0 Software. S1100 Version 2.0 Software.  
Also: DD1000 Magneto optical disk recorder. S1100 stereo digital sampler and S1100EEX expansion module. ADAM digital multitrack tape recording system. S1000-series stereo digital samplers.

**Alpha Audio Acoustics 12901.02**  
Intro: Portable isolation booth.  
Also: Sonex Pyramid acoustical foam. Soundtex. Sorb fiberglass panels.

**AKG Acoustics 2800**  
Intro: Tri-Power vocal and instrument microphones. C647 condenser gooseneck microphone.  
Also: Microphones, headphones, stands and accessories.  
Contact: David Angress  
1525 Alvarado St.  
San Leandro, CA 94577

**Alden Electronics Inc. 16106**  
Intro: With Zephyr Weather Information Service, will feature Color Weather Radar Imagery from the National Weather Service NEXRAD Program. It provides stations with lightning strike images, weather charts, satellite and weather text information.

**Alesis Corp. 1212**  
Intro: ADAT digital audio recorder, BRC full function remote controller, RMB 32 channel remote meter bridge. AT-1 ADAT to AES/EBU and S/PDIF digital interface, AI-2 ES bus protocol interface. Quadverb simultaneous effects processor. Midiverb III simultaneous effects processor. Microverb III digital reverb and delay. 1622 mixer. MEQ230 dual 1/3 octave precision equalizer. 3630 RMS/peak dual channel compressor/limiter, and RA 100 reference amplifier.

**Altec Lansing 19656**  
On Display: 1674C automatic mic mixer system. 8553B tamper-proof/programmable equalizer.

**Amber Electro Design 4806.07**  
Intro: 7000 precision audio measurement system.  
Also: Three series of low distortion audio signal generators.

**Altronic Research Inc. 11129, 11130**  
Intro: Line of air-cooled dummy loads.  
Also: Model 6725, 25kW air-cooled dummy load. Model 6705, 5kW air-cooled dummy load. Model 640105, low power static air-cooled load. Model 9725, 25kW water-cooled dummy load.  
Contact: Doug Starkey  
P.O. Box 249  
Yellville, AR 72687  
501-449-4093

**Andrew Corp. 16646**  
Intro: Macxline, inner conductors-only replacement systems.  
Also: Helix coaxial cables and waveguides. Macxline rigid lines. Dryline series of pressurization equipment.

**AMCO Engineering Co. 16412**  
Intro: Monitoring systems/enclosures for broadcasting type applications. Single/multibay consoles available. Vertical, sloped front and low silhouette frames start as base units and can be built-up. Treatments include wood, radius or traditional IF33 trim.  
Also: Monitoring cabinets/enclosures for broadcasting type applications. 19"-24" widths and accessories: doors (steel & plexiglass), drawers, shelves (pull-out, stationary, modem), internal MT6. Cooling devices including motorized impeller blowers.

**Antenna Technology 13725-13726**  
Intro: Satellite earth stations and related electronic components with transmit and receive antenna sizes available from 0.8 m to 32 m, new and refurbished. Receivers, LNAs, LNBs, jumpers, cables, connectors, heating systems, system design, consultation and maintenance available.  
Also: Simulcast multibeam antenna capable of receiving up to 35 C- and Ku-band satellites within a 70 degree view area simultaneously. Available in 3, 5 and 7 meter equivalent sizes.

**Aphex Systems 1902**  
Intro: 400 DigiCoder stereo generator. 9901 parametric EQ.  
Also: 320 Compellor compressor/leveler. 720 Dominator II peak limiter. 723 Dominator II transmission limiter. 124A level matching interface.

We've chalked up more orders for our solid-state, FMS Series Transmitters than any of our competitors! Broadcasters all over the world ended their search for solid-state FM Transmitters with up to 8KW of power, after discovering that TTC has the only solid-state, broadband FM Transmitter with **field-proven**, superior performance. Or did they choose TTC to get maximum efficiency, reliability, transparent audio specifications and increased immunity to lightning? Or was it TTC's exceptional value? Whatever the reasons, they chose TTC.

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**TTC Radio**

1801 14th Ave. Suite 103901 85455006 16 180 113100

**Come see us at NAB booth 15725**

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- Stereo Generators
- Stereo Decoders
- Radio Data System Generators
- Telephone Interface System

See Us at NAB Booth 1000

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World Radio History

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**Arrakis Systems Inc.** 1702  
Intro: Digilink, digital audio cart recorder.  
Also: Audio consoles: 150/500/2000/2100/5000/-10000/12000 series. Switchers: 1100 series. Furniture: Modulux, Modulux II, Supreme. Systems: Modulink. Contact: Mike Palmer, Pres 2619 Midpoint Dr. Fort Collins, CO 80525 303-224-2248

**ASACA/Shibasoku Corp. of America** 15746  
Intro: AAM-200 magneto-optical disk audio file. ADR-6000 NTSC M.O. disk recorder. ADS-330 NTSC M.O. disk still store w/RC33 remote control unit. CM203 20" high resolution auto setup monitor. CPI207 12" high definition monitor. RM25AX ghost signal Generator. VBI6D2 serial digital interface. VG922B closed caption encoder.  
Also: Audio analyzers, auto set-up monitors, decoders, encoders, envelope delay measuring sets, erasable rewritable magneto-optical disk audio files and still stores, GCR and HDTV equipment, high resolution color monitors, signal and sweep generators, video cart systems, and video noise meters.

**ASC Audio Video Corp.** 11948.49  
Intro: Virtual Recorder.  
Also: CASE editing controller.

**Associated Production Music** 16422.23  
On Display: KPM, Bruton, Sonoton, Themes production music libraries. "Broadcast 1" and "Broadcast 2." APM "Mini-Package." "The Best of the Best." "Sound FX—The Library" and "SFX" from KPM.

**ATI (Audio Technologies Inc.)** 12203  
Intro: Vanguard 6- and 12-channel on-air board. MXM Dual Mix-Minus add-on adapter for Vanguard consoles. PB2X8 Press Box microphone distribution system. HD1000 master headphone amplifier. HD100 single channel stereo headphone amplifier. Series of single and dual channel line amplifier/buffer modules for DA10000 modular amplifier systems.  
Also: Micro-Amp and Encore Series of microphone, line, turntable, distribution, power and IHF interface amplifiers with Emphasizer microphone processor. VU200-VU1000 studio metering systems and Vanguard series on-air consoles.  
Contact: Ed Mullin 328 Maple Ave. Horsham, PA 19044 215-443-0330

**Audi-Cord** 3227  
On Display: Mono or stereo cart recorders/players, using CMOS logic and available as dual record/play units for simultaneous record or cartridge copy.  
Contact: Andy Rector 1845 W. Hovey Ave. Normal, IL 61761 309-452-9461

**Audio Accessories, Inc.** 13744, 13844  
On Display: Audio jack panels and jacks, prewired audio patch panels, patch cords, patch cord holders, video panels, RS-422 patching, Edac connectors and accessories.

**Audio Animation Inc.** 1624  
Intro: paragon-transmission's FM stereo generator card option.  
Also: paragon digital audio transmission processor. Version 2.2 system software that has a digital 6-band parametric EQ, phase matrixing.

**Audio Broadcast Group** 4206  
Contact: Phyllis Freeman 2342 S. Division Grand Rapids, MI 49507 616-452-1596

**Audio Dynamics, Inc.** N/A  
Intro: AD-401 retrofit board for ITC Type 99 cart machines.  
Also: AD-302 retrofit board for ITC Delta Series cart machines. Contact: Steve Yates, Pres 137 W. Buckingham Circle, Ste B Charlottesville, VA 22901 804-296-4111

**Auditronics** 3902  
Intro: Auditronics 850 console for workstation or on-air capabilities.  
Also: Auditronics 800, 400, 310 and 210 series. Contact: Murray Shields, Dir of Sales & Mktg 3750 Old Getwell Rd Memphis, TN 38112 901-362-1350

**Audio Precision** 3900  
Intro: Portable One Plus audio test set with sweeps, graphs and printer port.  
Also: System One, System One+DSP, System One dual domain.

**Audio Processing Technology** N/A  
Intro: DSM100 two-channel duplex system, a self-contained unit that utilizes apt-X 100 SCSI100 and SDS100 stereo encoder and decoder boards, plus RS-449/X21 modem/telecom interfaces and ISDN multiplexer. DSM100 transmits full bandwidth audio over single or multiple 56/64 kbps data lines. An RS-232 port allows up to 9.6 kbaud of auxiliary data to be added to data-compressed bitstream.  
Also: apt-X 100 digital audio data compression system with an encode/decode process that reduces data bandwidth of 16-bit PCM by a factor of four while retaining subjective performance of original input signal. Available in form of a ROM-masked AT&T DSP chip for OEM applications plus PCB and self-powered systems. Contact: Mike Smyth, US General Manager 6255 Sunset Blvd., Ste 1026 Hollywood, CA 90028 213-463-2963

**Audio-Video Engineering Co.** 13720  
On Display: Video Hum-Stop coils, Models HSC-1 and HSC-2.

**Audio/Digital Inc. (a division of JBL)** 16236  
On Display: TC-4 broadcast digital processor.

**Audio Services Corp.** 5112  
Intro: DAT products: Fostex, Stella Vox, Sony, Panasonic. Sennheiser shotgun series. Infrared systems from Sennheiser Lectrosonics. Time-code conversion for NAGARA IV-S. Soundcraft, Mackie designs, CAD, Nakamichi, UREI, dbx, Symetrix, Klark Teknik, Hafler, BSS, Lexicon, Aphex, Shure HTS, Otari, Carver Pro, JBL, Auratone, Wohler Tech, Digitec, 360 Systems, GW, Yamaha, Rane, Drawmer, AKG, Crest, QSC, Tannoy, Bose, Microtech.  
Contact: Gwen Madrid, Dir of Mktg 10639 Riverside Dr. N. Hollywood, CA 91602 818-980-9891

**Audio-Technica U.S. Inc.** 11906  
Intro: PRO 88W wireless camcorder microphone system. AT845R/RW & AT847R/RW remote-powered cardioid miniature condenser UniPoint microphones. AT835a line & gradient shotgun condenser microphone. MT830R sub-miniature omnidirectional condenser lavalier microphone. AT822 OnePoint X/Y stereo DAT recording microphone.  
Also: AT831R remote-powered miniature cardioid condenser microphone. ATM63HE high-energy hypercardioid dynamic microphone. AT4033 studio condenser microphone. DT100 digital teleconferencing system. CP8403 multiple microphone stand clamp.

**audiopak, Inc.** 2326.27  
Intro: Compact cassette components.  
Also: AA-3 and AA-4 broadcast tape cartridges. Contact: Gordon Stafford, VP/Sales PO, Box 3100 Winchester, VA 22601 703-667-8125

**Autogram Corp.** 4527  
Intro: PM 1644 and MINI-MIX 8 consoles.  
Also: AC-8 console.

**AVCOM of Virginia, Inc.** 12903  
Intro: Options for PSA-65A that include AM detector, oscilloscope interface and RFP-24 preamplifier.  
Also: Portable spectrum analyzers: PSA-65A, PSA-37D, PSA-35A. Postable test receiver: PTR-25A. Satellite receivers: video, SCPC and SCS. Microwave video links: PSR-1000A and MVT-1000A and microwave accessories.  
Contact: Charlie Odom 500 Southlake Blvd. Richmond, VA 23236 804-794-2500

**BASYS Automation Systems** 18777  
Intro: Archive II, full feature text storage and retrieval system, runs on a DEC RISC platform.  
Also: D-Cart, a networked digital audio recording, editing and playback system that interface to newsroom systems. Newsroom Computer System that includes wire distribution, reporter assignments, communications, script processing with split screen editing and archiving.

**Belar Electronics Laboratory** 3920  
Intro: AMMA-1 AM Wizard.  
Also: FMM-2 FM modulation monitor and FMS-2 stereo monitor. FMMA-1 "The Wizard". RFA-4 frequency agile digital RF amplifier. PWM-1 peak weighting module. AMM-2B and AMM-3 AM modulation monitors. AMM-4 and FMM-4A frequency monitors.

**Benchmark Media Systems Inc.** 11301  
Intro: RS-444 mixing/routing amplifier module for System 1000. LLD-102 stereo long line driver. MP-1 mic preamp module.  
Also: System 1000 modular audio processing and distribution system. MF-1 Micro Frame system. MPS-400/420 microphone preamplifiers.

**beyerdynamic** 12230  
Intro: U700 Series UHF Lavalier and Hand Held Mic. MC833 Stereo ENG/EFP Microphones. TE170 Wireless VHF Camera Mount Receiving System. DT211/311/411 series of monitoring headphones. MCE 52 and 53 Miniature Instrument Mics for wireless applications.

**Bradley Broadcast Sales** 1024  
Intro: Middle Atlantic Work Series equipment racks.  
Also: AKG DSE 7000. Middle Atlantic rack accessory product line. Telos full product line.

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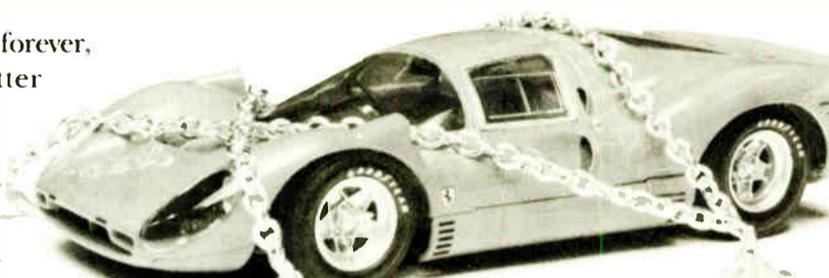
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**I**f electronics lasted forever, it wouldn't matter where you bought your next exciter, amplifier, STL, translator or transmitter. Track records of customer frustration would be of no concern as you simply chose the box which suited you. Since failures not only occur, they usually take place at the worst possible time, it's a good idea to go into the purchase knowing exactly what the manufacturer will do if you need help. Will they handle your need themselves? Will they take action? Will they follow up to see if you're okay?



At BEXT, customer service is a way of life. We freely share our reference list so that those whose experience with other companies leads them to doubt our claim can hear what a difference BEXT has made in our customers' lives. Beside our service, you'll hear about the technical superiority and reliability that have made our products the growing choice of the engineering community.

To find out what it's like to have a relationship with BEXT, unchain that high tech telephone system and call 619-239-8462, or rev up the fax machine and aim it at 619-239-8474. We'll promptly return the complete BEXT catalog of FM, UHF and VHF equipment, with reference list. And don't be surprised if we call to be sure you got it.



739 Fifth Avenue  
San Diego, California 92101 USA  
619-239-8462 FAX: 619-239-8474

**BEXT Inc. 3918**  
Intro: Upgraded MOSFET technology for amplifiers. Also: P2/PI0, TFX 20, PTX 30, PTX 80 programmable FM exciters. P250, PJ 500-I, PJ 500, T 2000, NS 1000S amplifiers. TC 280 UHF exciter. LC and SD STL composite aural STL system. HPT-FM transmitter/transmitter.  
Contact: Michelle DeFazio, Sales Mgr  
739 5th Ave., Ste 7A  
San Diego, CA 92101  
619-239-8462

**Broadcast Electronics Inc. 2312**  
Intro: AM-5, 5500 W AM transmitter, with built-in C-QUAM exciter.  
Also: AM-1 AM transmitter. FM transmitters. Audio VAULT digital audio storage device. CORE 2000 program automation. AT-90 modular on-air console.  
Contact: Tim Bealor, Mgr/Trade Shows  
4100 N. 24th St.  
P.O. Box 3606  
Quincy, IL 62301  
217-224-9600

**Broadcast Microwave Services, Inc. 12301.02.03.04**  
On Display: Microwave transmitters, receivers and antenna systems for portable and fixed applications. Ground and airborne autotracking systems. Antenna pedestals for central receiver towers. Helicopter systems for ENG. low noise amplifiers, duplexers and microwave accessories.

**Broadcast Services/EME 1300**  
Intro: Digital audio products for broadcasters including digital cart machines, CD players, digital audio workstations and headphone amps for monitoring digital sources.  
Contact: Keith Arnett, VP/Mktg  
Reedy Creek Rd.  
Four Oaks, NC 27524  
703-635-1322

**Broadcasting Systems, Inc. 3918**  
On Display: Line of TV 1-5 kW BEXT transmitters with 2-year warranties.  
Contact: Kenneth Casey  
One W Lone Cactus Dr.  
Phoenix, AZ 85027  
602-582-6550

**Broadcasters General Store 5426**  
Intro: Rodman/Brown Desk Jockey & Desk Jockey Lite, PC-based commercial/spot/liner control & storage system w/VGA color graphics. D&F Industries ST-60, low cost VTR controller w/JOG for Sony, JVC, Hitachi, Ampex and Panasonic. Audio Dynamics AD-302, ITC retrofit card.  
Also: Tailor equalizers. SMO 900 intelligent stereo modulation optimizer. Cutting Edge Unity 2000, CRI. Audio Signature/event timer, Gentner Lazer/Prizm, Telos digital phone hybrids/intercom link. Gentner digital phone hybrid. Sine Systems MCS. Celcast RBS-400.  
Contact: David Kerstin  
2480 SE 52nd St.  
Ocala, FL 32671  
904-622-9058

**Bruel & Kjaer Instruments 4302**  
On Display: B&K 4000 Series of studio microphones: omni, hi-intensity and cardioid models.

**BSW (Broadcast Supply West) 1620**  
On Display: Audio equipment from 360 Systems. Digital Audio Labs, Studer Dyaris.

**BSS, a division of AKG Acoustics 2800**  
Intro: FCS 928 digital controlled parametric equalization system featuring display of both systems RTA and computed response curve of combined filters.  
Also: Graphic and dynamic equalizer, limiters and other specialized signal processors. Speaker system, phase checker and mic splitters.  
Contact: Javxillion Loeb  
1525 Alvarado St.  
San Leandro, CA 94577  
510-351-3500

**Burk Technology 4812**  
Intro: AutoPilot, program switcher, six input stereo switcher.  
Also: TC-8 and ARC-16 remote control systems.  
Contact: Phil Halter, Sales Mgr  
7 Lomar Park Dr.  
Pepperell, MA 01463  
508-433-8877

**Cablewave Systems 1924**  
Intro: Microwave parabolic antennas, RF connectors and Rigid Line expansion components.  
Also: Flexwell coaxial cable, elliptical waveguide, RF connectors, Rigid Line and components, mounting hardware, pressurization equipment and accessories, FM and truncated antennas.  
Contact: Krista Esposito, Mktg & Adv Admin  
60 Dodge Ave.  
New Haven, CT 06473  
203-239-3311

**Canare Cable Inc. 11121, 11122**  
Intro: BCI-XI-TR impedance transformers for digital audio lines that convert AES/EBU signals from 100 ohms to 750 ohms. TS-4C, "The Stripper," a coax cable stripper that works in 15 seconds.  
Also: Stari Quad, L-4E6S. Microphone cable.

**Capitol Production Music 4320**  
On Display: The Professional production music series, a 60 CD production music library, color-coded and grouped by style. Contains every style and tempo in broadcast length versions of corporate and industrial, rock, country, jazz, adult contemporary, urban, classical, travel, holiday, comedy, drama, musical effects and retrospective. Available in certain markets on exclusive basis.

**CBSI (Custom Business Systems Inc.) 3908**  
Intro: CBSI For Windows for CBSI programs. CustomNet. Agency Management System.  
Also: Classic and Elite traffic/billing systems. Inter-Acct general ledger. CustomMusic. CustomSales. CustomRemote.  
Contact: Steve Kenagy  
P.O. Box 67  
Reedsport, OR 97467  
800-547-3930

**CCA Electronics, Inc. 2208**  
Intro: FM35000G, 35 kW FM transmitter. FM12000G, 12 kW FM transmitter. FM50G 50 W FM exciter.  
Also: FM4000G, 5 kW FM transmitter. FM20000G, 22 kW FM transmitter. AM10000F, 10 kW AM transmitter. Stabiline voltage regulator.  
Contact: John Binsfield, VP/Sales & Mktg  
360 Bohannon Rd.  
Fairburn, GA 30213  
404-964-3530

**Central Tower, Inc. 2500.01.02**  
Intro: Self-supporting towers (Series SS-STX) for large heights and heavy loads, can handle heights over 500 feet.  
Also: Designs and information on installing guyed and self-supporting towers. Offer a "turnkey" communication construction package. Provide site prep work, in-house engineering, fabrication, foundation design & installation, tower erection, antenna installation and rebuilding or field tuning.

**Circuit Research Labs (CRL) 4208**  
Intro: Real-time event sequencer that controls up to 8 outputs and stores 200 events over a 7-day clock with back-lit LCD display and battery backup. Amigo, stereo processing system with built-in stereo generator.  
Also: Processing products for AM, FM and shortwave applications. FM stereo and SCA generators. Dynaflex single-ended noise reduction systems. Programmable four-band stereo processing system. Programmable microphone processor.  
Contact: William Ammons, TV Products Mktg  
2522 W Genevieve Dr.  
Tempe, AZ 85282  
800-535-7648

**Clear-Com Systems 13706.07.08.09**  
Intro: PS-22, PS454 power supplies for party line, CS-222, MS-222 2-channel master stations for party line.  
Also: 2-, 4-, and 8-channel wired, wireless party line intercom with main stations. Belt packs, speaker stations, headsets. Matrix plus 50 x 50 point to point digital intercom system. AMS 1021 single rack unit amplified stereo speaker system.

*Tom -*

*While you're at the NAB, check out Cablewave Systems. They have some exciting new products like Truncated STL antennas and FLEXWELL<sup>®</sup> E30 Elliptical Waveguide with 7/8" EIA Transition for ITFS/MMDS service. They've added some new items to their FLEXWELL coaxial cable product line and enhanced their line of BOGNER<sup>®</sup> medium and low power broadcast antennas.*

*Their innovative engineering and product quality can't be beat. Cablewave Systems is right on the mark.*

*But don't take my word for it. Find out for yourself.*

*Remember - Cablewave Systems, booth # 1924 at the NAB.*

*Dave*

**RFS Radio Frequency Systems, Inc.**  
Cablewave Systems Division

**Cablewave Systems**

60 Dodge Ave.  
North Haven, CT 06473  
TEL (203) 239-3311  
FAX (203) 234-7718

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**Clark Wire & Cable** 11763,11863  
Intro: Mini mic cable. Super-flex R659 triax cable. Neutrik audio connectors. In-house termination services. Two lines of RGB video snakes.  
Also: Audio wire in various colors. Flat ribbon stereo wire. 2-, 3- & 4-channel audio snakes. Microphone snakes for remote applications. Microphone cable in nine colors. Video cables in 10 colors. ENG and production cables.  
Contact: Susan Clark, Pres  
1801 Holste Rd.  
Northbrook, IL 60062  
708-272-9889

**Coaxial Dynamics, Inc.** 12905  
On Display: Equipment for measurement and termination of RF power and design of OEM RF filters, directional power detectors, and models of wattmeters and loads available for power ranges from 0.1 W to 100,000 W. Terminating loads dry from 5 W to 500 W, liquid dielectric 600 W to 10 kW. Water-cooled and heat exchangers from 10 kW through 100 kW.

**Columbine Systems Inc.** 17019  
Intro: Columbine master control automation system that automates operation of any size broadcast/cable TV station.  
Also: Spot and media scheduling, logging and inventory management, sales analysis.

**ComStream Corp.** 5504  
On Display: Networks for satellite digital audio distribution including integrated receiver/decoder, uplink electronics and full monitoring and Audio Network Management System (ANMS), ABR200 receiver.

**Comark Communications Inc.** 15733  
On Display: UHF TV transmitters with advanced technology high power amplifiers and systems with klystron, IOT, ESC and klystron equipped transmitters through 280 kW, duplexed or operated in full-time common amplification. Coaxial and waveguide transmission systems and components with turnkey RF installation capability.

**Communication Graphics** 4318,19  
Intro: Satin cloth concert patches.  
Also: Manufacturer of screen printed decals, bumper stickers, and pocket folders.  
Contact: Donna Allbright, Sales Mgr.  
313 N. Redbud  
Broken Arrow, OK 74012  
800-331-4438

**Communications Data Services** 10449  
Intro: Real-world propagation workstation, land use and land cover data on CD-ROM.  
Also: Real-world propagation studies. 1990 population data on CD-ROM. 3 AFC second terrain data on CD-ROM. FCC and FAA databases, online services.  
Contact: Richard Biby, Pres  
6105-E Arlington Blvd.  
Falls Church, VA 22044  
703-534-0034

**Computer Concepts Corp.** 4814  
Intro: Digital editing option to Digital Commercial System.  
Also: Digital Commercial System, PC-based product that combines digital audio board and software to allow digital recording to hard disk, editing and instant on-the-air playback of station's current inventory of audio commercials, liners, jingles.  
Contact: Dana Cheney, Admin Asst  
8375 Melrose Dr.  
Lenexa, KS 66214  
913-541-0900

**Comrex Corp.** 13101  
Intro: Talk Console, complete talk studio in small package.  
Also: Digital audio codes for 7.5 kHz, full duplex audio on 56/64 kbps telephone services. Frequency extenders for high quality audio on normal telephone lines. Wireless cue system, telephone couplers and hybrids.  
Contact: Lynn Distler, VP  
65 Nonset Path  
Acton, MA 01720  
508-263-1800

**Comtech Antenna Systems, Inc.** 12806,07  
Intro: 1.8 meter flyaway multi-panel antenna system on wheels. Available with transit cases for airline baggage checking. Offset feed design.  
Also: Satellite antenna systems ranging in size from 2.4 to 7.3 meters. 3.8 meter is ideal for digital and analog SCPS reception. Offset is most popular for SCPS transmit applications.

**Connectronics Corp.** 13724  
Intro: Wire & Cable, Patch Bays, Cable Reels.

**Continental Electronics Corp.** 3418  
On Display: AM & FM transmitters with related broadcast equipment. Modulator.  
Contact: Steve Claterbaugh, Adv & Sales Promo  
P.O. Box 279879  
Dallas, TX 75227  
214-381-7161

**Cooper Industries/Belden Div.** 16225-29  
On Display: 1504A dual channel audio cable in zip-cord construction. 1508A-1519A, series of 24 gauge cables, multi-pair snake cables.

**Cooper Sound Systems** 5214  
Intro: 2-channel portable microphone preamp with internal batteries. 12 or 48 V. "T" power, balanced inputs and outputs, compact, custom chassis, low noise and distortion. M/S decoder and headphone amplifier with internal batteries, balanced inputs and outputs, compact, designed to be attached to 2-channel mic.  
Also: CS 106+1 16-channel audio mixer, a portable unit that satisfies all location sound requirements with a communications system. Also, an optional stereo input module with M/S decoder and power supply, both for use with the CS 106+1 audio mixer.

**Corporate Computer Systems** 5108  
Intro: CDO-2000 digital stereo MUSICAM codec.  
Also: Mono digital audio codec. Stereo MUSICAM digital audio codec model CDQ-2000.  
Contact: David Lin, Product Mgr  
33 W Main St.  
Holmdel, NJ 07733  
908-946-3800

**Cortana Corp.** 4625  
On Display: Components of Stati-Cat lightning prevention system.

**Crouse-Kimzey Co.** 5410  
Intro: Otari ProDisk 464. Ramsa WR 54416 16-channel mixer. Broadcast Electronics AudioVAULT. Ramsa WPI200 power amp. Sony DAT machine. Audio Technica AT4033 microphone. 360 Systems DigiCart.  
Also: Otari DDR 10 2-track recorder/editor. Denon DN970FA CD player. Furman power conditioners.  
Contact: Doug Simpson, Sales  
4108 Amon Carter Blvd., Ste 202  
Ft. Worth, TX 76155-2649  
817-283-7700



Computer Concepts Corporation's Digital Commercial System

**Crown International Inc.** 4818,4919  
Intro: CM-230 tri-axial microphone. CM-31 supercardioid electret condenser microphone. SASS-P MK II stereo condenser microphone. LM-300 silent-operating dual gooseneck supercardioid microphone.

**CTE International** 5424  
Intro: VL-1000 FM amplifier 1000 W. KT-24 FM exciter. KT-3000 FM transmitter 250 W. S-500, 500 W FM amplifier. DIP-2 FM antenna. YAGI-900 antenna.  
Also: FM broadcast equipment. VL-5000, 5W linear amplifier FET devices. VL-30 FM exciter. S-22 FM exciter. RX-10 STL receiver 300-1000 MHz. TX-02 STL transmitter 300-1000 MHz.  
Contact: Jorge Biccocchi, Pres  
2450 N Powerline Rd., #12  
Pompano Beach, FL 33069  
305-977-9111

**Cutting Edge Technologies** 5426  
Intro: Dividend composite filter. Vigilante limiter. Unity 2000 digital audio processor.  
Contact: F. Joseph Foti  
2501 W Third St.  
Cleveland, OH 44113  
216-241-3343

**d**

**dbx, a division of AKG Acoustics, Inc.** 2800  
On Display: dbx Production, Performer and 900 Series signal processing equipment.  
Contact: Judy Kata, Mktg Admin Asst  
1525 Alvarado St.  
San Leandro, CA 94577  
510-351-3500

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## TASCAM

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**Dataworld** 1626  
Intro: AM Rules, 1990 Census Data, Zip Code Maps.  
Also: Databases and computational programs for AM, FM, TV, LPTV and wireless cable. Directories, allocation and interference studies. Population counting, FCC flag service. Terrain elevation retrieval. FM and TV area-to-locate studies. AM daytime and nighttime channel studies. Maps depicting zip codes, coverage, population density, power density, terrain shadowing and received signal level. 24-hour on-line remote access.  
Contact: John Neff/Bob Richards, Sales  
4827 Rugby Ave., Ste 200  
Bethesda, MD 20814  
800-368-5754

**Datatek Corp.** 13914  
Intro: D-890 digital audio distribution amplifier. D-891/D-892 digital audio D/A and A/D converters.  
Also: Audio and video distribution amplifiers and routing switcher systems.

**Decision, Inc.** 2100  
Intro: Version 6.0 of Broadcast System III.  
Also: Broadcast System III.

**Delta Electronics Inc.** 2826  
Intro: ASE-2 AM stereo exciter.  
Also: AM stereo monitor, operating impedance bridges, NRSC measurement equipment with splatter monitor and stereo noise generator.

**Denon America Inc.** 4909,10  
Intro: DN-951FA CD cart player.  
Also: DN-950FA, DN-970FA production CD cart player. DN-7700R CD recorder.

**DIC Digital** 18738  
Intro: Betacam SP products for use in electronic news gathering applications. 5, 10, 15, 20 and 30 minute cassettes.  
Also: Digital audio tape products and 8 mm video tape products. MQ Series master quality professional DAT cassette. Longer lengths have 2 extra minutes so test tones and pre-roll IDs can be inserted without cutting into program time.  
Contact: Kevin Kennedy, Natl Mktg Mgr  
222 Bridge Plaza South  
Fort Lee, NJ 07024  
201-224-9344

**Dielectric Communications** 1708  
Intro: Transmission line, switches, switch remote control panel, combiner, filter, pressurization equipment.  
Also: Ring-style and panel antennas with TCB cavity-backed, circularly-polarized antenna designed for single/multistation use. Contact: Colleen Mitchell, Dir Mktg Svcs  
Tower Hill Rd.  
Raymond, ME 04071  
800-585-4500

**Dorough Electronics** 12206  
Intro: Loudness meter Model 380 for console mounting.  
Also: Audio meters. Stereo signal test set model 1200. Discriminative audio processor model 610-S.

**Digidesign** 12063, 12163  
Intro: Sound Tools II.  
Also: Pro Tools.  
Contact: Suz Howells, Product Mktg Mgr  
1360 Willow Rd. #101  
Menlo Park, CA 94025  
415-688-0600

**Dolby Laboratories Inc.** 4514  
Intro: DSTL system. SR Series. Model DP90.  
Also: Models DP501/DP502, Model 422, Model SDU-4, 430 Series. Model 363.  
Contact: Allen Whitman  
100 Potrero Ave.  
San Francisco, CA 94103  
415-558-0200

**e**  
**Editing Machines Corp.** 16712

**EEV, Inc.** 17730  
On Display: Power tubes for AM/FM transmitters including 15 kW Tetrode type 4CX15,000A, 35 kW Tetrode type 4CX35,000C and CY1637/4CV10000C for higher power AM transmitters.

**Electro-Voice Bdest. & Prod.** 19656  
Intro: 635A/B & RE50B ENG/EFP mics.  
Also: 635A, RE50, RE20, RE27N/D and RE38N/D microphones.

**Emcor Products/Crenlo Inc.** 12833  
Intro: Fan trays and fan panels.  
Also: Modular lines of electronic enclosures, EMI/RFI shielded cabinetry, computer support furniture, packaged blowers, fan trays and fan panels.

**Energy-Onix** 3604,3704  
Intro: The Legend Series, FM broadcast transmitters. SSTP line of FM broadcast transmitters and amplifiers. SST-25 25 W frequency agile solid state exciter.  
Also: MK series of single tube FM transmitters. High level plate modulated AM broadcast transmitters.  
Contact: Ernie Belanger, VP/Mktg & Sales  
752 Warren St.  
Hudson, NY 12534  
518-828-1590

**ERI Installations** 1020  
Intro: Medium-power FM panel antenna array for small radio markets. Low power modular FM combiner.  
Also: Design, manufacture, installation of omni and directional antennas, filters, combiners, multiplexers, and towers for commercial broadcasting.  
Contact: David Davies  
108 Market St.  
Newburgh, IN 47630  
812-853-3318

**ESE** 13701  
Intro: ES-236 digital audio DA. ES-246 quad 1x6 audio DA with terminal block or XLR connectors. ES-215 rackmounted audio level indicators. E-2695 SMPTE time code to ESE time code converter. ES-2743A ESE time code to SMPTE time code converter. ES-219 RS170A black burst generator. ES-233 video fade-to-black interface.  
Also: master clock systems, master timer systems, digital clocks and timers, audio level and impedance interfaces, audio level indicators, audio and video distribution amplifiers, SMPTE time code generators, readers, inserters, comparators and converters, audio and video accessories.  
Contact: Brian Way, Mktg Mgr  
142 Sierra St.  
El Segundo, CA 90245  
310-322-2136

**Eventide Inc.** 1421,22  
Intro: VR240 digital broadcast logger.  
Also: H3000B broadcast/postproduction Ultra-Harmonizer. BD1002 digital video delay.  
Contact: Gil Griffith, Natl Sales Mgr  
One Alsan Way  
Little Ferry, NJ 07643  
202-641-1200

**f**  
**Feral Industries** 16406  
Intro: C-100 time base corrector/synchronizer. Hamlet waveform/vectorscope.  
Also: YEM CVS-980 Scan Converter. Video International DTC 1504. Feral Industries 6119 and 6119Y/C production switchers.

**Fidelipac Corp.** 1920  
Intro: Dynamax DCR 1000 series digital audio cartridge using 3.5" disks as recording medium. Sampling rate is front panel selectable. At a sampling rate of 32 kHz, over 5 minutes of stereo audio may be recorded. A 2-line by 24 character LCD functions as an electronic cart label and a standard count-down timer display. Label information and cue tones are entered by plugging a common PC/AT keyboard into record module.  
Also: MX series modular console that features 8-12 mixers in rotary and slide fader versions and will support up to 2 telco hybrids. Dynamax CTR-90 series recorders, reproducers, erasers/splice detectors, Audio-max and Dynamax tape cartridges, storage systems, alignment tapes, studio warning lights and bulk recording tape. Modular audio consoles for on-air and production studios.  
Contact: John Tiedeck, Sales Mgr  
97 Foster Rd.  
Moorestown, NJ 08057  
609-235-3900

**FirstCom** 4626,27  
On Display: Direct Results Radio. Sound Designer Library. Custom Production Library.

**Flash Technology Corp. of America** 1618  
On Display: FTB 205 and FTB 204 High Intensity Aviation Strobe Obstruction Lighting. FTC 110N and 110R Controller. FTB 301 AC Operated Medium Intensity and FTB 339 DC Powered Medium Intensity Strobe Obstruction Lights.

**Focal Press Broadcasting Pubs.** 16768,69  
Intro: Books: "The Broadcast Century," by Robert Hilliard and Michael Keith. "The Art of Digital Audio," 2nd edition, by John Watkinson. "Broadcast Technology Worktext," by Samuel Ebersole. "Creative Radio Production," by Bruce Siegal. "Selling Radio Direct," by Keith. "Practical Radio Promotions," by Ted Roberts. Videotapes: "Basic Field News Coverage," by Jim Handley and Lucas Williamson. "Behind the Scenes at the Local News," by Robert Goad.  
Also: Books: "The Radio Station," by Keith & Krouse. "R-DAT," by John Watkinson. "Electronic Media Management," by Pringle/Starr/McCavitt. "Radio Production," by Keith.

**Fort Worth Tower Co Inc.** 3224-3226  
On Display: Guyed and self-supporting towers, turnkey services and installation, communications and mobile buildings, standby power systems and antenna mounts.

**Fostex Corp. of America** 17428  
Intro: Model PD-2, portable timecode DAT recorder.  
Also: G-Series multitrack recorders.

**g**  
**GE American Communications** 13906  
On Display: Satellite communication services to radio and TV broadcasters for broadcast, syndication, satellite news-gathering, digital audio and SCPS network programming and business video.

**GE Support Services/RCA Broadcast** 1326,27  
On Display: Service support for RCA Broadcast Studio transmission equipment and stage and studio lamps with genuine RCA parts. Services: Field maintenance service, parts (35,000 inventory), technical assistance, manuals, training, 24-hour service.



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**Garner Industries 13722.23**

Intro: 682 Series bulk degaussers for audio, video and computer media. Garner Type II degausser for NSA-approved erasure of videocassettes and cartridges.

Also: Eliminator 4000 bulk tape degausser for erasure of 1500 Oersted. Cassettes and C-format reels.

**Gefen Systems 5224.25**

Intro: NSM-CD 3101 AC CD changer. Touch-the-Music picture database background music system. CDJ Classic Pro Music System, background music system for broadcast.

Also: M&E Organizer System. SFX and production music. Locator software. 60 & 100 CD changer. Panasonic SV3900 computer interface.

**Gentner Communications Corp. 1712**

Intro: PeopleLink System One, full duplex teleconferencing system. Lazer 2.0, digital FM limiter/stereo generator. Prizm 2.0 digital audio processor.

Also: Teleconferencing, pro audio and broadcast products.

Contact: Chuck Leonhardt, Dir of Mktg Comm  
1825 Research Way  
Salt Lake City, UT 84119  
801-975-7200

**Gepeo International Inc. 12847.48.49**

Intro: Series GEP-5524, 100 ohm digital audio cable. SEP-VFM 807, miniature 75 ohm coaxial for RGB applications. RGB 2000 series, 59 U size low loss coaxial for RGB applications. Direct box with ground lift selection.

Also: Video audio cables, assemblies, breakout boxes, custom panels, direct boxes, cables reelers.

**Gorman-Redlich Mfg Co. 4224**

On Display: Model CM digital antenna monitor. Model CMR digital antenna monitor. Model CEB Emergency Broadcast System encoder-decoder.

Contact: James Gorman, owner  
257 W Union St.  
Athens, OH 45701  
614-593-3150

**Gotham Audio Corp. 3906**

Intro: SPOT 90 version 2.0 software. MicroTech Gefell microphones.

Also: SPOT 90 compact disc production system. Harmonia Mundi Acustica digital processors. Microtech Gefell microphones. DSP Workbench FFT analyzer. CEDAR Audio. Audio+Design analog & digital processing.

**h**

**Hallikainen & Friends Inc. 2224.25**

Intro: DRC200 programmable multisite transmitter control system.

Also: TEL171 digital telemetry adaptor for Moseley TC-15A. IT0177 computer interface for TEL171. DRC190 programmable multisite transmitter control system. TVA series rackmount audio mixers.

Contact: Harold Hallikainen, Pres  
141 Suburban Rd.  
San Luis Obispo, CA 93401-7590  
805-541-0200

**Henry Engineering 5500**

Intro: DIGISTOR digital message storage system that stores up to 4 minutes of audio for automatic playback via phone lines. TWINMIC dual (stereo) microphone preamp with mix capability. Can combine two mics into a single output.

Also: FAST TRAC automatic dubbing workstation. MICROMIXER 4-channel line level mixer. NETCOM-MANDER satellite programming control system. TWINMATCH dual stereo level converter. THE MATCHBOX level and impedance converter. USDA 2x4 mini stereo D.A. TELECARD II automatic telecoupler. SUPERLAY studio control interface. LOGIC CONVERTER studio equipment control interface. MIXMINUS PLUS broadcast hybrid interface.

Contact: Hank Landsberg, Owner  
503 Key Vista Dr.  
Sierra Madre, CA 91024  
818-355-3656



The HI-3624 ELF magnetic field meter from Holaday Industries

**Holaday Industries, Inc. 11607**

Intro: RF body current meter to measure RF-induced body currents in accordance with latest revision of ANSI RF exposure standard. Broadband isotropic RF field strength meter to measure electric and magnetic fields in accordance with "uncontrolled environment" levels of revised ANSI RF exposure standard. 3-axis ELF magnetic field strength meter to measure 50/60 Hz magnetic fields in accordance with proposed IEEE guidelines.

Also: Broadband isotropic RF field strength meters to measure potentially hazardous electric and magnetic fields in vicinity of transmitting facilities. VLF and ELF field strength meters to measure electric and magnetic fields at low frequencies. Datalogger to use with field strength meters.

Contact: Burton Gran, Pres  
14825 Martin Dr.  
Eden Prairie, MN 55344  
612-934-4920

**Hughey & Phillips Inc. 5218.19**

On Display: Obstruction lighting, safety climb devices and remote monitoring of tower lighting.

**Harris-Allied 2218**

Intro: Marantz CDR600 CD recording and playback system. Moseley DSP 6000 digital STL/TSL. AES/EBU digital audio interface. DX transmitters, medium wave in 300, 600, 750 and 1000+ kW.

Also: Medium wave. Platinum Series FM, and single tube transmitters. Arrakis Digilink, digital audio recording system. Eventide VR240 digital audio logger. MacroMedia AUDISK digital audio storage. AudioMetrics CD cart machine. AKG DSE-7000 digital audio workstation and production system.

Contact: Martha Rapp, Mgr Mktg Comm  
P.O. Box 4290  
Quincy, IL 62305-4290  
217-222-8200

**i**

**Inovonics Inc. 1418.19.20**

Intro: "The Sentinel," a station monitor receiver with audio diagnostics permitting comparison between stations in a given market. "DAVID," an FM audio processor/stereo generator combination unit.

Also: PWM-based multiband audio processors for AM, FM and TV broadcast. FM/FMX digital synthesis stereo generators, magnetic recording. Electronics for studio tape machines and mag-film recorders.

Contact: Jim Wood, Pres  
1305 Fair Ave.  
Santa Cruz, CA 95060  
408-458-0552

**Intraplex Inc. 5206.07**

Intro: TI "Smart MUX," TDM-163 TI Multiplexer Terminal and TDM-165 TI drop/insert terminal.

Also: PT/PR 150 stereo/dual program audio codec. 4500 MDAC digital audio codec. 3800 VRM variable rate multiplexer.

Contact: Christine Doyle, Comms Dir  
80 Taylor St.  
Littleton, MA 01460  
508-486-3722

**IDB Communications Group, Inc. 15750**

On Display: Transmission and distribution services for domestic/international radio, TV and data/voice communications.

**International Tapetronics Corp. (ITC) 1208**

Intro: Series 2 audio tape and cart machine. DPR-612 digital program repeater with audio storage for monophonic programs (6 or 12, depending on sampling rate) of varying length.

Also: Series 1 and 99B Series audio tape cart machines. ESL V eraser/splice locator, cart II broadcast cartridge, audio switcher system plus optional remote controls. DigiCenter, a digital audio operating platform with up to 5 operating systems with digital cart machine, satellite automation control, live assist capability, program automation and interface to traffic/accounting billing systems.

Contact: Bruce Helling, Mktg Comms Mgr  
2425 S Main St.  
Bloomington, IL 61702  
800-447-0414

**j**

**J.N.S. Electronics Inc. 1418.19.20**

Intro: D-MUX, digital program audio multiplexing system for mono or stereo audio. RFM.8180, synthesized FM receiver module. LM.8121, LED level meter module.

Also: The "FRAME," audio, RF and video capabilities within the same rack frame. CD quality audio routing switchers: 9000 series up to 120x120. 8300 series, stereo to 100 inputs.

Contact: John E. Leonard, President  
P.O. Box 32550  
San Jose, CA 95152  
408-729-3838

**JBL Professional 16236**

Intro: Model 4206, 2-way, 6-inch console-top studio monitor. Model 4208, 2-way, 8-inch console-top studio monitor. M644, 4-channel noise gate. M712, 2-channel gating compressor limiter.

Also: Control series loudspeakers. SR Series power amplifiers. 4400 Series studio monitors.



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The Sentinel is a Station Monitor Receiver with all-mode reception: NRSC AM/AM-Stereo, FM/FMX™-Stereo and SCA. But what's more important, The Sentinel has built-in diagnostics that measure and display 12 separate parameters of the program audio signal.

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-Albert Einstein

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**SCPC-2000E SCPC Satellite Receiver - \$1875**  
 AVCOM's Single Channel Per Carrier Receiver, model SCPC-2000E, has been developed for the reception of FM SCPC signals from satellites operating in the 3.7 to 4.2 GHz band. The SCPC-2000E is a complete receiver that can tune up to 4 specific crystal controlled audio or data channels from a given transponder and adapt to a variety of de-emphasis requirements. The SCPC-2000E is available in either wide or narrow band models and may be used with the SS-1000 (\$1027) Slave for simultaneous reception of additional channels.

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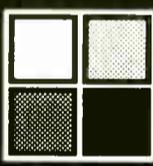


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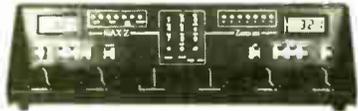
The MAX-Z console provides MAXimum flexibility, utility and above all, audio quality. Standard features include built-in rechargeable batteries and charger, clock, stopwatch/timer, VU meter, a wide range of audio inputs that will match almost anything, cue channel, phone line alarms, and more.

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The truly portable Mini Studio is made of heavy gauge injection molded ABS plastic. It folds into a compact package that can be transported in the trunk or backseat of a car.

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**READER SERVICE NO. 187**

**James Grunder & Associates Inc.** 16406  
Intro: C-100 time base corrector/synchronizer. Hamlet waveform/vectorscope.  
Also: YEM CVS-980 scan converter. Video International DTC 1504. Feral Industries 6119 and 6119Y/C production switchers.

**Jampro Antennas Inc.** 3824  
Intro: JLST series of CP translator antennas. JLHP series of HP translator antennas. YAGI antennas. JHD low-band VHF dipole panel antenna. JUHD broadband UHF panel antenna.  
Also: Circularly-polarized TV and FM broadcast antennas.

**Jensen Tools Inc.** 13426  
Intro: Fluke Model 97 Scopemaster.  
Also: JTK-5000 networking & computer maintenance kit. Fluke Model 87 DMM digital meter. JTK-48 field engineer's kit.

**K**

**Karl Heitz, Inc.** 13731  
On Display: 7 microphone fishpoles with range from 1 1/2" to 4 1/2", 2 1/2" to 12", clamp adapter to attach fishpoles to tripods, monopods.

**Kintronic Laboratories, Inc.** 4824  
Intro: AM/MW antenna matching networks. HF open wire transmission line switch. HF balun. HF open wire feedline. HF feedthrough panel.  
Also: AM/MW multiplexed antenna systems; antenna tuning units for AM expanded band operation. AM air-cooled dummy loads. AM/MW directional antenna phasing system. custom isolation unit for multiple-antenna installation on AM tower. Open frame and vacuum RF contactors. Rigid transmission line and accessories. RF patch panels. Standard 19" equipment racks. Isocouplers. Fixed and variable inductors. Meter jacks and plugs. Coaxial cable clamps. Static drain chokes. Lighting chokes.  
Contact: Thomas King, Pres  
144 Pleasant Grove Rd.  
Bluff City, TN 37618  
615-878-3141

**Klark-Teknik** N/A  
Intro: Midas X13/16 broadcast console.  
Also: Midas XL88.

**L**

**LDL Communications Inc.** 19258  
Intro: Monitoring system for 8 FM stations operating into a broadband antenna/combiner system manufactured by Alan Dick & Co., designed by LDL, monitors SWRs and reflective powers for the complete antenna system.  
Also: ADC's low windload FM CP antenna, a wide-band antenna capable of single- or multichannel operation.  
Contact: Lewis Page, NAB Coordinator  
14440 Cherry Lane Ct.  
Laurel, MD 20707  
301-498-2200

**LPB Inc.** 1918  
On Display: Citation II audio console. Signature III audio console series. AM broadcast transmitters. Operating carrier current broadcast system. and Travelers Information System.  
Contact: John Devecka, Sales Mgr  
28 Bacton Hill Rd.  
Frazer, PA 19355  
215-644-1123

**Leitch Inc.** 19924  
Intro: Distribution amp models UDA-680, VDA-681, ADA-885, VSE-6800. Clocks & timecode equipment including DAC-5012-24, ADC-5100 Series, UDT-5701, GTC-5701.  
Also: Distribution amplifiers. Sync and test generators. Digital distribution systems. Clock system and timecode equipment. Routing switchers.

**Lester Audio Labs** 4304  
Intro: DAS-3000 fiber transmission system. passes AES/EBU.  
Also: DAS 2000 fiber-optic transmission system.

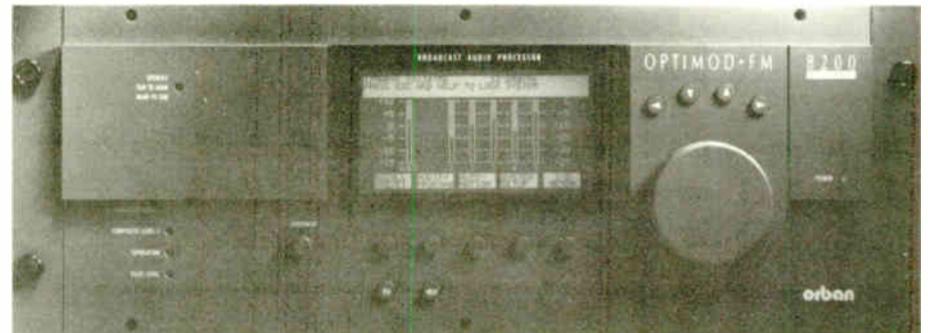
**Lightning Eliminators & Cons.** 16206  
On Display: Counseling in lightning prevention, grounding and power/signal line conditioning. Dissipation array systems to prevent lightning strikes to towers, power lines and buildings. Chem-Rod grounding electrodes to minimize ground resistance through continuous soil conditioning, high performance surge and transient preventors to protect against power surges, transients and RF bursts.

**Lightning Master Corp.** 11062  
Intro: Lightning Master transient voltage surge suppression equipment. CTI tower & site inspection services. Accu-Scan electrical environment monitors. ground alert ground bed monitoring systems. Strobe-Master strobe light monitoring system.  
Also: Lightning Master structural lightning protection products and systems including Underwriters Laboratories-listed static dissipating air terminals.

**Logitek** 4820  
Intro: Bright-VU LED audio meter.  
Also: Mariner on-air console with modular water resistant design. Stereocrack 6-channel rackmount console. TR2 12-channel rackmount console. Pre-10 10x2 switcher. Mon-10 10x1 switcher with meter and monitor.  
Contact: Tag Borland, Pres  
3320 Bering Dr.  
Houston, TX 77057  
800-231-5870

**m**

**Marti Electronics** 2624.25  
On Display: Studio-Transmitter Links (STLs) and remote pickup (RPU) equipment. RPT series transmitters.



Orban's OPTIMOD-FM 8200 digital audio processor

**MYAT Inc.** 5407.08.09  
On Display: Co-axial RF transmission line and components for radio and TV.  
Contact: Phillip Cindrich, Pres  
1380 Chestnut St.  
Norwood, NJ 07648  
201-767-5380

**Magnum Towers Inc.** 4321.22

**Marketron** 411  
On Display: FirstRate, a system for inventory and rate management that includes demand pricing, scheduling delivery and cost efficiencies. Designed to work on Marketron's Traffic and Accounting systems. Traffic, Management and Accounting for stations and networks. PC-based systems are network compatible and available on Hewlett Packard Minicomputers.

**Media Touch Systems** 5203  
Intro: MediaDISK Mass Storage Digital Audio System, OmniPLAY station automation/live assist system, and OpLOG.

**Micro Communications Inc.** 19043  
Intro: 7/8" EIA and 4 1/16" EIA coaxial transfer switches. FM all-band antenna. FM interdigital bandpass filter.  
Also: 1 5/8" EIA, 3 1/8" EIA and 6 1/8" EIA coaxial transfer switches. switching combiners, multistation combiners. Interference filters. Hybrid combiners. Directional couplers. High power isolators.  
Contact: Jennie E. Allen, Inside Sales  
P.O. Box 4365  
Manchester, NH 03108-4365  
603-624-4351

**Midas** N/A  
On Display: DN 300 series graphic equalizers. DN 400 series parametric equalizers. DN 500 series dynamic processors. DN 700 series digital processors.

**Modulation Sciences Inc.** 5118.19  
Intro: PROceiver, aural subcarrier receiver.  
Also: StereoMaxx spatial image enlarger. ModMinder digital FM peak deviation monitor. ModMinder Remote and Advanced Remote.  
Contact: Eric Small, VP/Engineering  
12A World's Fair Dr.  
Somerset, NJ 08873  
908-302-3090

**Moseley Associates Inc.** 3424  
Intro: PCL 6060 STL for high RF environments. CDQ 2000 digital audio for video STLs. FTI-3000 digital audio for fractional TI applications. Digital stereo generator for DSP 6000.  
Also: PCL 6000 synthesized studio to transmitter program link. PCL 606 studio to transmitter program link. RPL 4000 remote programming link. DSP 6000 digital audio transmission system. MRC 1620 and MRC 2 remote control systems. TaskMaster and MasterController software packages.  
Contact: Jamal Hamdani, Exec VP  
III Castilian Dr.  
Santa Barbara, CA 93117  
805-968-9621

**Motorola C-QUAM Stereo** N/A  
Intro: AMAX receiver demo.  
Also: AM stereo broadcast equipment.  
Contact: Donald Wilson, Mgr  
1216 Remington Rd.  
Schaumburg, IL 60173  
708-576-3592

**Murphy Studio Furniture** 1920  
On Display: Avant-Garde and Elite Series Studio Furniture.  
Contact: Dennis Murphy, Pres  
4153 N Bonita St.  
Spring Valley, CA 91977  
619-698-4658

**National Supervisory Network** 5210  
Intro: ABR200 digital audio VSAT network technology from ComStream with live digital audio via satellite from Colorado and other locations.  
Also: National off-premises control systems and services. Only FCC/FEMA legal system for full-walkaway station operations.  
Contact: Bill Sepmeier, Pres  
PO Box 578  
Avon, CO 81620  
800-345-8728

**Nautel Maine Inc.** 4520  
Intro: AMPFET AM transmitter with built-in C-QUAM stereo. AMPFET FM4, 4 kW FM transmitter.  
Also: AM & FM transmitters.  
Contact: Jorgen B. Jensen, Mgr Sales & Mktg  
201 Target Industrial Circle  
Bangor, ME 04401  
207-947-8200

**Nemal Electronics Inc.** N/A  
Intro: Flexible audio cable.  
Also: Electronic cable, connectors, patching products for broadcast, audio, video, data and RF applications.

**Neumann** 18169  
Intro: KMS-140 and KMS-150 vocalist microphones.  
Also: KMR81 short shotgun. KMR82 shotgun. RSM191 stereo shotgun.  
Contact: Jeff Alexander, Product Mgr  
6 Vista Dr.  
Old Lyme, CT 06371  
203-434-5220

**New England Digital** 11629  
Intro: MultiArc Macintosh-based audio editing software.  
Also: PostPro SD digital audio workstations. DSP option digital mixer and signal processor.

**O**

**Optical Disc Corp.** 16781  
On Display: LaserDisc recording systems and Recordable Laser Videodiscs (RLVs) that are compatible with LaserVision or LaserDisc format consumer and industrial players. Model 610A/620A videodisc recording systems.

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Circle (52) On Reader Service Card

**Orban, a division of AKG Acoustics, Inc. 2800**  
 Intro: Orban 460 compressor/limiter.  
 Also: Orban 8200 FM digital processor. Optimod-AM, FM & TV audio processing systems. FM & TV stereo generators. Studio compressor/limiters, equalizers, de-essers. Programmable microphone processor. Digital sound editor.  
 Contact: Howard Mullinack  
 1525 Alvarado St.  
 San Leandro, CA 94577  
 510-351-3500

**OpAmp Labs, Inc. 18180**  
 Intro: MS/8x8/SA stereo audio/video matrix switcher. Any input can be assigned to 1, 2, more or all outputs, which are buffered. Used for instructional, commercial and post production.  
 Also: Network feed boxes, audio and video distribution systems. RGBS systems. Switchers: routing, matrix, monitoring, assigning. Amplifiers: audio, video, VCA, mic line and power amps.

**PEP, Inc. 15901.02.03**  
**Pacific Recorders & Engineering (PR&E) 3812**  
 Intro: ADX digital audio production system.  
 Also: Radiomixer air console, production mixer, production console. BMX-III major market air console. Micromax broadcast cart machine. Dolby SR for carts. Distribution amps, audio switchers and patchbays, studio systems design services, studio furniture, peripheral products and accessories.  
 Contact: Mike Dosch, Mktg Mgr  
 2070 Las Palmas Dr.  
 Carlsbad, CA 92009  
 619-439-7426

**Quested, a division of AKG Acoustics 2800**  
 On Display: Monitor systems.  
 Contact: Judy Kuta, Mktg Admin Asst  
 1525 Alvarado St.  
 San Leandro, CA 94577  
 510-351-3500

**Otari Corp. 2806**  
 Intro: AL-662 and AL-632 audiotape loading systems, adaptable for the DCC format. Upgrades and features for the ProDisk 464. DTR-7 R-DAT, an inexpensive version of the DTR-90. DTR-90 R-DAT.  
 Contact: John Carey  
 378 Vintage Park Dr.  
 Foster City, CA 94404  
 415-341-5900

**Panasonic Pro Audio Systems (Ramsa) 18019**  
 Intro: WR-S4400 Series 12, 16 and 24-input mixers. WP-1000 Series class H power amplifiers.  
 Also: SV-3900 studio DAT with RS-422 control. SV-3700 studio DAT recorder. SV-255 portable DAT. WS-A70 and WS-A10, magnetically shielded monitor loudspeakers.  
 Contact: Steve Woolley  
 6550 Katella Ave.  
 Cypress, CA 90630  
 714-373-7277

**Potomac Instruments 2626.27**  
 Intro: 1900 Series directional array antenna monitors. AT-51 audio test system. RC-16+ automatic remote control system. SD-31/RX-31 frequency synthesizer & coherent detector. FIM-21/FIM-41 medium wave field strength meters. FIM-71 VHF field strength meter. FIM-72 UHF field strength meter. MPC-11 modulation and power controller. SMR-11 synthesized AM monitor receiver. QA-100 program audio analyzer. I500-PC programmable transmitter controller with DOS compatible software.

**RRN Inc. 5227**  
 On Display: Marketing programs for radio, television and cable broadcasters. SMARTcash™ retail marketing system which includes 69 Cent/Dollar™, DINEROfacil™, and Instant Auction System programs. Cause marketing program titled Seed Money CHALLENGE. Flashfacts System creates promotional database products which include RADIOMAP and Restaurant Dining Guides.

**RTI Research Technology International 13746**  
 On Display: Magnetic tape degaussers.

**Pristine Systems N/A**  
 On Display: MMCS, Music Management and Commercial Control System.

**Promusic Inc. 2601**  
 Intro: Producer's Sound Effect Library, produced by sound designers.  
 Also: Production music libraries, featuring more than 500 CDs. Licensing is available on needle-drop production planet or customized annual license.

**RTS-A Telex Communications Product 15860**  
 Intro: V-Series headphones. SSA 324 system-to-system interface. SAP 612 source assign panel. 2550 quad galvanic isolated buffer amplifiers. TIF950 series telephone interfaces. IKP950PCS production control stations.  
 Also: Intercommunication systems for teleproduction, broadcast and film industries. Audio products.  
 Contact: Murray Porteous, Natl Sales Mgr, RTS Prods  
 2550 Hollywood Way, Ste 207  
 Burbank, CA 91505  
 818-566-6700

**Prophet Systems Inc. 5420**  
 Intro: Audio Prophet "Wizard," utilizing mini-mainframe for multitasking workings. Configurable to run up to 80 audio terminals and 128 text terminals.  
 Also: Audio Prophet 10-track digital editing production system with air unit for live, satellite, automation playback. CD automation system with music librarian/playlist generator.  
 Contact: Ray Lockhart, Pres  
 113 W Fourth, Box 509  
 Ogallala, NE 69153  
 308-284-3007

**Radio Computing Service 1426.27**  
 On Display: Selector: the music scheduling system; Songtrack: the music research system; Music Base: the song information system; Master Control: the paperless studio; Prorate: magarate software for radio.  
 Intro: RECTracker: digital logging on dat tapes, multiple channel recording with simultaneous playback, remote playback from touch-tone phones.  
 Contact: Lee Facto, VP/GM  
 2 Overhill Rd, #100  
 Scarsdale, NY 10583  
 914-723-8567

**QEI Corp. 4518**  
 Intro: Variable peak duration test option (VPTDO) for 691 modulation monitor and 695 FM exciter.  
 Also: CAT-LINK digital STL/TSL, T-1 (DS-1) telco lines. 23 GHz microwave and Q-Chain direct digital input. 710 digital stereo generator with 24 bit Digital Signal Processing™. Q-Chain direct digital output for use with CAT-LINK.  
 Contact: William Hoelzel, Sr VP  
 One Airport Dr., P.O. Box 805  
 Williamstown, NJ 08094  
 609-728-2020

**Radio Design Labs 5406**  
 Intro: "Stick-On" series, ST-PA2 utility power amp, ST-PA6 audio power amp, ST-MLX3 mixer, STM-3 mic preamp, ST-AMC3 active mic combiner, ST-VPI voice-over/paging controller, ST-EQ3 3-band equalizer, ST-CL1 compressor/limiter, ST-ACRIM audio controlled relay, ST-SSR1 solid state "relay."  
 Also: "Stick-On" series, STA-1 electronic transformer pair, STA-1M line amp, ST-SH1 headphone amp, ST-MX3 and ST-MMX3 mixers, ST-DA3 and STM-DA3 distribution amps, STM-1 and STM-2 mic preamps, ST-MPA2 mic phantom adapter, ST-PH1 phono preamp, ST-VCA1 voltage controlled amp, ST-GCA1 and ST-GCA2 gain control amps, ST-LCR1 and ST-LCR2 logic controlled relays, STD series divider/combiners, STP-1 variable attenuator, STR-19 rack system, ACM-2 AM noise monitor.

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**Radio Systems Inc.** 4826  
Intro: RS Master Clock system, a synchronized clock that allows the master driver to use as its reference, an internal crystal, an external A/C line synch or any external 1K or 10K pulse. RS-700 DAT machine, for on-air and long-form programming from satellite feeds. It has RS-1000 features such as remote control, balanced audio, light cueing, fast access, "next" and "last" features and more. Allows 32 kHz sampling with optional "smart" rack mount that also provides large, illuminated controls on a lower chassis.  
Also: RS series mixing consoles for air and production studios. RS-2000 audio cart machine with phase and flutter correction. RS-1000 DAT machine.  
Contact: Dan Braverman, Pres  
P.O. Box 458  
Bridgeport, NJ 08014-0458  
609-467-8000

**ReVox** 3406  
Intro: C221 Professional CD Player.  
Also: C270, C274 and C278 reel-to-reel recorders.  
Contact: Sandra Hale, PR Mgr  
1425 Elm Hill Pike  
Nashville, TN 37210  
615-254-5651

**Redwood Marketing** N/A  
On Display: EELA Audio Broadcast and Studio Products: S20A Reportophone field reporting unit; S50 Reportomix field audio mixer; S120 series audio production and ESAM equipped edit suite consoles; SRM series on air broadcast audio consoles, and 800 series broadcast and studio accessories. Perfectone Unimag 35/17.5/16 mm magnetic tape, Unimag 35/17.5/16 mm magnetic film recorders and dubbers and Unitor high speed dubbing projectors.

**Register Data Systems** 2206  
Intro: RDS DigiCorder, a digital record/playback system for live and live-assist. R-DAS Register, a digital automation system that has CD-quality digital audio record and playback for spots, jingles, liners, IDs with total automation and satellite interface. Both interface with RDS traffic systems.  
Also: Micro-computer business systems that have sales/traffic/billing/accounting.  
Contact: Thomas Mead, Mktg Coordinator  
P.O. Box 980  
Perry, GA 31069  
800-521-5222

**Richardson Electronics** 12307,08,09  
Intro: MMD FM broadcast modules. Amperex 3-500Z power triode for AM transmitters.  
Also: Power grid tubes/rectifiers for AM, FM, TV, SW. Power grid tubes/planar triodes for UHF translators/transposers and transmitters. Cavity amplifiers for AM, FM, VHF, and UHF applications. Klystrons and TWTs for studio transmitter links. Vacuum cap acitors. RF transistors.

**Rodman-Brown & Associates Inc.** 5426  
On Display: Desk Jockey digital automation system. PC/hard disk based digital audio automation. Hardware: 14 day walk away time, 7 hours of stereo audio storage, interfaces with any satellite service, live assist or both. Systems include installation/training for operators and 24 hours service, one year warranty. Desk Jockey Lite available, same system with scaled down hardware.  
Contact: Ted "Brown" Czarnecki, VP  
1544 Lighthouse Dr.  
Naperville, IL 60565  
708-983-0977

**Rohde & Schwarz** 13918  
On Display: Radio Data System (RDS) Encoders and Decoders.

**Rosco Laboratories Inc.** 17453  
Intro: Permacolor glass filters. Glass designer patterns for high temperature applications or detailed custom design.  
Also: Cinegel color correction filters. Roscolux color effects filters. Pin Connectors and panel mounts for electrical power distribution. Ultimatte and Chroma Key Videopaints. Fog/Smoke Simulation Systems. Studio Floor Tiles. "Lighting in the Real World" videotape.

**Rusco Electronics Mfg Inc.** N/A  
Intro: Mark VI turntable, MA75 75 W power amp, MA25 25 W power amp, CD100 compact disk adapter, HA10 and HA20 headphone amplifiers. Studio Master studio mixer, Telemote 321 remote audio mixer, Fidelity Pro preamp, DA28116 distribution amp.  
Contact: Vickey Turley  
5690 E. Shields Ave.  
Fresno, CA 93727  
209-291-5591



**SCA Data Systems Inc.** 1326  
Intro: RD-57 combined RBDS/paging generator. Broadcast monitor receiver to work with Music 4 system.  
Also: 9600 bps subcarrier data system. Music 4/Data 4 four-channel audio and data system. PG 57-3 phase-locked paging generator.  
Contact: Corinne Weber, Ops Mgr  
225 Arizona Ave., Ste 350  
Santa Monica, CA 90401  
310-576-0655

**Scala Electronic Corp.** 15715  
On Display: Antennas for off-air monitoring of FM signals, boosters and translators, STL and RPU systems, and general radio communications and telemetry systems. Low noise preamps for 450 MHz and 950 MHz relay systems.  
Contact: Ellis Feinstein, Pres  
P.O. Box 4580  
Medford, OR 97501  
503-779-6500

**Scientific-Atlanta Inc.** 13929  
On Display: Analog & digital transmit and receive products for audio and data with SEDAT—spectrum efficient digital audio technology.

**Sennheiser Electronic Corp.** 18160  
Intro: MD422 upgrade of MD421-U, HMD25 supra-aural broadcast monitor headphone, HMD250 circumaural studio monitor headphone, MKH-MS system.  
Also: MD441-U supercardioid dynamic microphone, MKH40-P48U3 cardioid RF-condenser microphone, MKE4032-P3 supercardioid back electret condenser mic, HMD224 closed headphone/supercardioid boomset, HD25 studio monitor headphone.

**Sentry Systems** N/A  
Intro: DS-1 digital audio recorder.  
Also: Format Sentry PC-Based Automation.

**Sescom Inc.** 16502  
Intro: Books, ISO series, handheld test equipment, Field-Pro and audio SIPs. 40-page catalog with engineering tech topics.

**Shively Labs** 2102  
On Display: FM broadcast antennas and multistation combining systems. Rigid coaxial transmission line, band-pass filters, pressurization equipment, isocouplers, pattern studies.  
Contact: Jonathan Clark, Mktg Mgr  
19 Harrison Rd.  
Bridgton, ME 04009  
207-647-3327

**Shook Electronic Enterprises** N/A  
Intro: Model 20-36 TV production truck with air ride suspension, oak trim and stainless steel belly boxes.

**Shure Brothers Inc.** 11901  
On Display: FP410 portable automatic mixer. VP64 ENG Handheld Microphone. VP88 MS stereo condenser microphone. L Series Wireless Microphone Systems. AMS (Automatic Microphone System).

**Siemens Audio Inc.** 3400  
Intro: AMS Logic 2, digital recording and mixing console. Siemens integrated audio processing system, a customized mobile interface, including any combination of AMS and Neve digital/analog signal processors. AMS SoundField Mk V microphone, an advanced B-format, coincident and M/S stereo microphone. Mitsubishi X-880EX multitrack digital audio recorder with a 18-bit A/D converter yielding true 16-bit linear conversion and range. Mitsubishi X-8620E master recorder with high-resolution HBC-20 converters for use with X-86's 20-bit data bus.

**Smarts Broadcast Systems** N/A  
On Display: Smartcaster digital audio. Smartcart digital cart machine. CD-based digital audio.  
Contact: John Schad, Pres  
Box 293  
Emmetsburg, IA 50536  
800-742-6278

**Somich Engineering** N/A  
Intro: HPX PRO high performance headphone amplifier.  
Also: DBE-1000 dynamic baseband enhancer. PL-1 Pilot-Lok for stereo pilot. OSC-1 overshoot clipper.

**Sony Professional Audio** 11711 SS  
Intro: PCM-7010 time code DAT recorder. PCM-3324S DASH 24-channel multichannel recorder. WRT-830A electret condenser handheld transmitter.



**Sierra Automated Systems (SAS)** N/A  
Intro: APC-88, eight-character alphanumeric control panel with eight-course assignable hot punch push buttons for use with SAS 32000 series routing switcher. DCA-8 digitally controlled audio input lead amplifier for use with SAS 32000 series switching and mixing system that allows remote control in a control panel or modem of audio levels for switched paths.  
Also: SAS 32000 mixing and switching system. CPI-80 console mount control panels. ANC-8 alphanumeric control panels. ARC-8 alpha X-Y control panels. GPI 1600 Sabro interface sequencer.  
Contact: Al Salci, VP  
2112 N Glenoaks Blvd.  
Burbank, CA 91504  
818-840-6749

**Sound Ideas** 12906  
Intro: General Series 6000 digital sound effects library.  
Also: General Series 1000 and 2000. Ambience Series 3000. Hollywood Series 4000. Wheels Series 5000. Lucasfilm Sound Effects Library. Production Music Library. Sampler Library.

**Soundcraft** 16236  
Intro: BVE 100 audio follow video console. Vienna and Europa Stage production consoles.  
Also: SAC200 production and on-air console. Delta series consoles with VSA 24 audio-for-video interface.

**Stainless Inc./S.G. Comm.** 16519,20,21,22  
Intro: Guyed tower designs up to 1000 feet.  
Also: Guyed and self-supporting towers for broadcast, microwave and communications applications including 50 feet to 2000 feet with elevators. Turnkey installations, inspections, maintenance, analysis and repairs.

**Stanton Magnetics Inc.** 3124  
Intro: CD-22 CD player.  
Also: Turntable cartridges, replacement styli, turntable mats, preamplifier/equalizer, headphones, DJ starter kit, announcer/newscaster earphone, record care products, DJ equipment cases.

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*Jeff Loughridge, Chief Engineer, WCDX, Richmond, VA  
President, Audio Concepts and Engineering*

**Gentner**

Gentner Broadcast Systems, 1825 Research Way, Salt Lake City, Utah, 84119  
Tel (801) 975-7200, Fax (801) 977-0087

**Strata Marketing 307**  
 On Display: Computer software for qualitative and quantitative analysis. Presentations using Arbitron, Scarborough, Media Audit, Simmons, MA\*RT. On-site customer service and toll-free help from customer service representatives.

**Studio Technologies, Inc. 13407**  
 Intro: IFB Plus series, a two-channel interrupted fold-back (talent cueing) system for ENG and SNG trucks. Model 2 Central Controller, Model 22 Access Station and Model 32 Talent Amp are components.  
 Also: Mic-PreEminence microphone preamp, two-channel, used in broadcasting and recording applications. AN-2, ISS and Generation II stereo simulators for on-air broadcast, production and film and music recording.



Tannoy's Studio Monitor series

**Symetrix Inc. 1424**  
 Intro: 425 dual compressor/limiter/expander. Also: 528 voice processor, 511A single-ended noise reduction.

**Systems Wireless Ltd. 20136**  
 Intro: System 800 UHF Wireless Intercom System. Lectrosonics DR195 Diversity System that operates either VHF or UHF. Sony 800 Series UHF wireless microphone system.  
 Also: Broadcast quality Vega wireless microphones with UHF diversity systems (handheld and bodypack systems). Lectrosonics portable camera-mounted CR185 Series. Vega Q-Plus wireless intercom system in conjunction with Clear-Com products, such as MS-812 and matrix-plus systems.

**Studer ReVox America 3406**  
 Intro: Dyaxis II, D820 R-DAT recorder. D740 CD recorder. 823 four-way active loudspeaker. Digitec audio matrix switcher. Digital cart replacement center. NUMISYS automation system.  
 Also: A827 and A820 multitrack recorders. D820-48 digital recorder. A807-4 with center track timecode. Mixing consoles. A730/A727 CD players. Dyaxis hard disk digital recording and editing system. Contact: Sandra Hale, PR Mgr 1425 Elm Hill Dr. Nashville, TN 37210 615-254-5651

**Swintek Communications 13401.02**  
 Intro: Wireless end cap for handheld microphone, turns any handheld mic into a wireless. UHF full duplex intercoms. Four-channel wireless audio switch, switch between four hard wires. Encrypted microphones.  
 Also: Wireless lapel and hand-held microphones UHF and VHF. VHF full-duplex intercoms.

**S.W.R. Inc. 15730**  
 On Display: HP, LPTV and FM antennas. Rigid coax/waveguide.

**T.C. Electronic of Denmark 13704**  
 Intro: M5000 digital audio mainframe. DARC™ digital audio reverb co-processor.  
 Also: TC8201 AES/EBU digital audio interface test generator and analyzer. Contact: Edward Simeone, GM 717 Lakefield Rd., Ste C Westlake Village, CA 91361 805-373-1828

**TFT Inc. 2508**  
 Intro: Frequency-synthesized STL transmitter with built-in stereo generator. 9200/9205 frequency synthesized monaural STL transmitter and receiver. IF Interface STL system.  
 Also: 8900 synchronous FM booster/receiver. EBS system with Model 886 and 887, 884 and 844A FM stereo modulation monitors with P.M.D.D. frequency-agile STL transmitters/receivers for composite, mono, and dual mono. Contact: Darryl Parker, Dir of Mktg 3090 Oakmead Village Dr. Santa Clara, CA 95051 408-727-7272

**Tannoy-TGI North America Inc. 4302**  
 Intro: Bruel & Kjaer Series 4000 microphones. Omni, hi-intensity omni and cardioid designs.  
 Also: System 8 NFM reference near field studio monitor.

**TM Century, Inc. 2525**  
 Intro: Satellite commercial player using computerized hard disk digital audio recorder/player. Hard disk digital audio commercial player for live radio. Computerized 6-pack CD players with hard disk digital audio for spots.  
 Also: Computerized CD jukeboxes with hard disk digital audio for commercials, jingles, liners. Contact: Dave Scott, Chairman/CEO 14444 Beltwood Pkwy. Dallas, TX 75244 800-937-2100

**Tapscan 4325-27**  
 On Display: Ratings analysis software, Music-Scan music scheduling software.

**TTC 15725**  
 On Display: FET FM transmitters, 1 W to 8 kW. Model X FM exciter. High power tube type FM transmitters, 10 kW-25 kW. FM translators, 1 W-250 W. Contact: Russ Erickson, Mgr/Radio Prods 650 S Taylor Ave. Louisville, CO 80027 303-665-8000

**TWR Lighting Inc. 5124**  
 On Display: Aviation obstruction lighting for towers, fixtures and kits, controllers, parts and service. FAA-approved beacons, sidelights and strobes. Contact: Patrick Feller, GM P.O. Box 55606 Houston, TX 77080 713-973-6904

**Telos Systems 1024**  
 Intro: Telos 100 Delta telephone hybrid. Telos One Plus One offers two digital hybrids in one system.  
 Also: Line of digital telephone interface products: Telos One; Telos LINK; Telos Direct Interface; Telos Key System Interface, and Call Screen Manager.

### The Digital STL Advantage

- CD-Quality Audio
- Higher System Gain
- Constant SNR
- No Crosstalk
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Open and optimal partition of source and channel coder. AES/EBU allows for end-to-end digital connectivity.

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A new transmission technology that has the power to deliver CD-quality audio and solve your STL problems.

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fractional T1 applications! The DSP 6000 source coder is characterized by peak level preservation, low coding delay (3.8 ms), excellent bit-error immunity, and multiple encode/decode capability. The channel coder offers spectral efficiency, constant envelope, error detection capability and perturbation tolerance.

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World Radio History

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Everybody's been waiting and talking about audio hard disks for years, and now there's a bunch of them—adapted PCs with QWERTY keyboards, floppy drives and DOS operating systems... the last thing you want the audio console operator to deal with. Wheatstone's Not So Hard Disk gives your operator a simple and foolproof DISK CONTROL PANEL, with a clear, bright CRT color display that is easy to understand. It allows a view of both current and upcoming events. Familiar START/STOP buttons interface directly to console channel

ON/OFF buttons. Simply hit START on this panel (or "ON" on your mixing console) and the selection is initiated. No need to worry about the console operator accessing the operating system and accidentally reformatting or erasing data. With the new Wheatstone hard disk system you get all the security you're looking for, including mirror drive back-up and a separate production room record terminal; it even has networking capability.

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World Radio History

Circle (84) On Reader Service Card



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FOR YEARS  
TO COME.**

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and avoid the rush.**

No one knows exactly what makes a product a classic but everyone knows which products qualify. We do know that "standards" of the industry always excel in technical performance, comfort, durability and appearance, so with these as our criteria the V Series was designed to be superior to any headset on the market. By all accounts, after years of development, we succeeded.



Earcup fits any head shape or size.

Technically, the V Series specs are a cut above the rest.

But classics are created over time by the people who use them, not by manufacturers' claims, so let your own ears confirm our data. The revolutionary floating earcup conforms to any head shape or size for a more comfortable fit. But, of course, you'll realize that after one of those long, grueling production days. We know the materials and workmanship are second to none, but only time can tell about its durability. However, when enough time has passed to be a fair test, the V Series will already be a classic.

For complete details about the unique V Series modular ordering concept, outstanding specs and the comfortable



Model V220 with  
MB-11 Dynamic  
Mc option.

new earcup design write to Telex Communications, 9600 Aldrich Av. So., Minneapolis, MN 55420, (612) 887-5550.

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**TELEX**®

Circle (137) On Reader Service Card  
World Radio History

**Tektronix Inc.** 18032  
Intro: VM700A, Option 21 automated camera measurement set. VS210 NTSC video synchronizer.  
Also: VM700A video measurement set. TSG-100 series of test signal generators. 760A stereo audio monitor. TSG-1001 programmable generator. TSG-1050, 1125, 1250 HDTV generators. SPGI000 HDTV sync generator. 2467BHD oscilloscope. 1730HD waveform monitor. Serial digital video interface option. Avanzar Video System. Synchronizers, generators, component/composite waveform monitors and vectorscope systems.

**The Management** N/A  
On Display: Digital DJ, digital audio hard disk and satellite controller. EZ-Log. Simple-Log and Super-Log traffic systems. Music Log, computer music selection.  
Contact: Peter Charlton, Pres  
P.O. Box 1-36457  
Ft Worth, TX 76136  
817-625-9761

**Varian Power Grid & X-Ray Tube Products** 12451  
On Display: Eimac power grid tubes. 4CX20, 000A, and power tetrode.

**Vega Wireless** 19656  
Intro: RMT-10 wireless IFB transmitter. PL-2 2-channel mini bodypack IFB receiver. AX-20 Professional studio wireless microphone system.  
Also: UHF "600" series wireless microphone system. "Q" Plus wireless intercom system.

**Wireworks Corp.** 14044  
Intro: Refit/repair department to protect existing cabling investments. We inspect, repair, and test cable assemblies or refit them with new Wireworks industry standard connector assemblies.  
Also: Wireworks microphone multicable components group: multipin-based audio cabling components, 3-50 channels. Multiboxes, multitrunk extension cables, multitail fan-outs, transformer isolated microphone splitters.

**The Express Group** 1208, 2312, 3902  
On Display: Series 6000 and 5000 at ITC booth 1208. Series 4000 furniture at BE booth 2312. Series 5000 furniture at Audiotronics booth 3902.  
Contact: Byron Andrus  
3518 3rd Ave.  
San Diego, CA 92103  
619-298-2834

**Transamerica International Broadcasting** 2506  
On Display: Radiolinks for FM. FM exciters/transmitters, low and high power. TV exciters/transmitters, low and medium power. TV microwave antennas. FM/TV antennas.

**Trompeter Electronics Inc.** 12801.02  
On Display: Patching products for re-routing of RF and video signals, standard and miniature patch jacks, "normal through" jacks, paralleling jacks, patch plugs, patch cords and cable assemblies. 50/75 ohm BNC connectors. 20 series coax. Wrench Crimp.

**Ward-Beck Systems Ltd.** 12501  
On Display: D8212 distribution amplifier systems, MicroCOMM II digitally controlled programmable communications system, R series radio consoles, ST series stereo television audio consoles.

**WaveFrame Corp.** 12463  
Intro: Time compression/expansion for WaveFrame 1000. Digital mixer for WaveFrame 400. CD recording interface for WaveFrame 1000. Also: WaveFrame 400 and 1000.

**Wheatstone Corp.** 5000  
Intro: TV-600S console with bus-minus IFB system, event computer, source displays above each fader, eight-input Smart Select pre-selector overbridge, two stereo and two mono master outputs, mono or stereo subgrouping.  
Also: Audio consoles: radio on-air (A-20, A-32, A-50, A-500) stereo production (SP-4, SP-5, SP-6), radio and TV master control (TV-600). Digital audio hard disk storage/playback system. Signal processing equipment (compressor-limiters, parametric and graphic equalizers, electronic crossovers, distribution amps, line selectors). Intercom system, studio furniture (stock, custom, pre-wired and tested).  
Contact: Kelly Major, Asst Mktg Dir  
6720 V.I.P. Pkwy.  
Syracuse, NY 13211  
315-455-7740

**Y Z**

**Yamaha International Corp.** 13746, 13846  
Intro: PM4000 audio mixing console.  
Also: YPDR601 Professional CD recorder. DMC1000 digital audio mixing console.

**Zero Stantron** N/A  
Intro: Wood-trimmed consoles. Epoch 2000 racks and consoles series.  
Also: Racks, consoles, accessories.



TFT 9160/9167 monaural STL

**Telex Communications Inc.** 15860  
Intro: MicroMini series of miniature electret lapel mics. Microneck series of gooseneck microphones. V-100 series professional headsets. FMR-100 wireless mic receiver. Economic cassette tape duplicators.  
Also: Microphones, wireless microphone systems, headsets, monitor earsets, intercoms and audio tape duplicators.  
Contact: Ronald Taylor, Mgr/Adv & Mktg Svcs  
9600 Aldrich Ave. South  
Minneapolis, MN 55420  
612-884-5041

**U V**

**UREI, a division of JBL** 16236  
Intro: LA-10 single channel compressor/limiter. LA-12 dual channel compressor/limiter. LA-22 dual channel parametric compressor/limiter/expander.

**Utility Tower Company** 2824  
On Display: Samples of tower sections for AM, FM, TV, CATV, LPTV and microwave communications.

**Will-Burt Co.** 16636,37  
Intro: Low profile 12 VDC pan and tilt positioner with variable speed, and sits two inches above mast height. Pendant mounted controls for remote operation. Mast extension warning kit.  
Also: Pneumatic telescoping masts to position antennas, sensors or cameras up to 134 feet. Standard duty mast models for mobile radio remotes or testing up to 34 feet. Heavy duty mast models for cameras, sensors or mobile ENG and SNV remotes up to 58 feet.

**Winsted Corp.** 13122  
Intro: System/90 post production console. Desktop production workstation with recessed monitor.  
Also: System/85 modular editing and post production consoles. Space saving video tape storage systems.

**Wohler Technologies** 20176,77  
Intro: TDM-1 time delay meter module. DAM-1 desktop audio monitor.  
Also: MSM multi source metering series. ARS series routing switchers. AMP-1A, AMP-2 speaker systems.

**Valentino Music And Sound Effects** 12208,09  
Intro: New releases to production music and sound effects libraries, plus "Mini" sound effects library.  
Also: Two music and effects libraries for radio production. Music consists of 60+ CDs and sound effects consists of 40+ CDs.

**Tennaplex Systems Ltd.** 15715  
On Display: Broadband panel antennas for TV and FM. Combiners and filters for transmitters. Wave splitters. Non-inductive coaxial bullets for high power. Antenna pattern computing program.

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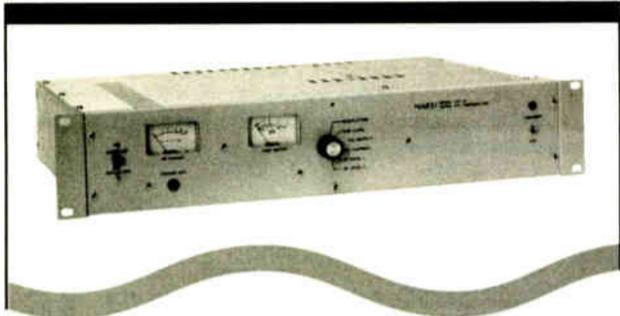
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# PLAN A

**SMALL STATION  
LOCAL NETWORKS:  
THE MICROWAVE  
PATH TO PROFITS**



*A single Marti STL-10 Transmitter delivers mono programming to transmitter sites up to 40 miles from the main station. (Two STL-10s required for stereo programming.)*

## TRYING TO GO IT ALONE COULD MEAN GOING DARK

In the 90s, many rural and semirural communities have become too small to support a typical radio station staff—or the typical station's debt load. For proof, just look at the growing number of small market stations going dark. That's too bad, because these communities still need and deserve the benefits local radio can provide—

services such as local news, weather alerts, school closings, community events, etc. But how can a station survive and generate a profit when its market can no longer support an independent operation?

## NETWORKING BRINGS OVERHEAD IN LINE WITH REVENUES

The key to small station survival and profitability is efficient operations—doing more with less and with fewer people. One viable station can provide organizational support and even much of the programming for several "satellite" stations that would otherwise have shut down. Since satellite stations need only a salesperson or salesperson/announcer, they can contribute profits to the whole system at realistic revenue levels. At the same time, satellite stations contribute to the life of their communities with improved programming that builds listener support and advertiser satisfaction.



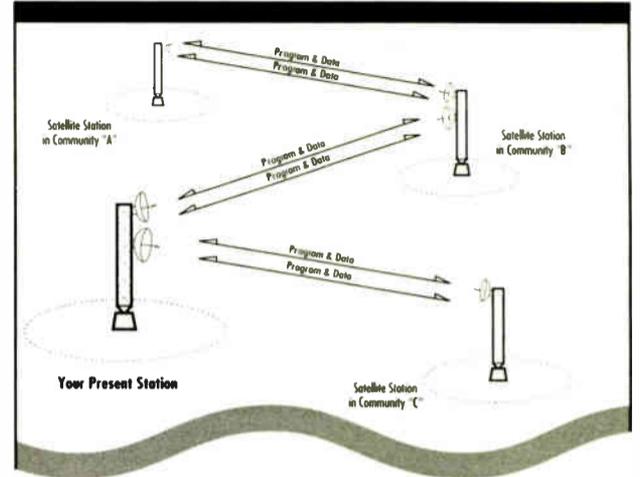
*Marti subcarrier generators and demodulators provide transmitter remote control as well as intercom functions between stations on the network.*

## MICROWAVE STL/ICR SYSTEMS DO THE JOB AT LOW COST

Modern microwave STL (Studio/Transmitter Links) and ICR (Inter-City Relay) systems use reliable, proven technology to provide versatile communications capabilities at low cost. Interactive technology from manufacturers like Marti Electronics can carry programming, transmitter control and telemetry signals, even EBS tests.

Two-way links let you "backhaul" local programming from satellite communities for rebroadcast from the central station, so you retain 100% control at all times. You can even eliminate phone charges between networked stations with multiplexed two-way voice and data channels that let you run contests or call-in shows and traffic spots from the central station.

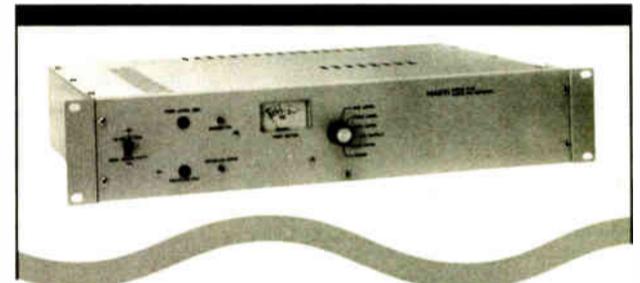
**Don't wait to put PLAN A to work for you. See us at NAB Las Vegas Booth 2218.**



*Two-way interactive microwave technology gives you full control of satellite programming without the need to duplicate office, engineering and air staff.*

## NETWORKING IS MORE THAN SIMULCASTING

Satellite local stations use the central station's office and administrative services and much of its programming. But satellites have to be more than just simulcast "repeaters." Local content in the form of news, sports and talk programs is the key to ongoing community and advertiser support.



*Marti's R-10 Receiver — engineered to work with the STL-10 in 950 MHz microwave STL and ICR linkups.*

## HARRIS ALLIED HAS THE RESOURCES TO MAKE PLAN A WORK

The Great Depression of the 1930s was a difficult time for many, yet fortunes were made by creative business people throughout the years. The more than 250 dark radio stations now waiting to be turned into "satellite" profit centers in local networks are just such an opportunity. Harris Allied product experts will help you engineer a deal that can literally "pay for itself."

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## AMPLIFIERS

### Want to Sell

HPX high-perf headphone amp for monitoring, processing, setup, Q-C & maint checks, stereo, balanced instrumentation inputs, rack mountable. J Somich, 216-561-1919.

McMartin MS-252 audio, 25 W, 2 mic inputs, 1 line input, 4.8 ohm & 70 V outputs, \$200/BO. M Glaser, MRG Prod Assoc, 95 Colony Dr, Holbrook NY 11741. 516-447-1041.

Eddor PA-50 single chnl 5 1/2" rack mount audio, excel cond, \$135. Gary, 602-258-6161.

Perma Power S-102 w/S1420 batt holder, mobile/portable PA unit, 12 W out, SS excel cond, \$100. R Sumner, CAVU, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

Audionics 100+100 W pwr, silver, rack mount w/handles, \$100; Soundcraftsman CX4100 2-band 1/2-octave preamp, black, 19" rack mount, will trade for tube gear, \$200, all in gd cond. R Glenn, 813-634-1940.

RCA BTE-15A w/2 SCA generators, extender board & book. 503-774-0459.

Crown D-75 gd cond, limited use, \$275. Davis, MCP, 1504 Sunset, Newberry SC 29108. 803-276-0639.

Crown Micro-Tech 1200 320 Wchnl 8 ohms, 495 Wchnl 4 ohms, 700 Wchnl 2 ohms, 1315 W 4 ohm bridge mono, new w/balance xlerable warranty, B Fisher, KPOK, 122 S Main St, Bowman ND 58623. 701-523-3883.

Auditronics AUD-1100DAGLC (20) in 2 AUD-1100-MF 10-input mainframes w/AUD-PS60 RM external pwr supply, \$1200. B Lord, Lord Bldg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Auditronics AUD-1000DAGLC (20) in 2 Auditronics AUD-100-MF 10 input mainframes w/external pwr supply, \$1200+s/h. B Lord, Lord Bldg, 13313 SE 28th St, Kent WA 98042. 206-631-2374.

RCA, Altec tube mic pre's & tube amps & mixers; Langevin AM-16's, sale or trade. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

### Want to Buy

ATI DA-416 (1) Quad 1x4 distribution amp in gd cond. C Knerr, KCNA, 139 SE J St, Grands Pass OR 97526. 503-474-7564.

## ANTENNAS & TOWERS

### Want to Sell

Andrew 3" Helix 300'; various connectors, BO; Phelps Dodge HPCFM 6 6-bay FM on 93.1, \$4500. S King, KIXZ, 1703 Avondale, Amarillo TX 79116. 806-355-9777.

Anixter parabolic TRF 6020; P942, both \$80 ea. S Southern, WCIR, Box 1037, Beaver WV 25813. 304-252-6452.



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Kintronics Isocoupler 103.7 MHz, \$1000. S Southern, WCIR, Box 1037, Beaver WV 25813. 304-252-6452.

Tower, 350' w/24" face w/lights & beacon, 7 yrs old. C Shank, KSKU, 106 N Main St, Hutchinson KS 67501. 3116-665-5758.

Monopole, 102', free to good home, avail 3/1, you take down. B Engblade, WKLA, Ludington MI. 616-843-3438.

Rohn (5) 20' 65q sections, \$400 ea; approx 180' of HJ7-50A coax w/type-N conn, \$6/ft, add \$150 for conn. Robert, 817-566-5036.

Andrews (50) insulated line hangers; Phelps-Dodge CFM LP2 2-bay circ polar w/radomes, tuned to 105.5. B Walters, WASE, POB 2087, Elizabethtown KY 42702. 502-769-1055.

Harris/Gates FMC-4A 4-bay FM, circ polar, tuned to 97.7, excel cond, \$1500, FOB Clinton IA. B Dieckman, KCLN, 1853 442nd Ave, Clinton IA 52732. 319-243-1390.

Dielectric 50000 3 1/8", 4 port motorized coaxial xter switch, excel cond w/local control panel, \$2800. R Sharkey, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-456-4070.

Shively 6813 bay w/radomes, new, tuned to 96.1, \$6500. D Magnum, WBOG, 1021 N Superior Ave #5, Tomah WI 54660. 608-372-9600.

Shively 6810 6-bay w/2 1/2 yr old deicer, BO; Cablewave 250 pt 3 1/2" xmission line w/o connectors, (2) 500' runs of 7/8 xmission line. B Newman, KEFX, 913-661-0101.

Shively 6810 6-bay w/2 1/2 yr old deicer, BO; Cablewave 250 pt 3 1/2" xmission line w/o connectors, (2) 500' runs of 7/8 xmission line. B Newman, KEFX, 913-661-0101.

20' sections (18), very sturdy, 18" face w/1 good, 1 rebuildable beacon, conduit, base insulators, guy wire, BO. L Tschirhart, KVMK, POB 681321, San Antonio TX 78268. 512-599-6511.

Cortana folded unipole, upper skirt; 27 1/2" x 26 1/4" square shaped tower bracket for Rohn 25; 30 1/2" x 89 1/2" L shaped tower bracket; 74' 5/8" Helix; 141' 5/8" Helix; various 27 pair multi-cable shielded, under 30'; punch blocks & jack panels. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 78902. 915-949-2112 ext 20.

Jampro 2-element custom-built directional panel, tuned at 93.9 MHz, never used, BO. B Kingman, KRIT, Box 15460, S Lake Tahoe, S Lake Tahoe CA 96151. 916-541-6681.

Bdct Feedline 400' guyed, 20' x 12' bldg & 17 acres. D Schroeder, KOSU, 302 Paul Miller Bldg, Stillwater OK 74078. 405-744-6352.

ERI 2-bay Rototiller tuned to 101.7, 6 yrs old, 360' 1 5/8 Andrew line, \$2500. C Maley, KSIB, Box 426, Creston IA 50801. 515-782-2155.

Andrew 87G-83799 (2) 1 5/8" helix, EIA flanges, gas blocking, new, \$200 ea. B Brewer, KOKL, 410 W 6, Okmulgee OK 74447. 918-756-5400.

Rohn 55-G 310' w/lightning pkg & guy wire, 5 yrs old, \$9000. B Williams, WBLG, 948 Fairview Ave, Bowling Green KY 42101. 502-843-0107.



## ICE CRACKERS, INC.

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### Circle (75) On Reader Service Card

Scala HDCA10 (4) 10-element Yagis tuned to 102.3, gd cond, \$150 ea4 section Rohn 25, \$50/section; Andrew 4 lengths of 1/2" foam Helix, \$250 all. D Rose, KAAA, POB 3939, Kingman AZ 86402. 602-753-2537.

UTC type 480/340 100-meter; 370' 1 5/8 air dielectric coax, BO. B Leggett, KRVE, POB 68, Denham Springs LA 70727. 504-665-5154.

Andrew HJ8-50B 800' cf 3" Helix, \$15,000. T Sittner, KSTX, 8401 Data Point Dr, San Antonio TX 78229. 512-271-9600.

Cortana folded unipole, upper skirt; 27 1/2" x 26 1/4" square shaped tower bracket for Rohn 25; 30 1/2" x 89 1/2" L shaped tower bracket; 74' 5/8" Helix; 141' 5/8" Helix; various 27 pair multi-cable shielded, under 30'; punch blocks & jack panels. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 78902. 915-949-2112 ext 20.

CSP phasor built for 5 kW day/1 kW night; DA-2 5 twr array on 1410 kHz; Potomac Instruments AM-19D phase monitor for 5 twr array, BO. L Fuss, WDTL, POB 159, Fayetteville GA 30214. 404-460-6159.

Shively 2-bay w/radomes, used only 7 wks, tuned to 96.1, \$6500. D Magnum, 608-372-9600.

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### Want to Buy

100-145' guyed/unguyed tower, minimum size like Rohn 25G. M Bohn, WLIO, Box 1689, Lima OH 45802. 419-229-7091.

Any antenna tuned to 100.1 MHz, 1/2 bays. D Reynolds, WGFM, 1356 Mackinaw Ave, Cheboygan MI 49721. 616-627-2341.

Antenna in gd cond 100.5 freq, need by 3/92. D Rogers, KXAX, POB 465, St James MN 56081. 507-375-3386.

300-350' tower, used, L Trammell, WVVNT, POB 1828, Dothan AL 36302. 205-792-2161.

Xmission line 400' of 3 1/8"; 300' of 1/2" of 7/8", various lengths. R Dees, KARX, 3507-A Van Tassel, Amarillo TX 79121. 806-355-4554.

450' w/36-48" face, lights, guys, pref located in SW. R Simmons, Austin Bldg, POB 50124, Austin TX 78763. 512-476-5200.

400-500'; 8-bay FM or near 99.9 MHz. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Helix, 78', 50-100'; 1 5/8"; 300'; 3" larger, 400-500'. J Powley, WJIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

LAPP 9861 AM base insulator, gd castings. D Mance, WTOJ, 199 Wealtha Ave, Watertown NY 13601. 315-782-1240.

UHF TV w/Scala parapanels & SC-8, Bogner B Series or LPS Thomas UHF panels, tuneable to chnl 31/40/48; Rohn #80 tower sections; GE UHF TV for parts, 100 W driver & 30/55/110 kW amps. J Powley, WJIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

## AUDIO PRODUCTION

### Want to Sell

dbx 155 (2) 4-chnl type 1 noise reduction, \$200 ea/\$375 both; AKG BX-5 dual spring reverb, \$150. P Cibley, Cibley Music, 136 E 38th St, NY NY 10016. 212-986-2219.

SAVE \$300 ON T T 144 POINT PATCH BAYS brokers of line and coarse used equipment audio village 619/320-0728

ATI Emphasizer vgc, \$525. C Crouse, 46 Cedar St, Dedham MA 02026. 617-461-2699.

Burwen TNE 7000 looks gd, working when removed from svc, \$50+s/h. D Moore, WDUZ, Box 310, Green Bay WI 54305. 414-468-4100.

Rane HC 6 headphone amp 235; PE15 equalizer 235; Alessi Microlimiter, \$100; Symetrix 517A noise red unit, \$425; dbx 224 XDS type 2 noise red unit, \$150; (2) Furman PB40 patchbays, \$85/ea. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

Orban 111B stereo reverb, clean, \$400. P Wolf, 813-574-5548.

Burwen 1000 Dynamic Noise Filter, gd cond, \$350. D David, KMBA, 5000 Marble Ave NE, Albuquerque NM 87110. 505-262-1866.

Comrex TLX, low freq ext, \$750; PLX, port low freq ext, \$500; Telex 3+1 tape duplicator, \$300. R Meadows, Durham Bulls, POB 507, Durham NC 27702. 919-688-8211.

Radio Systems CP-15 (12) couplers, excel cond, wired w/6' 3 phase cable & 3 phase disc plug, \$90 ea. R Rossman, 814-865-9568.

### Want to Buy

Orban 222 stereo enhancer. M Friend, WTJV, Box 711 Newcomb Hall Sta, Centerville VA 22904. 703-924-0885.

Ampex 350 & 351 electronics. Wayne Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728 or FAX 619-320-2454.

AMCO 10 or 20 position stereo audio/video switch boxes. TKV, 301-445-5450.

Ham radio operators looking for surplus audio processors, mixers & mics, as well as other inexpensive gear that could help bdct engs play radio at home among enthusiasts for vintage AM. Please write w/offerings. WA3VJB, Box 73, West Friendship MD 21794-0073.

## AUTOMATION EQUIP

### Want to Sell

Schafer 901 w/4 SMC 250 Carousels, 1 SMC 350 Carousel, 1 SMC 250 Carousel (parts), 3 racks, 3 ITC WP mono cart machs, \$5000. S Southern, WCIR, Box 1037, Beaver WV 25813. 304-252-6452.

Otari ARS-1000 (2) tape transports w/tone decoder, \$650 ea. S King, KIXZ, 1703 Avondale, Amarillo TX 79116. 806-355-9777.

IGM Go-Cart 24 stereo Carousels (2) & an IGM EC automation controller, never used, wired for 220V/50 Hz, BO including freight. F Hirschmann, BCI-Rundfunkberatung, Reichswaldstr, 52-8501. 0-911-50 00 35, FAX 9-911-500 96 52.

Conex CG-25 tone gener w/manual, \$225. M Meyer, KLOP, Box 70, Madison MN 56256. 612-598-7301.

Schafer 903-E w/(4) Revox A-77s, (2) Audiophile 2-AS, Extel logger, I/O cards & cables for studio/net, ITC/UMC carts, spare parts, manuals, stereo, working, \$4000/BO. B Kingman, KRIT, Box 15460, S Lake Tahoe CA 96151. 916-541-6681.

SMC ESP-2 8000-event prgrm mem, 800 time command mem, 20 stereo inputs, 6 prgrm remote, 8 prgrm ext, 2 remote keyboards w/monitors & cables, (6) 352 stereo car, (5) Otari ARA 1000, SMC 722 PB, \$7000. F Troiani, WMRP, 12 1/2 E Market, Lewistown PA 17044. 717-248-6757.

Format Sentry FS-120 IGM Go Cart 24 w/Goldstar PC w/keyboard, Pana KX-P1092 multi-mode printer, (3) ITC single play cart machs, 1 R/P, 2 play only. C Jenkins, POB 1897, Louisville KY 40201. 502-587-0970.

Instacart machines (2) 48-hole w/Sentry firing and IBM-PC software. 503-774-0459.

IGM (5) Go Cart, (24) stereo, 4 Otari ARS 1000DC P/B, (3) Fidelipac stereo cart P/B, auto rwd, cue & load, excel cond, \$19500. B Walters, WASE, POB 2087, Elizabethtown KY 42702. 502-769-1055.

MW Persons 3-A Programmer w/unltd sequential rotation of up to 4 sources, excel cond w/manual, \$600; Microprobe Electronics 24 Station/8 source controller, need rpr or good for parts w/remote control switch pad, \$150. R Chambers, KSUE, 916-257-2121.

MW Persons Programmer 3A live assist tape controller w/auto sequence option, excel cond, \$700. M Persons, KLOH, Hwy 30 W, Pipestone MN 56164. 218-829-1326.

SMC 452 stereo Carousels (2) plus MEI Sat-master 1000 event programmer, cables, manuals, \$1700+s/h. R Kerbyway, WTN, 609 Main St, Mt Hope WV 25880. 304-877-5592.

SMC 350RS Carousels, \$250 ea; Ampro CT4500, \$250; Infont Encore computer, \$100; SMC racks, \$75; Schafer 903 parts/boards; SMC DP2 Instacart interface, \$200; Scully 270s (4) for parts, \$400; SMC 250 Carousel & extra boards, \$150. D Rose, KAAA, POB 3939, Kingman AZ 86402. 602-753-2537.

Jones Sat Audio net commander, \$650. A Neri, WGTK, Box 590, Middlebury VT 05753. 802-388-4101.

350RS Carousel, \$400. Kelly, 503-933-2217.

Otari ARS 1000 (5) w/manuals, clean & well maint, \$800 ea; IGM 48 tray stereo Instacart (2), 1 needs capstan motor, \$2500, other \$3000; IGM Go-Cart 24 w/manuals, 1 yr old, \$2000. T Teagarden, KELI, Box 3834, San Angelo TX 76902. 915-655-5483.

Harris SC-90 (2) auto controllers, one removed from svc, one for parts w/books, cables & 733 ARS system, \$995. R Redmond, WWSC, 217 Dix Ave, Glens Falls NY 12801. 518-798-1031.

Conex DS-25-3, 25 Hz sensor, 6-chnl, \$536; CG-25R, 25 Hz gener, both rack mount, J Blodgett, WGTG, 308 Westgate Pkwy, Dothan AL 36303. 205-794-4770.

MW Persons programmer easy oper, set up w/manuals & cables, compatible wall reel decks, \$650. P Wolf, 813-574-5548.

Insta-Cart (2) 48-cart 1.6M, excel cond, \$3500/BO. R Carr, 509-925-1488.

### Want to Buy

CD juke box & multiple CD plyrs. J Stromquist, WNCB, 2828 Piedmont Ave, Duluth MN 55811. 218-722-3017.

Wegener 1801/1601 systems. Kelly, 503-933-2217.

Okidata Microline 182 printer; serial data card for SMC. D Rose, KAAA, POB 3939, Kingman AZ 86402. 602-753-2537.

SMC Mini-Pro, very gd cond. J Torsitano, KNIS, 6363 Hwy 50 E, Carson City NV 89701. 702-883-5647.

## CAMERAS (VIDEO)

### Want to Sell

Shintron FP157 w/remote unit, 20-100 Fujinon zoom, \$200. J Baltar, ME Reel Video, 67 Green St, August ME 04330. 207-623-1941.

RCA TK45 studio, lenses, CCU, cables, J Panza, LZZS, Box 9847, Kansas City MO 64134. 816-767-1118.

## CART MACHINES

### Want to Sell

BE Spotmaster 505C mono, works, \$100+UPS. L Spivey, WLLS, Hwy 231 S, Hartford KY 42347.502-298-3268.

BE 5310 stereo rec amp w/aux tones, gd cond, \$800. R Cowell, KNTR, POB 308, Ferndale WA 98248. 206-384-5117.

Pacific Recorder Micromax mint cond, stereo in rack mountable pairs, \$3000 pr/(6) \$5500. K Rosato, Sound Bldg, 303 Webster Ave, New Rochelle NY 10801. 914-235-5939.

Tapecaster X700RPS \$695; (2) X700PS, \$495 ea, both in very gd cond. DA Ishkarian, 132 Arbor Oak Dr, Ashland VA 23005. 804-752-6942.

BE 2100RPS stereo R/P, \$775. Gary, 602-258-6161.

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Scully 8300 3-deck tape reproducer, audio switcher, reload indicator, 150 Hz sec cue tone, \$250. Jaye, Nimbus Prods, POB 5903, Takoma Park MD 20913. 301-507-3358.

Gates Criterion R/P, \$150; Tapecaster 700P, \$75. S Southern, WCIR, Box 1037, Beaver WV 25813. 304-252-6452.

Tapecaster 700 R/P, gd cond, \$300; (2) 700P, needs work, \$100 ea. T Hopkins, Alexandra Comms, 580 Roger Rd, Walla Walla WA 99362. 509-529-7094.

RCA rack mount bdcrt cart P/B & separate recrd unit, \$75+sh. Ronnie, Super Sonics, 1401 NE 159th St, N Miami FL 33162. 305-949-2040.

LTC WP (2), \$350 ea. Kelly, 503-933-2217.

Dynamax CTR II (4), work great. J Eck, KSAJ, POB 69, Abilene KS 67410. 913-263-1560.

ITC 3D (2) motors w/new bearings, works gd, \$100 ea. mono, \$550; SMC stereo deck, \$150; Tapecaster 700-P mono, \$100, rblt audio & cue cards in all; Gates Critreon 80 compact, \$75; LEL splice finder, \$30; BE winder w/counter, \$75; Spotmaster winder w/case, \$40. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

BE 2100 R/P mono w/tones, \$550. R Redmond, WWSC, 217 Dix Ave, Glens Falls NY 12801. 518-798-1031.

Tapecaster 700RP mono R/P w/manual, gd cond, \$250. D Davis, KMBA, 5000 Marble Ave NE, Albuquerque NM 87110. 505-262-1866.

ITC 3D triple-deck mono; Harris 90-3 triple-deck stereo; IGM 92A stereo; Contel CT-101P-B mono; ITC PDII mono; (2) Gates CPR mono w/rec amp. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

**Want to Buy**

Collins dual R/P, svc manual, any cond; Amp pro R/P w/rapid cue. J Panza, LZSZ, Box 9847, Kansas City MO 64134. 816-767-1118.

Fidelipac Dynamax CTR123 R/P, gd cond. J Torsitano, KNIS, 6363 Hwy 50 E, Carson City NV 89701. 702-883-5647.

**CASSETTE & REEL-TO-REEL RECORDERS**

**Want to Sell**

Marantz/Superscope PMD220 3-head cassette, works well, \$80+s/h. R Zimmer, Snd Enhc, 2430 N Dodge #NO134, Tucson AZ 85716. 602-326-2080.

Telex 6120 XLP high-spnd cass duplicator, master w/3 slaves & rwd mod, used less than 100 hrs, \$5000; ITC 850 stereo R-R RP, \$1750. S Southern, WCIR, Box 1037, Beaver WV 25813. 304-252-6452.

Ampex AG-440C-2 2-chnl, 7.5", P/B only, \$1000. A Garza, Foster Comms, 2824 Sherwood Way, San Angelo TX 76902. 915-949-2112.

Dictaphone 1" 40-trk loggers mounted in rack w/time/date gener/reader, gd cond, \$1875. Gary, 602-258-6161.

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Campbell, CA 95008  
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Tandberg 641X 1/4-trk rarely used, BO. S Winthrop, Winthrop Prods, 156 W 94th St, NY NY 10025. 212-662-8685.

Ampex MM1200, 8-trk remote AL control box, \$4500; 354 stereo in metal cabinet, \$495; PR10-2 stereo w/354 elecs, \$295; 440 transports reconditioned bearings, brakes, \$395; motors parts 8 & 16-trk heads. J Price, Price's Recording Studio, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

Nagra #N03 use for cinema, TV & radio, single-trk recorder, XLR input, signal to noise ratio, use for bdcig, \$950; #IV-D, use for music, TV & film, full trk, Neopilot sync system, XLR inputs, use for bdcig, \$1500. Jaye, Nimbus Prods, POB 5903, Takoma Park MD 20913. 301-507-3358.

Revox A77 less R/P heads, 3 3/4"/1 1/2 ips, poor cosmetics but good parts, \$125+s/h. D Dintlenfass, 206-784-4803.

MCI 110B used parts in gd working cond, motors, set transport cards w/micro, complete audio drawers. M Shea, Precision, POB 723, NY NY 10276. 212-989-2684.

Tascam 42B 1/4" stereo mastering recorder, balanced I/O, 2 hrs use, rackmount, \$2000/BO. M Ravain, Trinity Christian Music, POB 2479, Flagler Beach FL 32136. 904-439-3671.

Tascam 34B 4-trk w/dbx, rack mount, \$1825. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

Otari MX-5050 MKIII-4 in gd physical/elect cond in roll around cabinet. J Glass, WROK, 3901 Brendenwood Rd, Rockford IL 61107.

Crown 6CSX 1/2-trk 10.5", tube elect, works well, clean w/case & manual, \$250/BO. R Glenn, 813-634-1940.

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Revox A77 1/4-trk in walnut case, very gd cond, \$570; Uher CR240 portable prof w/ALC, monitor line adapt, leather case, access, excel cond, \$650/BO. J Paul, 2800 3rd St, San Francisco CA 94107. 415-821-6464.

Revox A-77 gd cond, 1/4-trk, \$250. M Turner, WYIC, 7641 Camberwood Dr, Indianapolis IN 46268. 317-872-3004.

Otari MX5050 MKIII-8 8-trk, less than 2 yrs old, in roll stand, \$3500. E Kain, WWL, 1450 Poydras St, New Orleans LA 70112. 504-593-2105.

Otari ARS-1000 (4) 2-chnl, 1/4-trk/1/2-trk w/25 Hz tone sensor & cue tone relay w/adjustable delay & manuals, excel cond, \$1100 ea. R Chambers, KSUE, 916-257-2121.

BE Spotmaster 2000 (3) mono P/Bs, \$300/3. B Walters, WASE, POB 2087, Elizabethtown KY 42702. 502-769-1055.

3M M7916 16-trk 2" master recorder, gd cond, great sound, \$7000; M-79-8 8-trk 1". M Cogan, Bay Records, 1741 Alcatraz, Berkeley CA 94703. 510-428-2002.

Realistic SCT-74 stereo dual deck, play/no record, \$40+UPS. L Spivey, WLLS, Hwy 231 S, Hartford KY 42347. 502-298-3268.

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Scully MS-280-2 console, P/B & R w/remote, \$400 ea+s/h. D Vernier, KUNI, Univ of No IA, Cedar Falls IA 50614. 319-273-6400.

Otari ARS 1000 DC R-R's (4), 2 chnl reproducer, 1/4" 1/2 trk w/25Hz tone sensor & cue tone relays w/adjustable delay, excel cond, \$1100 each. R Chambers, 916-257-2121.

Scully 286B (2) 1/4" mono w/manuals, 1 for use, 1 parts, BO+s/h. D Moore, WDUZ, Box 310, Green Bay WI 54305. 414-468-4100.

Otari MX-70 16-trk 1", mint cond, \$10500. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

3M M79 24-trk, excel cond, \$9950. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Marantz/Superscope PMD-220 \$80+s/h. R Zimmer, 602-236-2080.

Revox A77 (2), \$350 ea; PR-99 (1), \$750; Ampex ATR-700, \$750, all in gd shape. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

Tascam 35-2B, \$500; 32-2B, \$300, both 1/2-trk 1/4" open reel. D Gaydos, NYU, 721 Broadway 11th Fl, NY NY 10003. 212-998-1665.

Ampex AG-440B-8 1", gd cond, in console w/remote & manuals, STL alignment tape, take-up reel, \$3000. G Falk, Falk Rcrdng Studio, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Scully 270 (5) some work, \$550/BO. M Kessler, KAWZ, 241 Main Ave, Twin Falls ID 83303. 208-733-3133.

Scully 100-16 w/8-trk heads, \$2900. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Magnecord PT-6 & others, recorders/transports/amps/tube equip, BO. L Dupree, KSYL, 1115 Texas Ave, Alexandria LA 71301. 318-487-0347.

Ampex AG-440 stereo, gd cond, \$300. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Revox A77 (2) wood cases, \$300 ea; (1) rack mount, \$200; (1) for parts, \$75. Kelly, 503-933-2217.

Otari MX5050BQII-4 4-trk, rack mount, gd cond, \$900; Revox A77 1/4" stereo, factory Dolby, fair cond w/manual, \$175. P Thompson, Moonlight Sound, 4763 Weld County Rd #32, Longmont CO 80504. 303-535-4748.

Tascam 48 8-trk, new, excel work cond w/dbx & remote, \$2200. Ken, 419-243-1000.

Tascam 32 2-trk, 10 1/2" reel, 7.5/15 ips R/P w/remote & svc manual, excel cond, \$950. M Friend, WTJV, Box 711 Newcomb Hall Sta, Centreville VA 22904. 703-924-0885.

Otari ARS-1000 stereo, used only as back-up, \$900; Tascam 32, 10 1/2" reels, little use, \$950. P Wolf, 813-574-5548.

Tascam 112, \$311; 32 (2), \$837 ea, all need work. J Blodgett, WGTf, 308 Westgate Pkwy, Dothan AL 36303. 205-794-4770.

MCI 110 A&B 2-trk w/spare elect drawers, transport cards, head stacks, pwr supplies, working. M Shea, Precision Recorder, POB 723, NY NY 10276. 212-989-2684.

Ampex 351 (2) tube-type; Revox A77 (2) R/P for parts; Revox PR99 P/B only for parts; Sony Tapeorder TC-766-2 R/P w/remote; Audi-otronics 132 multi-track, multi-head large reel mach w/carry case. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 76902. 915-949-2112 ext 20.

Tascam 38 (2) 8-trk, mint cond, \$1750/\$1250. R Messick, 407-686-9505 x318.

MCI 110 motors reel & capstan, complete audio drawers, xport PC boards, head stacks, microproc boards. M Shea, Precision Rec, POB 723, NY NY 10276. 212-989-2684.

Technics RS1500 2-trk, \$985; Sony/MCI JH110C on roll around metal cabinet, \$2500+s/h, both excel cond. J Gelo, 813-642-6899.

**Want to Buy**

2-trk 1/2" head stack for Ampex ATR 100; Stelavox large reel adapters for SP-7. Bob, 212-219-3671.

Technics M85 MKII for parts, specifically capstan motor. T Melbourne, WNAA, NC A&T Univ, Greensboro NC 27411. 919-334-7936.

Otari MX5050BII2, very gd cond. J Torsitano, KNIS, 6363 Hwy 50 E, Carson City NV 89701. 702-883-5647.

MCI capstan motors any cond, electronics, decks, boards, proc & display boards, heads. Scully electronics. J Price, 214-321-6576.

Scully '100' recorders, record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 1131 Virginia Ave, Campbell CA 95008. 408-866-8434.

MCI/Sony capstan & reel motors, any cond., recdg heads, most migs, machines, new used. Relapped then sold. Amp Services, 224 Datura St No 614, W Palm Beach FL 33401. 800-826-0601, in FL 305-659-4805.

Ampex ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

**CD's**

**Want to Sell**

Technics SLP 720 plyr, \$200 ea; 1200 plyr, \$700. S Southern, WCIR, Box 1037, Beaver WV 25813. 304-252-6452.

Denon 950FA working when removed from svc, \$700/BO. R Rogers, KSKG, 1217 S Santa Fe, Salina KS 67401. 913-825-4631.

Numark CD-5020 dual rack mountable, \$995. Steve, RRSC, 1201 S Sharp St, Baltimore MD 21230. 800-547-2346.

**COMPUTERS**

**Want to Sell**

Tandy WP-2 port w/128K RAM, WP-DUET software & cable for use w/Macintosh, \$450. F Beacham, Beacham Prods, 163 Amsterdam Ave, NY NY 10023. 212-873-9349.

Victor IBM 40-MB hd drv, 5 1/4" drive, 640k RAM, green mon w/software, \$350+s/h. J Allen, 805-253-1277.

Tandy 2000 w/color mon, 10 meg ext hd, 2 5 1/4" internal drives, BO+s/h. R Kerbyway, WTNL, 609 Main St, Mt Hope WV 25880. 304-877-5592.

Wang w/Control Data printer, BO. M Martindale, KVON, 1124 Foster Rd, Napa CA 94558-9611. 707-252-1440.

Wang CPU VP-2 Micro 3-port print, 4-port RS232, MW-0300 cards, Magna disk drive backup, 40 meg hd, 3 terminals, modems, BO. C Mellon, WILI, Box 496, Willimantic CT 06226.

**CONSOLES**

**Want to Sell**

Custom prod/news w/50A circuitry, 7 stereo chnls, extra large Gates-type knobs & pac-plates for rotary controls, 36" x8" x12", stereo EQ, \$495. Davis, MCP, 1504 Sunset, Newberry SC 29108. 803-276-0639.

Shure SR101 Series 2 port audio mixer, SS, 8-chnl mixer/preamp w/reverb, rack mount in port case, excel cond w/manual, \$395. R Summer, CAUV, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

Shure SR101 series 2 audio, 8 input, \$125+UPS; Ampex 6 input mike mixer, \$125+UPS. L Spivey, WLLS, Hwy 231 S, Hartford KY 42347. 502-298-3268.

Ramko SC-5M 4-chnl mono, great for prod, \$300; DC-5M5 12-chnl stereo w/digital switching & light emitting meters, \$600, both in excel cond w/manuals. R Chambers, KSUE, 916-257-2121.

Ramko SC-5M 4-chnl mono board, \$300; DC-5MS 12-chnl stereo w/digital switching & light emitting meters, \$600, both excel cond w/manuals. R Chambers, 916-257-2121.

Eventide H949 Harmonizer, \$500; Gates ME 1 mod enhancer, \$100. S Southern, WCIR, Box 1037, Beaver WV 25318. 304-252-6452.

Harris Mono 5 excel cond, \$500. B Walters, WASE, POB 2087, Elizabethtown KY 42702. 502-769-1055.

Gates Producer 4-chnl, mono board, \$100. M Meyer, KLQP, Box 70, Madison MN 56256. 612-598-7301.

Panasonic WR-450 6-chnl 3 1/2" rack mount mixer w/oscillator, speaker & talkback, excel cond, \$325; Ecdor AM-400 auto mic mixer, 4 separate/adjustable voice activated chnls. Gary, 602-258-6161.

Auditronics 200 series (1) stereo input, fair cond, \$100; (2) microphone input, gd cond, \$175 ea; (1) mono line input, gd cond, \$150; (3) stereo line output, \$175 ea/\$950 all. M Guthrie, 813-287-1047.

Sparta A-15 5-pot board, mint cond, \$300; turntables & furn, will separate/package+s/h. Ronnie, Super Sonics, 1401 NE 159th St, N Miami FL 33162. 305-949-2040.

Ramko DC12 for parts, T Melbourne, WNAA, NC A&T Univ, Greensboro NC 27411. 919-334-7936.

Gates/Harris Gatesway 80 8-chnl mono, clean, gd cond, \$1000. L Nixon, Classic City Prods, 1094 Baxter St, Athens GA 30606. 404-613-6724.

Russco 505 5-chnl mono, like new, \$750. R Cowell, KNTR, POB 308, Ferndale WA 98248. 206-384-5117.

Allen-Heath-Brenell Scepter rackmount 12x2x1, 4 auxes, 8 returns, balanced I/O w/direct outs, separate pwr supply, quiet, \$1750. M Ravain, Trinity Christian Music, POB 2479, Flagler Beach FL 32136. 904-439-3671.

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Acoustics	Consoles	Stereo Generators
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Audio Production (Other)	Furniture	Tax Deductible Equip
Automation Equip.	Limiters	Test Equipment
Brokers	Microphones	Transmitters/Exciters
Cameras (Video)	Miscellaneous	Tubes
Cart Machines	Monitors	Turntables
Cassette & R-R Recorders	Movie Production Equip	TV Film Equip.
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	Stations	

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## ACTION-GRAM

### Equipment Listings

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply send your listings to us, following the example below. Please indicate in which category you would like your listing to appear. Mail your listings to the address below. Thank you.

Please print and include all information: I would like to receive or continue receiving **Radio World** FREE each month.  YES  NO

Contact Name: \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_  
 Title \_\_\_\_\_  
 Company/Station \_\_\_\_\_ Please circle only one entry for each category:  
 Address: \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**I. Type of Firm**

D. Combination AM/FM station	F. Recording studio
A. Commercial AM station	G. TV station/teleprod facility
B. Commercial FM station	H. Consultant/ind engineer
C. Educational FM station	I. Mfg, distributor or dealer
E. Network/group owner	J. Other _____

**II. Job Function**

A. Ownership	D. Programming/production
B. General management	E. News operations
C. Engineering	F. Other _____

Phone Number: \_\_\_\_\_  
 Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a **paid** basis. Line ad listings & display advertising are available on a per word or per inch basis. Call 1-800-336-3045 for details.

WTS:  WTB:  Category: \_\_\_\_\_  
 Make: \_\_\_\_\_ Model #: \_\_\_\_\_  
 Brief Description: \_\_\_\_\_  
 \_\_\_\_\_  
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 Price: \_\_\_\_\_

WTS:  WTB:  Category: \_\_\_\_\_  
 Make: \_\_\_\_\_ Model #: \_\_\_\_\_  
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WTS:  WTB:  Category: \_\_\_\_\_  
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 Brief Description: \_\_\_\_\_  
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 Price: \_\_\_\_\_

WTS:  WTB:  Category: \_\_\_\_\_  
 Make: \_\_\_\_\_ Model #: \_\_\_\_\_  
 Brief Description: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Price: \_\_\_\_\_

\*Closing for listings is the first and third Fridays for the next month's issue. All listings are run for 2 issues unless pressed for space or otherwise notified by listee.

### Broadcast Equipment Exchange

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**CONSOLES . . . WTS**

Russco 505M 5 pot mono, gd cond, \$500; Sparta A-20 8 pot mono, \$200; BE 4M50, 5 pot mono, \$200. S Minshall, KFIV, POB 3408, Modesto CA 95353. 209-545-5585.

Audio Technica AT4462 stereo field prod mixer, vgc w/manual, \$575. C Crouse, 48 Cedar St, Dedham MA 02026. 617-461-2699.

Interface 16x8, to 24 inputs, very gd cond, little use w/manual, \$1000/BO. Bob, 212-219-3670.

Studiomaster series 3 6 mono x6 stereo x4 subs x2 mains, excel prod board, \$2995. J Ripley, KORD, POB 2485, Tri-Cities WA 99302. 509-547-9791.

Ramsa 8616 mainframe, pwr supply, 4 mono input mods, 6 stereo input mods, LR output, 2 yrs old, \$5000/BO. D Reynolds, WGF, 1356 Mackinaw Ave, Cheboygan MI 49721. 616-627-2341.

Ampro AC8D mono, 32 inputs, 8 mixers, 2 prog outputs, for parts, BO. A McDonald, Audio Services, POB 160175, Altamonte Springs FL 32716.

Biamp Legend 20x16, like new w/outboard p/s & manual, \$4000. G Falk, Falk Rcrdg Studio, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

BE 4M50 4-chnl mono, gd cond, \$500; Howe Tech 10-k 16-chnl 24 mainframe, extras, BO; Ramko DC-12 11-chnl mono, needs control cables, BO. M Martindale, KVON, 1124 Foster Rd, Napa CA 94558-9611. 707-252-1440.

Harris Stereo 80 audio 8-chnl board, needs work, \$500. C Maley, KSB, Box 426, Creston IA 50801. 515-782-2155.

Sparten Centurion II 12-pot stereo, \$1000. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Wheatstone A-500 11-input mods, 2 mic mods, like new, \$8000; BE Mono 4, 2 mos old, \$850; Autogram AC6, pgm, aud, gd cond, \$3500; Autogram AC8 (2) gd cond, \$4500 ea; Howe Tech Series 9000 w/spare parts & xtra pwr supply, clean, \$5000. P Wolf, 813-574-5548.

MCI 428 28x24, 336 pt patchbay, prod desk, \$7500. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Sparta A-20B 22 in/2 out, mono w/pwr supply, gd cond for news/prod, BO. J Violanti, WSJR, 5600 City Ave, Philadelphia PA 19131. 215-660-1082.

Tascam MZ24 24x4x2 mixer sound reinforcement/studio use, \$1500. R Messick, 407-666-9505 x318.

Yamaha M916 16x4, \$1500. D Gaydos, NYU, 721 Broadway 11th Fl, NY NY 10003. 212-998-1665.

Shure M67, gd cond, \$50. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

Harris Stereo-5. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 76902. 915-949-2112 ext 20.

McMartin B501 5 pot mono, \$500; Howe 7500 12-chnl side faders, remote starts w/books & custom copy stand, \$2500; LPB Monogram 8-chnl slide fader stereo, remote starts & books, \$1500, all clean. R Redmond, WWSC, 217 Dix Ave, Glens Falls NY 12801. 518-798-1031.

Collins/Autogram IC-10 10-chnl, refurbished, excel cond, \$3500. B Elliott, WRF, 915 E 4th St, Charlotte NC 28205. 704-338-9970.

AUDITRONICS 501 recording console. Great production board. 18 inputs, 16 buss out. \$2800. Boynton Studio Inc. 607-263-5695.

QUANTUM Series 22 console. 14 input mainframe loaded with 6 inputs: 4 mono, 2 stereo, also with master and monitor modules. This console is like new in factory carton. \$1995, Boynton Studio Inc. 607-263-5695.

**Want to Buy**

Tube & remote mixers RCA/WE/Collins, OP5/6/7 & 22D, B Davies, Virgo Prods, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Quantum Series 22 modules; QM-2202, QM-2205, QM-2206, will buy mods/22 working consoles. B Geyer, 606-473-7377.

24-16-8 outs, will repair. J Price, 214-321-6576.

RCA BC-7B w/ or w/out plug-ins. Robert, WFR, POB 908, Franklin PA 16323. 814-432-2188.

Langevin AM4A w/documents. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

**DISCO & SOUND EQUIPMENT**

**Want to Sell**

EEV Delta-Max processor controlled speaker systems, 2 pairs w/2" compression driver, 1 pair 12", 1 pair 15", dedicated processors, EP-4 cabline & I/O panel for amp rack, \$7000/will separate. M Ravain, Trinity Christian Music, POB 2479, Flagler Beach FL 32136. 904-439-3671.

Lexicon 200 (2) stereo digital reverbs, new, XLR I/O, programmable parameters & presets, \$1900 ea/\$3600 both. M Ravain, Trinity Christian Music, POB 2479, Flagler Bch FL 32136. 904-439-3671.

Shure Vocal Master 2-6" columns, 2-3" monitors+PA head w/6-chnl inputs, old but reliable, BO. S Winthrop, Winthrop Prods, 156 W 94th St, NY NY 10025. 212-662-8685.

Dolby 361 (4) noise reduction units, \$550 ea. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Allied 615HC speaker 15" w/horn driver & attenuator, new cone & diaphragm, \$150. J Price, 214-321-6576.

AKG Bx-5 dual spring reverb, \$125; dbx 155 (2) 4-chnl encode/decode noise reduction, \$250 ea/\$450 both. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

**Want to Buy**

Altec 604E JBL horns & drivers, 15" bass crossover. J Price, 214-321-6576.

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**Want to Sell**

2' 8" x 3' 10" x 2' 5" high steel desk; (5) beige formica & wood R-R stands for Revox PR99; inlay w/bordering 12" x 8" 10" air rug; 9' 8" x 7' 7" white air rug; Carrier 16k BTU refig A/C, 240 VAC. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 76902. 915-949-2112 ext 20.

**LIMITERS**

**Want to Sell**

Modulation Sciences CL803 composite clipper, \$600; CRL FM-4 w/(1) SPP800, (2) SEP-400As, (1) SMP-800, \$1200. B Bailey, KIZN, 401 Idaho St, Boise ID 83702. 208-343-5991.

Wilkinson LGC-1 AGC unit, mono w/manual, \$200+UPS; BE AM 400 compressor, mono w/manual, \$200+UPS. L Spivey, WLLS, Hwy 231 S, Hartford KY 42347.502-298-3268.

Valley People 440 compressor, very gd cond, \$350/BO. K Fitzgerald, WKBG, 495 Court St, Binghamton NY 13094. 607-723-2925.

CBS Labs FM Volumax 411 stereo peak controller, works OK, BO. A McDonald, Audio Services, POB 160175, Altamonte Springs FL 32716.

**We buy Optimod 8000A's and 8100A's 414-482-2638**

Inovonics 250 5-band, set up for AM, can be converted to FM, \$2000; Inovonics 215 limiter-mono, \$100; Optimod 8000 FM stereo gen & proc, \$1200. S Minshall, KFIV, POB 3408, Modesto CA 95353. 209-545-5585.

CBS Volumax stereo 411, \$225; (2) 410, \$130 ea. K La Rue, KSTN, 2171 Ralph, Stockton CA 95206. 209-948-5786.

Gentner RC9-1 for Optimod 8100A w/Audio Prisms, \$100. D Reynolds, WGF, 1356 Mackinaw Ave, Cheboygan MI 49721. 616-627-2341.

Optimod 9100A excel cond w/NRSC, factory refurbished, \$4200. T Crockett, Hot Tracks Rcrdg Svcs, POB 10501, Blacksburg VA 24062. 703-953-0222.

Inovonics MAP II AM proc, working when removed, \$300. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Harris MSD10 (2) tri-band AGC processors, \$250/both. K Smith, WNCG, 510 N Main St, Clyde OH 43410. 419-547-8792.

DAP 310 w/CRL NRSC unit, \$400; Gates Solid Statesman AGC & limiter units, \$50; dbx 224 & 224x units (4), \$200 ea; dbx 140A unit, \$200. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

Volumax 4000A for parts, \$300; Orban 245E stereo synthesizer, \$200; Harris MSP90 AM peak limiter, \$300. Kelly, 503-933-2217.

**Want to Buy**

Orban Optimod 9100 A/B mono/stereo with NRSC. T McGinley, WPGC, 6301 Ivy Ln, Greenbelt MD 20778. 301-441-3500.

UREI BL40 schematic/manual to repair, will pay+postage. E Patrucci, WBCB, 200 Magnolia Dr, Fairless Hills PA 19054. 215-949-1490.

Fairchild 670 stereo & other tube proc gear used w/mastering discs. K Gutzke, Custom Recording, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

Optimod FM 8100/8000 gd cond, NE preferred. P Galasso, WJLK, 605 Mattison Ave, Asbury Park NJ 07712. 908-774-7700.

Aphex Compellor 103A aural exciter, Kelly, 503-933-2217.

**MICROPHONES**

**Want to Sell**

RCA 44 & 44 jr; SK 76, all in gd cond. R Raines, Dixie Sound, 1002 Fulton Dr, Corinth MS 38824. 601-287-3116.

Sennheiser MKH 40 (2) cardioid, digital rec series, \$850 ea; (2) AKG 451 EB cardioid w/20 dB pads, \$375 ea. T Hoffman, Sonic Booms, 29589 Serenity Way, Wilsonville OR 97070. 503-682-6988.

Atlas (3) metal stands for desk in black, \$10+UPS. L Spivey, WLLS, Hwy 231 S, Hartford KY 42347.502-298-3268.

Electro-Voice 671 dynamic cardioid dual Z, new, \$50. R Sumner, CAVU, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

Shure SM-81 (4) matched cardioid studio condenser, never used, \$1000 set/\$275 ea. M Ravain, Trinity Christian Music, POB 2479, Flagler Beach FL 32136. 904-439-3671.

RCA ribbon & others. B Davies, Virgo Prods, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Beyer M500 cardioid ribbon, \$250. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Beyer M-500 cardioid ribbon, \$250. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Sennheiser MD-211U (3) dynamic, omnidirectional, mint cond, \$840. R Grote, Cornell Univ, 159 Sapsucker Woods, Ithaca NY 14850. 607-254-2409.

Beyer M160 (3) dual ribbon hyper-cardioid, \$120 ea; AKG D200E (2) dynamic cardioid, \$45 ea. P Thompson, Moonlight Sound, 4763 Weld County Rd #32, Longmont CO 80504. 303-535-4748.

Telefunken U-47, Neumann U-67, KM-54 mint; RCA ribbon mics (2) KU3A's 10,0001, (3) 77-DX, (1) 44-BX, (2) BK-5; Altec tube mics M-11, M-20, M-30; 639 film version mic ect. Trade or sale. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

Mics; desk mics (hi2), EV-Shure mic stands, also baby booms (3); tubes, new (32) RCA, GE, Sylvania; Sams tube sub books #8 & #6; RCA tube manual; Sony head demagnetizer (new); jack femal connectors; EV 502 transformer print/sec. Mr. Oliver, 212-874-7660.

**Want to Buy**

RCA 44S/77S/WE 639S & other ribbons, working or not. B Davies, Virgo Prods, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Sennheiser MKE 2002 at gd price. F Beacham, Beacham Prods, 163 Amsterdam Ave, NY NY 10023. 212-873-9349.

Western Electro-Acoustic Labs condenser mic complement (pwr supply) #120A, R Robinson, TNA, 10 George St, Wallingford CT 06492. 203-269-4465.

RCA, Neumann, WE & all other vintage mics, parts, flags & stands. R Van Dyke, Caffrey House, 2 Squires Ave, E Quogue NY 11942. 516-728-9835.

**MISCELLANEOUS**

**Want to Sell**

Ford radio AM/FM, no cass, never used, factory connectors, \$50+UPS; VTC (1) CG-104, (2) CG-44, NOS chokes in orig cartons, \$100+UPS; GE variable AC xformer NOS, \$30+UPS. L Spivey, WLLS, Hwy 231 S, Hartford KY 42347. 502-298-3268.

Gates cabinet 7' w/patch bay & rear door, excel cond. R Raines, Dixie Sound, 1002 Fulton Dr, Corinth MS 38824. 601-287-3116.

Scully capstan (2) motors, rebuilt, \$50 ea. M Meyer, KLOP, Box 70, Madison MN 56256. 612-598-7301.

GE 117KVA xformer, 3PH, dry, 230VD, in cabinet, new, \$500; 6 KVA xformer, 3PH, dry, 230V, 1820/3150Y sec, new, \$200. S Minshall, KFIV, POB 3408, Modesto CA 95353. 209-545-5585.

Triad HS-29 xformer audio interstage; HS56V xformer line to line. A Grundy, Inst of Audio Rsrch, 64 Univeristy Pl, NY NY 10003. 212-677-7580.

Bud PA 3101 (20) rack panels new in paper, 3/16" thick, 1 1/4" x 19", \$110. Davis, MCP, 1504 Sunset, Newberry SC 29108. 803-276-0639.

Single rack stereo, like D-60, \$100/less. P Wells, KJQY, 625 Broadway, San Diego CA 92101. 619-238-1037.

PA Equip Rider, vol I manual, \$60; RCA PA & BC sales catalog, 47-50s, \$20. B Woolf, Audio Reco Sys, 3986 Edidin Dr, Jacksonville FL 32211. 904-744-1661.

Phasemaster T-10000 rotary phase converter, excel cond. D Murray, WKLT, 745 S Garfield, Traverse City MI 49684. 616-947-0003.

**COMREX RENTALS**

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Star printers; Gemi 10X; NX-1000; NP-10, \$50 ea; phone system w/20 phones, 8 lines, rotary dial, BO. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

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NP1 battery charger in gd cond at reasonable price. M Glaser, 516-447-1041.

Realistic SA-200A right chnl vol control, slide type for SA-2000 (31-1985); stereo amp Radio Shack part #P-1632, mtg part #28200025 (250K/Bx2). R Kerbway, WTNi, 609 Main St, Mt Hope WV 25880. 304-877-5592.

Older journals audio/bdct engrg, on disc from 40s-60s. K Gutzke, Custom Recording, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

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

UTC linear standard transformers LS40, LS58, LS73, LS74, others. Mark Van Roojen, POB 83836, Lincoln NE 68501. 402-438-3724.

MONITORS

Want to Sell

TFT modulation monitors: model 724 & 734 stereo, \$500; AM model 753, \$400. R Chambers, 916-257-2121.

BE MA-1 AM stereo, \$850; Kahn stereo, \$1000. S Minshall, KFIV, POB 3408, Modesto CA 95353. 209-545-5585.

TFT 724 & 734 stereo modulation, \$500; AM 753, \$400. R Chambers, KSUE, 916-257-2121.

McMartin TBM-2000B SCA; BFM-1531R SCA gener, both 67 kHz, \$250 ea; TBM-3700 FM mono mod, \$300. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

TFT EBS rblt, gd cond, decode unit, set up for 94.1 MHz, \$400. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

TFT 760 EBS gen card, \$150; Gates MO2639 AM mod, \$100. Kelly, 503-933-2217.

Want to Buy

Any older McMartin mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1686.

MOVIE PROD EQUIP

Want to Sell

Cinema Products GSMO 16mm reflex, Ang 15-150 zoom, batts, chrgs, 2 mags, handgrip & shoulder pod, Zero case, excel cond w/manual, \$4995. R Sumner, CAVU, 3322 Applegate Ct, Annandale VA 22003. 703-560-0233.

RECEIVERS & TRANSCEIVERS

Want to Sell

SCA decoder, high quality micro-miniature 6792 kHz, prewired & ready to install, \$15. D Jackway, Backgrnd Music Eng, 5742 Fairpark, Springfield MO 65810. 417-881-1846.

AM STEREO RECEIVERS Portable, Home/Studio, Auto RRADCO GROUP 708-513-1386

Spitsbury IMTS mobile phone, new, \$1000; IMTS/ cellular combo mobile phone, gd cond, \$1500. B Williams, WBLG, 948 Fairview Ave, Bowling Green KY 42101. 502-843-0107.

Sony SRF-A1 & A100 AM/FM stereo Walkmans, port radios, new, \$100/A-1, \$120/A-100. C Fox, WOLF, 4853 Manor Hill Dr, Syracuse NY 13215.

Maxon CP-0510 VHF port, 5 W, 4-chnl, 144-174 MHz, new batt, chrg & manual, leather swivel case, mint cond, \$150/BO. C Stahuke, 1951 N Meridian Rd #84, Tallahassee FL 32303. 904-385-0718.

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Comrex Box model PTLX, asking \$2000/BO. Call Lisa at 714-495-2471.

Marti STL-8 xmir & R-200 rcvr both FCC type-rated, excel cond w/manuals, \$4250. R Chambers, KSUE, 916-257-2121.

Symetrix TI-101 telephone interface, \$349. Steve, RRRSC, 1201 S Sharp St, Baltimore MD 21230. 800-547-2346.

Symetrix TI-101 hybrid to interface audio equip & telephone, gd cond, \$350. R Cowell, KNTR, POB 308, Ferndale WA 98248. 206-384-5117.

Moseley 505C rcvr only, 946.0, \$625; system, \$2300. S Minshall, KFIV, POB 3408, Modesto CA 95353. 209-545-5585.

Symetrix TI 101 clean w/manuals, working when removed from svc, \$150+s/h. D Moore, WDUZ, Box 310, Green Bay WI 54305. 414-468-4100.

Wescom 791B 2-4-wire telco hybrids, 60 db, long bal, \$50 ea; ADS 109H repeat coils, \$8 ea, both w/pnts. R Weaver, 919-552-9357.

Micro Dynamics TC8 extra-clean w/radio modules w/manuals, \$1200+s/h. D Moore, WDUZ, Box 310, Green Bay WI 54305. 414-468-4100.

TFT 7610-C studio & xmr, 7 yrs old, gd cond, \$1495. C Mellon, WILI, Box 496, Willimantic CT 06226.

Gates RCD-10 (2) remote control units, need some work, \$50 both. J Summers, KMZU, 102 N Mason, Carrollton MO 64633. 816-542-0404.

Schafer TC300/SC300 wireline remote control unit, needs minor repair w/manual, \$75; Moseley TRC-15AR remote control unit, 26 kHz, control subcarrier, subaudible metering return, gd cond, \$450. D Davis, KMBA, 5000 Marble Ave NE, Albuquerque NM 87110. 505-262-1866.

Macom 4' dish, 23 GHz, will trade for 2' dish. D Solinske, WSUN, 877 Exec Ctr Dr, St Pete FL 33702. 813-576-1073.

TFT 761-C digital, \$1200. Kelly, 503-933-2217.

Marti 406-512 MHz single section cavity, resonator 450 band, never used, \$100; Motorola UHF Maxar 450, 0-10 W, mobile, air traffic w/mic, single freq, \$350; Moseley MRC-1600, clean, spare parts, STL-TSL set up, \$1300; Marti RPT-30 (2), UHF, CR-10, w/ants, 1 w/code identifier, \$1350 ea; Regency Transcom, dual freq w/mic, 0-15 W, mobile, traffic, 450 MHz, \$150/BO; Burk TC-8, set up for STL, SCA w/SCA rcvr, \$1200; TFT 7700B, 16 W STL, new, \$4500. P Wolf, 813-574-5548.

TFT 7700 dual composite STL, 2 TX & RX, gd cond, \$2500/BO; TFT 8600 STL dual mono systems (2), never used, BO. T Tucker, Desert West, POB 36717, Tucson AZ 85740. 602-797-1008.

Micro Control DLC-9/DLT-9 9-chnl remote w/single pair line, \$1000. C Maley, KSIB, Box 426, Creston IA 50601. 515-782-2155.

Micro Controls DLC-9 (2), 1 set up, 1 telco, \$600 ea. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

Want to Buy

Moseley PCL-606/C RX/TX combo, gd cond, any 950 MHz chnl/TX/RX separately. T McGinley, WPGC, 6301 Ivy Ln, Greenbelt MD 20770. 301-441-3332.

Geniner VRC or Sine Systems. Kelly, 503-933-2217.

SATELLITE EQUIPMENT

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Wegener STS-RX 1602 mainframe w/working pwr sply w/1639-14 card, \$100; Macom MA-1001 rcvr, \$50. M Meyer, KLPQ, Box 70, Madison MN 56256. 612-598-7301.

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Prodelin 3-mtr dish w/Harris mdl 6550. B Walters, WASE, POB 2087, Elizabethtown KY 42702. 502-769-1055.

Monroe 5002 remote for Fairchild Dart 384 rcvr w/transponder selection by telephone, VGC w/manual, \$300. D Niccum, KCKN, POB 670, Roswell NM 88202. 505-822-6450.

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Salcus 400, \$175. J Casey, Casey Bdct Engrg, 3706 Vold Ct, Eau Claire WI 54701. 715-835-7347.

Microdyne 1100 rcvr, demod, gd cond, freq agile, SCPC, \$1500. P Wolf, 813-574-5548.

Comtech Unistar AC format rcvr, avail new w/net controller, \$1500; Wegener Unistar oldies chnl rcvr, avail 5/1. B Williams, WBLG, 948 Fairview Ave, Bowling Green KY 42101. 502-843-0107.

Drake SA24 stereo adap, \$165. J Blodgett, WGTF, 308 Westgate Pkwy, Dothan AL 36303. 205-794-4770.

Wegener 1600 mainframe rcvr for Unistar country, excel cond, \$200+s/h. R Kerbway, WTNi, 609 Main St, Mt Hope WV 25880. 304-877-5592.

Laux system w/(2) 8705 audio terminals, Laux LNA LC0106, 70 MHz Laux downverter, 2 runs of 25-30' Coax, 9' parabolic dish for 4 GHz w/books. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 76902. 915-949-2112 ext 20.

Macom VR3X rcvr, \$300. Kelly, 503-933-2217.

Want to Buy

Micro-Phase MP 20305 will rec 73.80, TN/SC/AL radio ntwk. K Thompson, WWIC, 815 W Willow, Scottsboro AL 35768. 205-574-2198.

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Hi-fi tubes in box will pay cash; McIntosh, MC 3040/6075/240/275, C11/22 (pre), \$100-\$2000. R Glenn, 813-634-1940.

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RCA 8501 & GE GL-6183 (6942), J Powley, WILM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

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Sparta (2) 3-sp, ea w/2 tone arms, \$150 both +s/h. Ronnie, Super Sonics, 1401 NE 159th St, N Miami FL 33162. 305-949-2040.

Russco Cue Master (1) pr w/tone arms/cartridges, \$195. Davis, MCP, 1504 Sunset, Newberry SC 29108. 803-276-0639.

Collins 12" (2) 3-sp, for parts, BO. A McDonald, Audio Services, POB 160175, Altamonte Springs FL 32716.

Gates 3-sp manual scription, manuals/parts/wiring instructions for compensation switch. L Van Luven, 60 Rochelle St, Rochester NY 14612.

QRK 12C; Russco Cue-Master, both no tone arms. A Garza, KIXY, 2824 Sherwood Way, San Angelo TX 76902. 915-949-2112 ext 20.

Harris CB1201 (2) fair cond, \$25 ea. K Smith, WNCG, 510 N Main St, Clyde OH 43410. 419-547-8792.

Technics SP-15 w/Audio-Technica tonearms, \$350. P Wolf, 813-574-5548.

#### Want to Buy

Svc manuals/parts for Grey viscous damped & regular tone arm, 16" transcription unit, circa 1948-1955. L Van Luven, 60 Rochelle St, Rochester NY 14612.

RCA Presto & other disc recorders & assoc equip, blanks, needles, pre-recorded 16" transcriptions, acetate/pressed. B Davies, Virgo Prods, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Rec-O-Kut, Shure 16" tone arm. J Panza, LZS, Box 9847, Kansas City MO 64134. 816-767-1118.

Fairchild tonearms, stereo carts, any cond, SM-1/2, XP-4/232/F-7 & arms 202/500/280-2/SA-16 & 12. D Bisbee, 685 S Roys Ave, Columbus OH 43204. 614-279-6183.

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NEC 1/4" U-Matic time lapse, \$350 +s/h. J Baltar, ME Reel Video, 67 Green St, Augusta ME 04330. 207-623-1941.

NEC VCR variable spd 3/4" U-Matic, \$400. J Baltar, ME Reel Video, Augusta ME 04330. 207-623-1941.

# NAB's Christian Stresses The Need for Innovation

► continued from page 64

with a group of FM stations. I couldn't sell them on it because of competitive jealousies. The idea was that we build one communications center, and share all the non-confidential operations.

It would have cut back on the costs, and it would have been better for the advertising agencies. The stations would have all been located together, all the studios in one complex, sharing a lot of the technical work. With computers, satellite dishes and digital equipment, it will happen. It didn't happen in the '60s, but I think it will start to happen by the end of the '90s.

**RW:** *What else do you see ahead for the industry, in terms of the way radio will be run in years to come?*

**Christian:** What it comes down to is that everyone will be assigned a piece of spectrum space and you will do with it what you will. You will be doing radio, video and data transmission and various digital audio services.

We all jumped up and down when we heard about DAB (digital audio broadcasting). It is not as close as we thought it was. But NAB's putting the discussion on the table was very healthy because we all had to stop and think about the future. Sure it was a giant debate, but it was healthy for the industry.

My overall vision is that the technology is there. There will always be audio services. We are not positive how or what the distribution system will be—but there will always be a major distribution system. And it will get into the homes, the autos and the portables.

From where I sit, the real need is product. Who is going to fill the pipelines? Who is going to come up with the ideas? And I have seen less and

less innovation in the last 10 years than I saw in the previous 10 years.

I'm not sure what the reason is for that. You could say that part of it is ratings, part of it is consultants, part of it is the record industry, part of it is banking and financial pressure. It is not due to a lack of talent. There is probably more talent out there today than ever.

I think it goes back to the owners and operators. I think they have become much more tuned to trying to be like their competitor than trying to be something different.

And it is prevalent at the advertising level. It starts with the agencies. If you walk in with a pitch for a new format in the market, they want to know, "Who are you going to sound like?"

I feel that there is going to have to be some real innovation. If you look at the ideas that are more successful, the new concepts tend to be non-music-driven.

I think people are getting bored of going around the dial and getting four AC- and five country-formatted stations. There are so many stations, yet in many cases, only six or seven choices of product in a market. So listeners are tuning out.

Part of the problem is the music industry. The recording industry has not been turning out as good a product as it did before. So we constantly recycle. Classic rock, oldies, AC—there is a constant recycling of product.

There has to be some pressure from broadcasters and programmers saying, "hey, this is the kind of product and innovation I need."

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Production whiz exper, West Coast air talent seeks CA job. A Jay, 4949 Snyder Ln #78, Rohnert Pk CA 94928. 707-585-7571.

Adult communicator exper, friendly, highly motivated w/great prod skills seeks stable opportunity, solid airwork, team plyr, AC/oldies or country. Dave, 712-262-7954.

Gen/Sta/Ops Mgr avail, minor sales, personality/straight announcing & promos, motivated young airman, prefer SE, all considered. John, POB 2551, Newman GA 30284.

Exper AM personality looking for long term relationship, team plyr, no ego problems, always give 250%. Mike, 414-426-0541.

Exper PD medium market seeks AOR/classic rock station, nearly 10 yrs on-air, let me work for you! Mark, 209-544-1597.

Classical announcer, exceptionally knowledgeable, exper, prod, news & copywriting, any shift, prefer NY/LA. Bob, 516-758-5641.

Chief Engineer w/18 yrs exper in high power FM, AM directional & audio. Professional individual w/exceptional references seeks position. Reply to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box #RW-03-25-1.

CE w/dual EE/bus educ & 5 yrs exper seeks radio/TV pos in NE major mkt, gd people skills & gd learner. D Sparano, 518-355-9612.

AM/FM deal, revitalizing, loyal, listener keeping, exper DJ/PD seeks pos in EC/SE OH, sales, FT/min wage/30 day trial, AC/MOR/oldies, extensive library. L Brandt, 7038 Wes Ct, Newcomerstown OH 43832. 614-498-8507.

NYC afternoon-drive talk show prod, 6 yrs exper, writer, editor, flexible, current events knowledge, music bckgmd, NY-metro area. Robert, 212-863-0745.

Energetic gospel DJ w/5 yrs exper looking for new station & challenges in TN/KY. Mike, 615-847-9019.

DJ/Trainee/Vol all formats, PT/FT, AZ/CO/AL/CA, 5 yrs exper, some prod work. J Roberts/J Benjamin, 602-942-1514.

### HELP WANTED

Chief Engineer for six station group in SE Alaska. Salary DOE. Resume to KJNO, 3161 Channel Drive, Juneau, Alaska 99801. c/o Steve Thyner, GM, 907-586-3630 or FAX 907-463-3685.

Chief Engineer for six station group in SE Alaska. Salary DOE. Resume to KJNO, 3161 Channel Drive, Juneau, Alaska 99801. c/o Steve Thyner, GM, 907-586-3630 or FAX 907-463-3685.

PROGRAM DIRECTOR/COORDINATOR: For radio production house focusing on West Indian format, develops, writes and researches proposals for radio programs; determines feasibility, length & time of broadcasts. Selects specific topics according to the station's needs. Originates, coordinates and approves ideas for new international features, confers with station directors to purchase programming & solve productions problems. Utilizes knowledge in preparing special features for the West Indies community. Supervises seven employees, 40 hrs. wk.; 9-5; \$20,000 yr. Requires M.S. in Mass Communication plus 2 yrs experience in same job or 2 yrs as Producer/Director. Excellent writing and communication skills. Exp. must involve production of specific West Indian features. Resume only to Job Service of Florida, 701 SW 27 Avenue, Miami FL 33135-3014. Ref. Job Order # FL 0561065.

### ENGINEER

WHFS-FM is accepting applications for Broadcast Engineer. Minimum 5 years experience required. Harris XMTRS experience and SBE Certification a plus. Hands on position dealing with all levels of maintenance, planning, studio construction and restoration. Send resumes to:

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**WHFS Radio**  
**8201 Corporate Dr., Ste 550**  
**Landover, MD 20785**  
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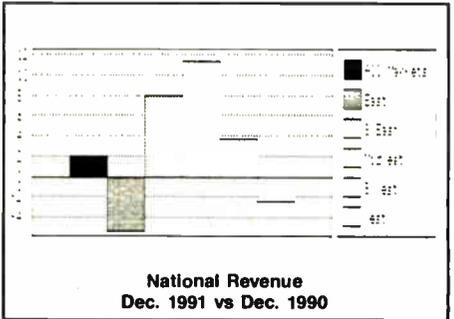
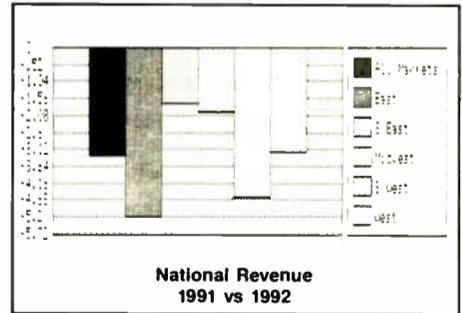
## Revenues on the Increase

► continued from page 67

Local and national spot revenue for the month of December 1991 posted a slight gain—the first increase since July 1991. Network revenue was up 0.6 percent for December 1991 as well.

As individual categories, local ad revenue for December posted a decrease of 0.5 percent, and national ad revenue recovered 1.9 percent after a November 1991 decrease of 7.7 percent.

National revenue in the Southeast and Midwest posted gains of 8 percent and 11.3 percent, respectively, for the month of December, following November declines of roughly 4 percent in both regions. The



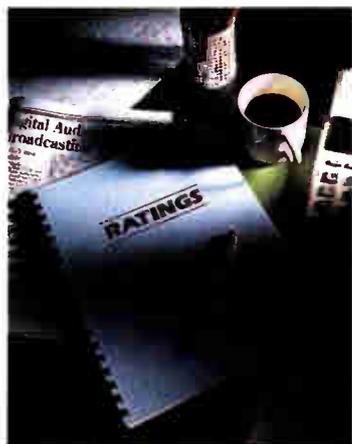
Southwest recovered from a November decrease of 12.5 percent to post a 3.7 percent increase in December.

The Eastern region of the U.S. continues to suffer the brunt of the recession, with local revenue down 4.4 percent and national down 5.2 percent for the year 1991.

All figures are based on the index of revenue pool results compiled by the RAB and network revenues reported by the Radio Network Association (RNA). The accounting firms of Miller Kaplan Arase & Co. and Hungerford Aldrin Nichols & Carter provide the local and national spot revenue data on the 100 markets the RAB uses to calculate its revenue index. Network revenues are reported by RNA members.

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# A Hit.



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World Radio History

# BUYERS GUIDE

March 25, 1992

Tape Recorders, Microphones & Monitors

## TECHNOLOGY UPDATE

### On Track with Studer A807 Series

by **Sandra Hale**  
Adv./Public Relations Manager  
Studer Revox America

**NASHVILLE** After years of application research and extensive production development, Studer generated the A807 family of two-and four-track recorders. Primarily designed to accommodate broadcasters, the A807 two-track recorder offers what we feel is an excellent cost/performance ratio.

In addition to the digitally controlled analog technology and the rugged mechanical assemblies, Studer's A807 is easy to operate and features comprehensive remote capabilities. For high-quality audio, the A807 decks incorporate Dolby HX Pro and amorphous metal heads that deliver a wider frequency response than was previously possible in analog recording.

An overview of A807 features include: a compact ergonomic design, optional SMPTE center track time code, a maximum reel diameter of 11.1 inch (282 mm), three tape speeds (3.75/7.5/15 ips), a maximum spooling speed of approximately 10 m/s, a reduced spooling speed of 5 m/s, braking time from maximum spooling speed of about three seconds,

and shuttle operation with one-hand cueing.

#### Transport system

The tape transport consists of two rugged six-pole asynchronous AC spooling motors and a brushless, Hall DC capstan motor.

Sophisticated servo technology and the

**The A807 two-track recorder offers what we feel is an excellent cost/performance ratio.**

use of a microprocessor for control functions are the key to the simple yet efficient tape transport design. Both spooling motors are equipped with one tacho sensor each that continuously supplies the processor with information on the left guide roller to measure speed and direction of the tape motion.

The processor analyzes this information and automatically computes the diameter

of the loaded reels. Because this data can be used to control the torque of the right-hand spooling motor, the traditional tape tension sensor of the right side is no longer required. The elimination of this sensor, plus corresponding guide rollers, offers significant benefits in editing operations, because it no longer is necessary to thread tape around these rollers.

For optimum torque control, the A807 features an active three-phase control for the spooling motor. The frequency of the rotating field is readjusted as a function of speed, resulting in a much more efficient design that is capable of higher motor speeds and consequently higher spooling speeds.

#### Electronically reversed

The rotating field can be electronically reversed, allowing stepless control of the motors in either direction. The motor output stages are, of course, switched in order to achieve high efficiency combined with low heat dissipation. The spooling motors are similar to DC motors, however, they offer several advantages: no brushes,



Studer's A807 two-track recorder was designed with broadcasters in mind.

rugged long service life, no maintenance, no torque pulsation and low noise.

□□□

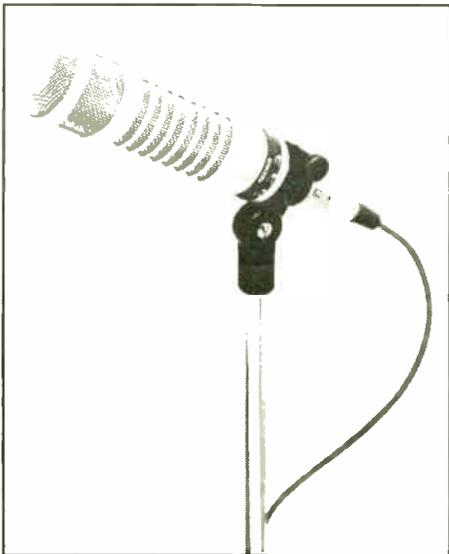
For information, contact Joe Bean, Studer's Southeastern regional manager, at 615-254-5651; fax: 615-256-7619; or circle Reader Service 20.

## TECHNOLOGY UPDATE

### EV Updates with RE27N/D Mic

by **Rick Sanchez**  
Broadcast Products Manager  
Electro-Voice Inc.

**EL MONTE, Calif.** The Electro-Voice model RE27N/D is a professional-quality



The Electro-Voice Model RE27N/D Variable-D dynamic cardioid microphone

dynamic cardioid microphone designed for broadcast production announce and voice-over, high-quality recording and sound reinforcement applications.

The microphone, an update of the industry standard RE20, utilizes a revolutionary neodymium alloy magnet and a reinforced diaphragm dome, which offers increased sensitivity (up to 6 dB more output), un-

distorted output at high sound pressure levels and an extended high-frequency response.

The RE27N/D's dynamic transducer offers superior sensitivity, transient response and noise rejection, providing a signal-to-noise ratio comparable to condenser cardioid microphones. Further reducing noise is a humbucking coil.

The mic offers a continuously Variable-D design, which reduces bass boosting "proximity effect" to maintain a uniform low-frequency response, either up close or at a distance. Two bass rolloff switches offer a sharp low-frequency cut at 200 Hz or a gentle rolloff. A third switch reduces the high-frequency treble boost if desired.

The microphone's cardioid polar pattern offers the greatest rejection at 180 degrees off-axis, ensuring increased gain-before-feedback. An integral blast and wind filter covers each acoustic opening of the microphone, allowing close-talk situations without worry of "P" pops, breath sounds or excessive sibilance.

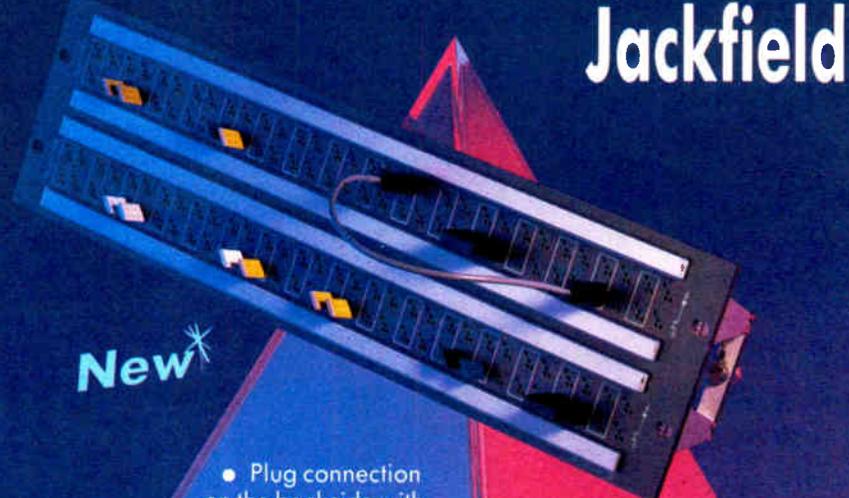
Part of the filter also shock mounts the internal microphone transducer, reducing transfer of vibration from external sources. This, along with rugged exterior steel casing, allows the RE27N/D to withstand the rigors of professional use.

The RE27N/D has a frequency response of 45 Hz to 20,000 Hz, with impedance at 150 Ohms (balanced). The list price is \$625.

□□□

For information on the Electro-Voice RE27N/D, contact Rick Sanchez at 800-877-1771; fax: 818-444-1342; or circle Reader Service 89.

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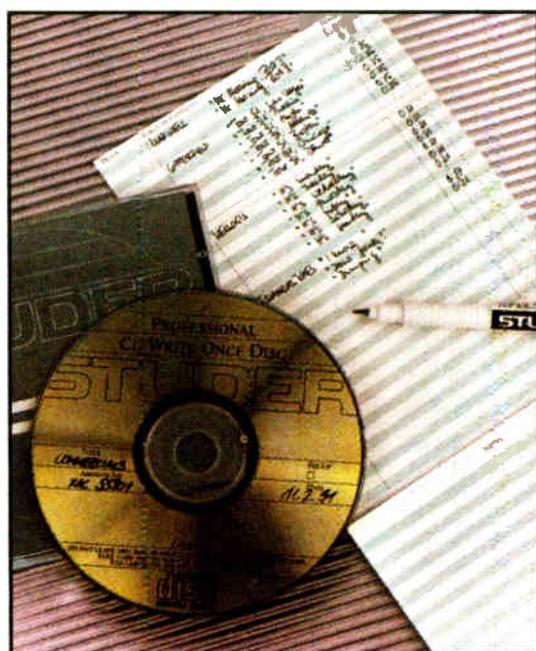


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# STUDER

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TECHNOLOGY UPDATE

# Shure Talks Up VP64 Handheld Microphone

by Mark Brunner  
Marketing Communications  
Coordinator  
Shure Brothers Inc.

**EVANSTON, Ill.** Shure's VP64 omnidirectional handheld microphone is rapidly becoming a microphone of choice for field production in broadcast arenas.

Specifically designed for interviewing, the VP64 was painstakingly engineered to incorporate a significant number of features useful to electronic newsgathering professionals.

Those who watched the CBS broadcast of Superbowl XXVI in January saw and

heard this microphone in action. The VP64 was used for both the play-by-play and color announcers, as well as by those reporting from locations around the Metrodome.

Additionally, the VP64 is being used by radio field crews throughout the world in locker rooms, press conferences and on the street.

**All traditional benefits**

The VP64 provides all the traditional benefits of an omnidirectional microphone, such as pickup of sound from all directions and an absence of proximity effect (low frequency boost) when used close up. However, the VP64 does not suffer from col-

oration (shifts in frequency response) if the sound source is off-axis, a problem often encountered with earlier omnidirectional microphones.

Its 50 to 12,000 Hz frequency response is shaped with a moderate upper midrange presence rise to maximize crispness and clarity of the voice, while the low-end rolloff minimizes boominess and background rumbling noise.

In addition, the VP64 cartridge utilizes a neodymium magnet, which produces a higher output than previous Shure omnidirectional models and a 6 dB boost over similar models from other companies. It also features effective internal shock mounting for reduced handling noise, an integrated pop filter to suppress explosive breath sounds and a black polyurethane finish that is resistant to chips and scratches.

**A survivor**

But a high-output microphone with excellent sound means nothing if it cannot survive the daily equipment abuse that comes with field reporting. For this reason, durability testing during the VP64's development went beyond the standard battery of Shure quality assurance tests. In addition, the microphone is put through a cycle of environmental extremes to ensure its success regardless of climate.

As equipment ruggedness is arguably the most important characteristic to users of a

field interviewing microphone, Shure engineers wanted to be certain that this element was sufficiently addressed.

What may be most impressive to potential users, however, is the fact that the VP64 provides these features and benefits at a price that undercuts other field interview-



The VP64 omnidirectional dynamic ENG mic has a handle on broadcast field production.

ing microphone models. The user net price is \$135, which includes a foam windscreen and stand adapter.

□□□

For information on the VP64, contact Chris Potter, professional products market specialist at Shure Brothers: 708-866-220; fax: 708-866-2279; or circle Reader Service 2.

TECHNOLOGY UPDATE

# AKG Mics Ideal for On-Air

by David Angress  
VP Sales and Marketing  
AKG Acoustics Inc.

**SAN LEANDRO, Calif.** For years, AKG Acoustics has been a leader in micro-

phones for professional studios. This popularity is due largely to the C414.

Its dual classic one-inch, gold-splattered large diaphragms and variety of switchable polar patterns, pre-attenuation settings and rolloff curves make the C414 a flexible on-air mic or production tool. The C414's transparency and clarity allow the unique characteristics of the radio voice to cut through everything else, giving the station a powerful identity.

The two newest models, the C414 B/ULS and C414 B/TL, are ideal for on-air personalities, analog production environments or the latest in digital recording. Extremely low self-noise, coupled with exceptionally high overload points guarantee dynamic range specs of more than 126 dB, achieved with all output loads.

AKG, which is well-established in R&D, advanced technology and design capabilities, exerted special care at the design stage of these microphones, which has resulted in very flat on-axis and smooth off-axis frequency response curves, with no variance in sensitivity.

The transformerless TL version is recommended for demanding applications requiring ultra-low distortion at the highest SPLs and complete linearity of phase and frequency response in the low bass and upper harmonic regions.

With a frequency range of 20 Hz to 20,000 Hz, the C414 offers switchable polar patterns, including cardioid, hypercardioid, omnidirectional and figure eight. There is switchable pre-attenuation to -10 dB or -20 dB.

□□□

For information, contact David Angress at AKG Acoustics: 415-351-3500; fax: 415-351-0500; or circle Reader Service 96.



AKG Acoustics C414 multi-pattern transformerless condenser microphone

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## USER REPORT

# Telex V-Series Makes Remotes Feel Like Home

by Tom Mac Donald  
News Reporter/Remote Engineer  
WWDB (FM)

**PHILADELPHIA** Remotes are always a compromise.

I've heard that sentiment time and time again from both program directors and engineers. Well, with the new V-Series headsets from Telex, remotes might just get a lot better.

Having worked on both sides—as a remote engineer and news reporter on remotes—I've either heard the complaints or made them: "I can't hear the studio," "the microphone sounds like two tin cans and string," "this headphone hurts my head," etc.

Working at a talk station like WWDB, you do a lot of remotes. In the past year, I've traveled from Israel to Disney World, and even done the live broadcast of a funeral from inside a cathedral.

We've tried just about every headset on the market and had just about given up on using them for remote broadcasts until we heard about the new V-Series from Telex.

## Something different

When our V-220 arrived, we knew it was something different. The headphones have a sleek, futuristic look that is something right out of Buck Rogers. And the set performs even better than it looks, with the best isolation I've ever experienced in a headphone.

On election night, I took the V-220 out of the headquarters of the victor in the mayoral race. In a room with more than a thousand people packed in, the headphone was so good that all I could hear was the cues from the radio station and the mix provided from the mult box.

Frequency response is excellent—10 Hz to 20 Hz better than the competitors we've tried. The dynamic mic is rated at 50 Hz to 15 kHz. There also is an electret microphone available that can be phantom powered, if that is what you need.

## Standardize facilities

The V-Series from Telex is designed to standardize all the headphones in a broadcast facility. Its modular design lets you order just what you need—be it one-ear or two-ear, with microphone or without—so you can use it everywhere you need a good headphone.

Telex also offers modular cordsets to fit every need, whether you want it wired or just tinned ends, with an on-off switch or a cough button or just straight through to an XLR or other connector.

The cordsets also are interchangeable, so you can have several and change them, depending on your application. For that matter, if you really want to, changing micro-

phones is a snap with just a small DIN-type connector.

Since I've had the V-220, just about everyone in the building has wanted to try the headphones out, so they've taken quite a beating. From the most petite woman to



"Like something from Buck Rogers,"  
the Telex V-220

the burliest man, everyone has told me how much they like the headset and in some cases, even agreed to wear a headset on a remote when they refused to do so previously.

If you're looking for a headset with superb isolation that can make any remote easier, from sportscasting to talk show to news reporting, or even as a replacement for studio headphones, the V-Series from Telex is your answer.

Remote broadcasting has gotten just a bit easier and is less of a compromise, thanks to Telex.

For information on the V Series, contact Ron Taylor at Telex: 612-884-4051; fax: 612-884-0043; or circle Reader Service 133.

## Tuned In



**People . . .** Glen Clark, founder and former president of **Texar**, joined CCA Electronics in January as VP of engineering. Clark's technical background includes development of the Audio Prism digital processor.

Mike Smyth was named U.S. operations manager for **Audio Processing Technology**. Based in Los Angeles, he will oversee contact with customers of the apt-X 100 system and the upcoming 4:1 digital audio data compression processes.

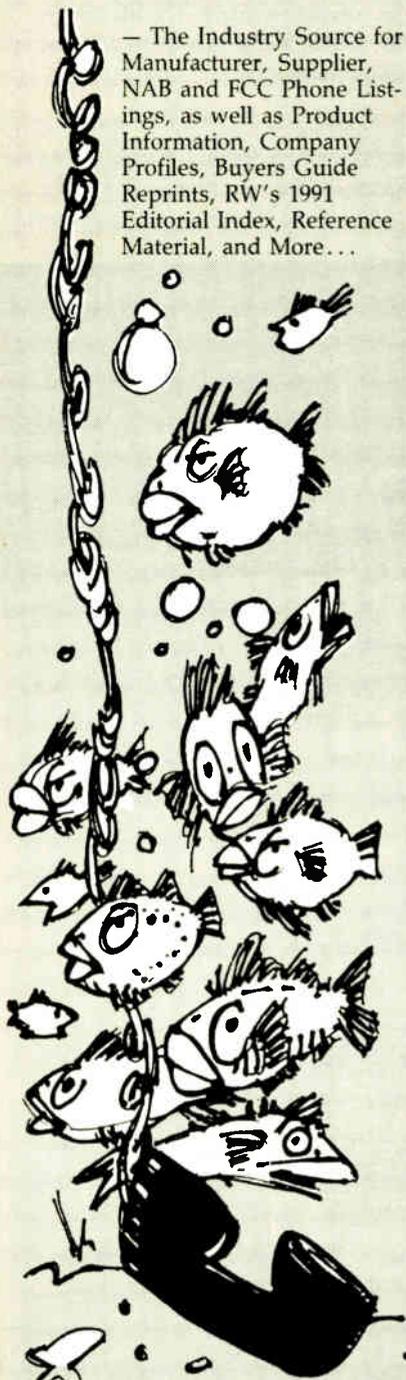
**Business . . .** TTC joined forces with four broadcast equipment dealers who will represent its FM product line. Mark Bradford of **Crouse-Kimzey** in Fort Worth, Texas, will represent the line in Texas, Louisiana, Oklahoma and Arkansas. Kathleen Karas of **Crouse-Kimzey** in Annapolis, Md., will represent TTC in South Carolina, North Carolina, Virginia, Maryland, Delaware, D.C., Pennsylvania, New Jersey, Connecticut and New York. Don Denver of **DENCO** in Bellevue, Neb., will represent TTC in Nebraska, Kansas, Missouri, Iowa, North Dakota and South Dakota. Mike Cruz of **Barrett Associates** in Oceanside, Calif., will represent the company in Southern California, Arizona and U.S.-based export areas.

**Crouse-Kimzey** also has joined the **Audio Animation** distributor network, and will stock and sell the company's paragon digital audio transmission processor.

## Fishing For A Phone Number?

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— The Industry Source for Manufacturer, Supplier, NAB and FCC Phone Listings, as well as Product Information, Company Profiles, Buyers Guide Reprints, RW's 1991 Editorial Index, Reference Material, and More . . .



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## S 20A: New version Eela Audio Reportophone®

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The new model, the S 20A, has the following additional features:

- Pushbutton dialling with tone or pulse systems.
- Powering from internal batteries or mains via adaptor supplied.
- An extra output for recording the contribution with balance control for setting the mix of 'phone and mixer signal.

US Sales 1-800-486-0074

**eela audio**



TECHNOLOGY UPDATE

# Peavey Dual Cassette Offers Multiple Options

by Sharon Wiese  
Advertising Manager  
Peavey Electronics

**MERIDIAN, Miss.** The Peavey Electronics DPS-1000 Digital Production System may appear at first glance to be little more than a dual cassette machine with mixing capability. Closer inspection, however, reveals much more.

A Motorola 56000 DSP chip combined with a 16 bit delta-sigma, over-sampled A/D converter provide full bandwidth studio quality to several digital signal manipulations. The DPS-1000 is a distant cousin of the popular sing-along or "Karaoke" (Japanese for "empty orchestra") machines.

Two rear-panel XLR connectors provide low-noise, low-Z microphone inputs with switchable phantom power capability. Front panel high-Z inputs bypass the rear inputs for flexibility of microphone choice or possible input of an instrument or sub-mix.

### Independent gain control

Mix level pots control the gain of each microphone independently. Bass and treble tone controls provide equalization to the vocal only. Sixteen-bit digital studio quality effects provide simultaneous, independently adjustable chorus, echo and reverb.

A digital vocal enhancer with enable switch also is provided. A rear-panel TRS insert jack allows processing of just the

mono with the left and right out of phase causes the center information to disappear, while the full left or full right information remains intact.

### Removing lead vocal

Since most solo vocalists are panned near center, this simple technique is pretty effective at removing much of the lead vocal. When first called up, the Vocal Eliminator goes into a setup mode where the bass tone control actually tunes for

**The DPS is pretty much a full-blown recording studio in four rack spaces.**

center position of the vocalist and the treble tone control tunes for minute time delay differences between the left and right channels.

Once the vocal has been tuned as low as it gets, another push of the mode button locks in the tuning and returns the tone controls to normal function.

The DSP converts the mono signal minus vocal back to stereo for best presentation. The ability of even this extremely powerful DSP to remove vocals depends solely on how the original song was recorded. Multiple vocalists or doubled vocals panned off-center will not cancel out. You will, however get passable results with many solo artists and avoid several months or more waiting for obscure titles. Add a little reverb to your own vocal and whatever was left over is effectively hidden.

As long as we have the music in the digital domain, a pitch shift algorithm allows you to shift the instrumental up or down to match your vocal range. A control also varies the playback speed of one deck to get different tempos than originally recorded.

So, you've finally got the song you want at the pitch and tempo you want, what's-his-name's vocal is down in the dirt and you've got enough reverb and chorus on your mic to make Elvis jealous. Now pop in a blank tape and hit the record button on transport two. Cut your demo, mail it off and become a star.

The other 99.99 percent of us will use the DPS-1000 for basic production tasks, like recording parody songs while the original is still charting, making inspirational tapes for business purposes and numerous other applications. The DPS is pretty much a full-blown recording studio in four rack spaces.

□□□

For information on the Peavey Electronics DPS-1000, contact Ernie Lansford at 601-483-5365; fax: 601-484-4278; or circle Reader Service 5



There's much more than meets the eye to the Peavey DPS-1000 Digital Production System.

vocal with an external compressor or any other outboard processor you might desire.

Similar controls on the music side of the front panel provide music-only bass and treble equalization, as well as mix and master level.

A selector switch allows you to choose one of four different audio inputs: Tape 1, Tape 2, CD or Aux. Since many pre-recorded sing-along tapes record the vocal on one track and background music on the other, the mode switch allows you to toggle between two multiplex modes: "Left only" or "Right only"; a normal mode, which is stereo-in, stereo-out; and a vocal elimination mode. In the vocal elimination mode, as well as the two multiplex modes, the internal DSP runs a stereo synthesis routine that converts the monophonic signal to a believable pseudo-stereo.

For music too new to have background tracks, the vocal eliminator attempts to remove the vocal from normal recordings. As you may have learned quite accidentally the last time your phono cartridge was miswired, playing back a stereo recording in



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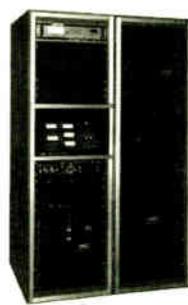


We never charge you extra for single phase power. Not on our FMQ 10000 or our FMQ 20000B—not even on our 30 k FMQ 30000B.

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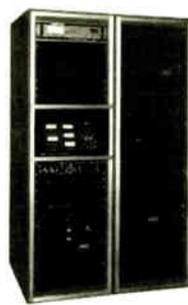


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Our new FMQ 30000B is the only 30 kW transmitter available with a single phase power supply.

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### Built-in Backup.



QEI's constant 50 Ohm interstage impedance lets you bypass the IPA or PA in the unlikely event of a problem.

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## TECHNOLOGY UPDATE

# Beyerdynamic Stays Ahead of Trends

by Mike Solomon  
Market Development Manager  
Beyerdynamic

FARMINGDALE, N.Y. Historically, on-air radio personnel have relied upon a



Beyerdynamic's D 159

group of dynamic moving coil or dynamic ribbon-type microphones to communicate with their audience.

As time progressed and the level of

audio sophistication increased, microphones that had traditionally been designed for recording studio applications began to find their way into the radio station studio.

Several of these included large diaphragm, multipattern condenser models.

Recently, new trends have been emerging within the radio station studio environment to upgrade even more, based on the desire to improve the "sonic personality" of specific radio personalities and/or to provide the on-air talent with unprecedented physical freedom in the studio without sacrificing either speech/vocal quality or monitoring capabilities.

### Transient response

Several new products have answered these needs with the Beyer Broadcastgroup Series. The new M 59 is, at first glance, a conventional-looking vocal microphone; however, it incorporates low-mass, large diaphragm technology that helps yield fast transient response at a price that would not terrorize any station's accounting department.

The M 59's Enhanced-Field Magnet technology is designed to withstand the critical demands of in-studio or on-location speech or interviews. The mic's low mass, large diaphragm Macrodon element and hypercardioid polar pattern provide the fast transient response, along with high output,

high sensitivity and excellent off-axis rejection.

Each M 59 incorporates a sophisticated internal shock-mounting system designed to reduce stand, boom or handheld noise, plus the microphone contains an internal multistage blast filter to reduce undesirable wind or pop.

The M 59 lists for \$399.

### Head-worn gear

Beyer also has introduced new head-worn studio-quality mics either with or without monitoring headphones. The HM 560 head-worn microphone incorporates a new high SPL-capability version of the classic M 500's dynamic ribbon transducer. The HM 560 is designed to handle the demands of close-talking high SPL assignments, while providing high-quality off-axis rejection in a comfortable, lightweight head-



Beyerdynamic's M 59 Microphone

band.

The HM 560 can be interfaced directly into the audio chain, or it can be interfaced with body pack wireless transmitters, permitting more freedom of movement. The list price is \$379.

### Another level

The new DT 158 and DT 159 take the HM 560's vocal-quality head-worn format to another level by attaching its boom to either single closed ear (DT158) or dual closed ear (DT159) monitoring headphones. The dual ear DT 159 can be set up for mono, stereo or split feed.



Beyerdynamic's HM 560

The DT 158 lists for \$479, the DT 159 for \$539.

These head-worn microphones and headsets provide comfort, isolation and distinguished monitoring capability with a vocal-quality microphone, which allows the mic to move when your talent moves. Each of the microphone's transducers will



Beyerdynamic's DT 158

provide superb vocal-quality frequency response.

□□□

For information on the Beyer Broadcastgroup Series of mics, contact Mike Solomon at 516-293-3200; fax: 516-293-3288; or circle Reader Service 13.

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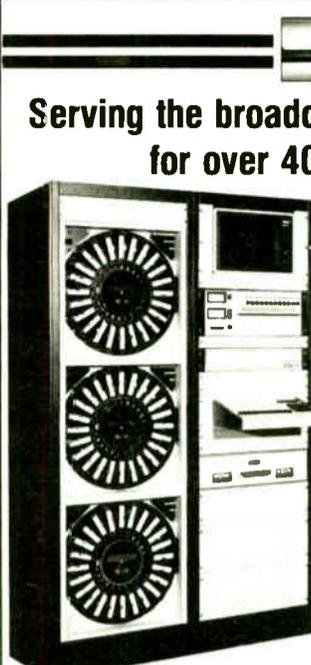
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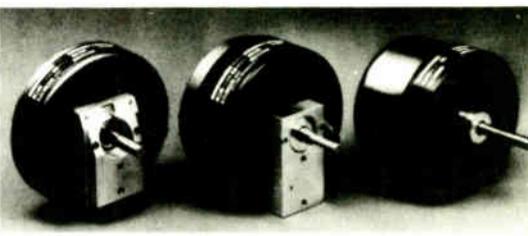
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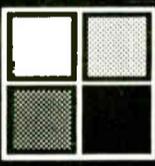


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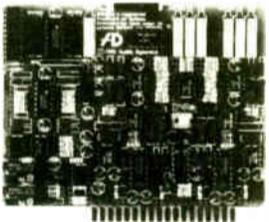
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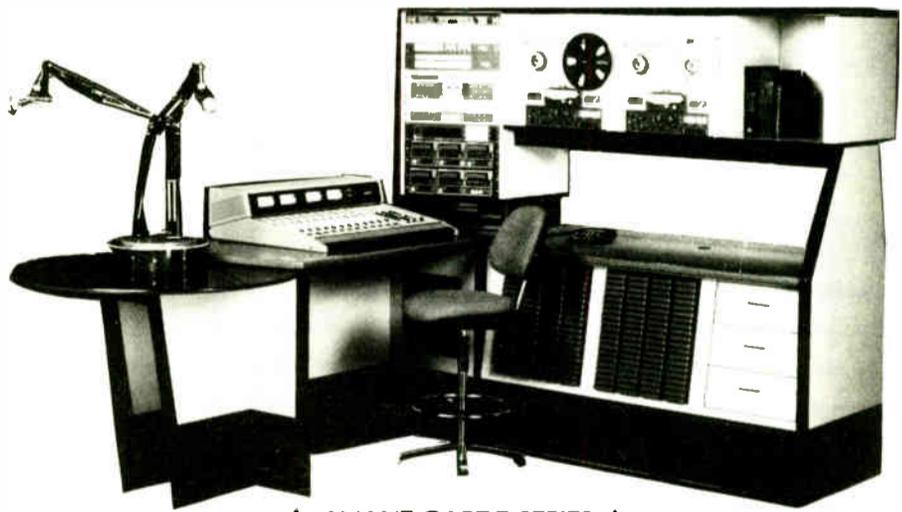
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**READER SERVICE NO. 31**

## TECHNOLOGY UPDATE

# Otari Adds Features to MX-5050s

by John Carey  
VP of Sales and Marketing  
Otari Corp.

**FOSTER CITY, Calif.** Otari, manufacturer of the legendary MX-5050 B-II and Mark III tape machines, has developed the next generation of MX-5050 recorders, a family of rugged, reliable, broadcast-quality tape machines with added features and higher levels of performance.

The fourth and newest generation of MX-5050 tape machines includes the MX-5050 BIII quarter-inch, two-track stereo tape machine, the BQ-III quarter-inch, four-track,

and the Mark IV Series, available in two, four and eight-track configurations (four- and eight-track versions are on half-inch tape).

Building on a design formula already time tested and proven in the marketplace, Otari engineers have equipped the MX-5050 Series tape machine with an array of performance improvement and features, including improved high frequency response, better signal-to-noise ratio, more sophisticated, advanced microprocessor controls, gapless and seamless punch in/out (GSPIPO) on the Mark IV-4 and Mark-IV-8, chase syn-

chronizer compatibility and better remote capability.

While the B-III stands upright in a compact housing, the Mark IV Series is configured as a table-top, console-mounted machine. The machines are ideal for and already widely utilized in the radio production and audio post production fields.

It's the kind of machine we think you can



Otari's new MX-5050 family includes the Mark IV Series, the BQ-III and B-III.

put your trust in. It's rugged and reliable, with great sound, improved performance and new features.

Improvements also have been made on the popular and affordable MX-50 II quarter-inch, two-track tape machine, a high-quality but cost efficient workhorse for production and broadcast applications, minus a few bells and whistles.

New features include a built-in cue speaker with headphone amp, level control and channel select switches, enabling the operator/editor to utilize the MX-50 II as a completely self-contained unit.

□□□

For information on the MX-5050 Series and other Otari products, contact John Carey at Otari Corp. at 415-341-5900; fax: 415-341-7200; or circle Reader Service 146.

## BUYERS BRIEF

**KITCHENER, Ontario** Bruel & Kjaer of Denmark has introduced the WA0609 Acoustic Pressure Equalization (APE) attachment for its 4003 and 4006 Series low-noise omnidirectional microphones.

The attachment functions as both a spatial and spectral equalizer. It is a passive acoustic processor, which employs diffraction to modify the sound field near the microphone diaphragm, thus changing the microphone's frequency and polar response.

When outfitted with the 50 mm spherical rigid APE adapter, the on-axis frequency response of the 4003 and 4006 mics is increased in the frequency range of 2 to 5 kHz, while sounds originating off-axis encounter pronounced low-pass filtering. The result is an increased front-to-rear hemisphere sound reception for frequencies above 1 kHz, transforming the omnidirectional 4003 and 4006 microphones into quasi-directionals with exceptional directivity characteristics and high frequency response.

Improved "reach" is a direct function of the microphone's directivity increasing with frequency. The WA0609 APE attachment provides increased directivity at frequencies above 1 kHz, which enhances the S/N ratio of sound sources received on-axis.

Fullness of sound is preserved and the rendering of delicate transients is unimpeded by the APE.

For information on the Bruel & Kjaer WA0609 unidirectional APE attachment, contact Bill Calma at the company's exclusive U.S. distributor, Tannoy/TGI North America, at 519-745-1158; fax: 519-745-2364; or circle Reader Service 8.

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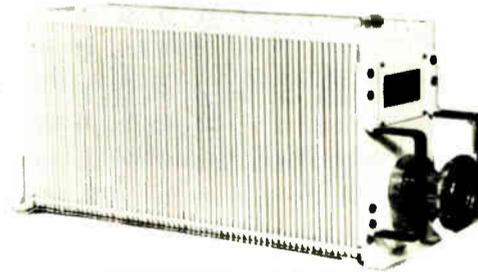
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# BUYERS BRIEFS



**STOW, Ohio** Audio-Technica's AT822 OnePoint X/Y stereo condenser microphone is specially designed for DAT and high-quality cassette recording.

The AT822 is equipped with a pair of wide-range, closely matched cardioid (unidirectional) condenser elements, optimally positioned and uniform enough in response that the AT822 fully reproduces the spatial impact and natural response across an arc of 170 degrees.

The stereo elements' low-mass diaphragms offer superb transient response and 101 dB dynamic range. Frequency response is flat from 30 Hz to 20 kHz, with maximum input SPL rated at 125 dB.

The AT822 terminates its standard cord with two mini plugs threaded inside a pair of quarter-inch phone plug adapters. Also included is a mic cable terminating in a single stereo mini plug, compatible with a common input format for portable semi-pro and consumer stereo DAT recorders.

The AT822 includes a switchable low-cut filter, windscreen and camera show mount adapter. It operates on a standard 1.5 V AA battery. Current demands are low enough that battery life exceeds 1,000 hours with normal intermittent use.

User net cost is \$299.

For information, contact Garry Elliott at Audio-Technica U.S.: 216-686-2600; fax: 216-686-0719; or circle Reader Service 24.



**CALABASAS, Calif.** Saki Magnetics has introduced a complete professional maintenance service for analog audio magnetic recording heads of any size, material, format or manufacture.

Upon receipt, Saki will provide a free head evaluation and recommendation, provide needed maintenance and guarantee reshipment within 24 hours or less.

Using state-of-the-art technology, Saki's staff brings more than 40 years of experience to the task of restoring each head to original performance specifications. Services include a full relap/recontour/polish and test, edge slotting, grounding and base plate rebuilding. Base plate disassembly, reassembly and precision digital optical alignment are included at no additional charge.

Full relap services are priced as low as \$40 for quarter-inch heads, and same-day service is available from Saki's California headquarters by special request.

Saki also offers ferrite replacement playback heads for Studer and Otari decks. Saki heads are priced at \$695 each for Model 1-80-QC and \$535 each for Models 710, 720 and 721 cassette decks. The Otari DP1610 replacement head is \$695 each.

For information, contact Trevor Boyer at Saki Magnetics: 818-880-4054; fax: 818-880-6242; or circle Reader Service 125.

## TECHNOLOGY UPDATE

# KMS 140/150: At Close Range

by Jeff Alexander  
Product Manager  
Neumann USA

**OLD LYME, Conn.** Neumann has introduced two variations of the KM100 Series—the KMS 140 and KMS 150. These are specially designed for applications as handheld microphones, as used for a live stage performance by vocal soloists.

The KMS 140 has a cardioid capsule characteristic; the KMS 150 is hypercardioid. The capsules are interchangeable. Primary features of the microphones are: fast transient response, as only possible with a true condenser microphone; true transparent sound with specifically tailored frequency response; virtually pop-proof performance, thus no need for an additional windscreen; tightly controlled polar patterns over the entire frequency range; and effective suppression of handling noise.

These microphones use a special acoustic filter and transformerless circuitry. Even loud explosive sounds do not cause overloading. Pop stability is excellent and sibilant sounds reproduce naturally.

Although the acoustic filter effectively suppresses interference caused by explosive sounds, the distinctive directional characteristic of the capsules is maintained all the way down to the bass region. This provides these mics with a high degree of stability against feedback when used in a live performance.

With two easily operated recessed switches, sensitivity can be reduced by 10 dB and a high-pass filter switched in to match the vocal characteristic of the performer at the preferred pick-up distance.

The KMS-140 and KMS 150 both come with an acoustic attachment to slip over the capsule inside the head grille. This provides some additional high frequency boost for extra brilliance of program material in the upper frequency range.

The microphone housing is constructed from thick-walled brass material and milled

from a single piece. It is robust and free from any self-induced resonances. An internal multistage suspension decouples the housing from the capsule. Handling noise and other outside interference are effectively suppressed.

These microphones have proven to be ideal for broadcast applications where they must handle the demands of wide dynamic range from continually changing talents, consistently producing a superior transparent sound.

□□□

For information, contact Jeff Alexander at Neumann USA: 203-434-5220; fax: 203-434-3148; or circle Reader Service 65.

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See **D-Mux** during NAB in Booth 1420, or contact our nearest location for further details.

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# MARKETPLACE

Radio World's Marketplace is a compendium of new and recently introduced radio broadcast products.



## Studer Dyaxis

Based on the wide range of digital editing and recording applications, Studer offers three Dyaxis systems: Dyaxis Lite, Dyaxis I and Dyaxis II. Each can be upgraded and expanded.

Dyaxis Lite fills the need for a low-cost, user-friendly digital editing system for broadcast applications. Based on the operating principles found in conventional tape machines,

this integrated system includes a Macintosh computer, Dyaxis remote controller, large internal disk drive and Dyaxis audio processor.

Dyaxis I is a pure, two-channel stereo editor and production tool designed for complete integration with Studer's D740 CD recorder and D780 R-DAT. Utilizing Studer Editech's exclusive MacMix software, Dyaxis I features automated real-time EQ and level control.

The top-of-the-line Dyaxis II digital audio workstation is a modular multitrack system allowing real-time multichannel capabilities. Dyaxis II is the first system in its class to offer real-time crossfades in all editing and recording modes and real-time digital mixing and processing power in a modular, multitrack package.

For information on Studer products, contact Joe Bean, southeastern regional manager, at 615-254-5651; fax: 615-256-7619; or circle Reader Service 54.



## DigiSat II Automation

The Schafer Digital DigiSat II satellite automation system is a rack-mounted, pre-wired system (including the equipment rack) that utilizes an IBM-compatible AT computer.

It features an eight-second time adjustment that places the station's commercials into the network "window" with digital precision. The system features a minimum of nine hours of CD-quality stereo audio. DigiSat II can be used both on-air and in the production studio.

Standard equipment also includes key-

board, VGA color monitor, two modified Sony Beta VCRs, 340 MB hard drive, 1.2 MB floppy disk, modem, uninterruptable power supply (UPS), two printers, audio fading/switching, network control, external device controller and all required software.

For information, contact Jim Hansen or Dean Cull at Schafer Digital, a division of Hansen Digital Technologies: 916-646-3444; fax: 916-646-3493; or circle Reader Service 116.



## Ten Years and the DigiStor

Henry Engineering celebrates 10 years of service to the broadcast industry with introduction of the DigiStor, a digital message unit for radio station "information lines," such as concert information, ski reports, sports scores, etc.

DigiStor will store up to four minutes of audio for automatic playback via a regular telephone line. The message is stored in digital memory with battery back-up. DigiStor can be programmed to play the message only once or continuously until the caller hangs up.

There is no re-cue time—the caller always hears the message from the beginning. DigiStor also can be used as a stand-alone digital record/playback unit (not connected to a phone line) for utility applications, such as a message repeater, sound effects, etc.

Play, stop and record functions are remote controllable; and battery backup prevents memory loss during AC failure. List price is \$350.

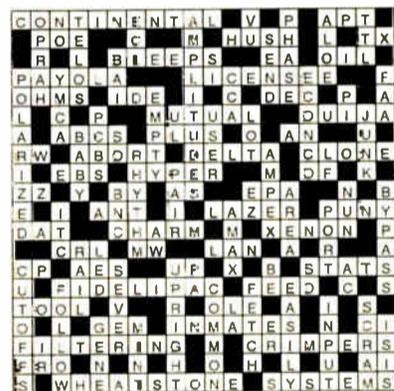
For information, contact Hank Landsberg at Henry Engineering: 818-355-3656; fax: 818-355-0077; or circle Reader Service 88.

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## Solution to March 11 puzzle



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**Radio World**  
March 25, 1992 Issue Use until June 25, 1992

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- 009 031 053 075 097 119 141 163 185
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**WE MEAN IT**—we really DO provide the quality, performance, technical support, and innovation we promise!

Our model A-500 is a thoroughly engineered on-air console: it delivers the level of performance your clients now expect, and DAB demands. All components are selected for long life—gold bus connectors, gold I/O connectors, all gold contact switches, gas-filled relays, triple burned-in integrated circuits, solid state ON/OFF lamps, and precision laminated Lexan control surfaces for a lasting, wearproof finish. And we back that up with a 3-year parts and labor warranty, complete with

factory support from a technically competent and responsive staff.

We've also handled your special requirements as well with a super family of accessories, including a choice of three different telephone modules, an intercom module, an off-line mixer module for your remote feeds, talent control stations, accessory panels, failsafe power supplies, and auto cart and CD sequencing options.

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# *The Better We Look!*

*A-500*

# The New Wheatstone Production – Air Console



## *In Fact, a Whole New Console Family...*

These consoles give you full multitrack production capability while at the same time providing familiar program and audition busing so your production room can double as a back-up on-air facility. They free up your primary Air studio for routine calibration and maintenance sessions. They are a perfect solution for complex talk or news formats.

Beyond its on-air capability the SP-4 is a powerful production console offered in 2, 4 and 8-track formats. Production crews will love the smooth sounding equalization, the auxiliary send buses, and, of course, the full on-air type machine and console logic. There's also plenty of room for those special functions: like a phone module that can handle multiple callers, yet

doesn't tie up your line inputs; an intercom module that lets you communicate with other Wheatstone consoles and rackmount locations throughout your facility; plus a studio control module, line preselectors, tape controllers, and automatic timers.

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Call us.

*SP-44/4-Track*