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RadioWorld®

Special Issue:
Our Exclusive Top 10
Stories of the Year

Vol 17, No 24

Radio's Best Read Newspaper

December 22, 1993

Foundation for Radio's Future Set in '93

WASHINGTON The major radio news stories of 1993 tended to have a futuristic aspect to them.

Most of the technological and business decisions government and radio station owners must make to insure the health of the radio medium were not made in the past year. Standardization of a digital audio radio system and the creation of new sources of revenue through radio data broadcasting are stories to be written in 1994 and years beyond.

But much of the groundwork for change was laid over the past 12 months.

Starting on this page, *RW's* editors—Lucia Cobo, Randy Sukow, John Gatski and T. Carter Ross—list what they believe were the ten most important radio-industry news stories of 1993.

Some of the stories, such as the development of new Emergency Broadcast System and radio frequency radio exposure standards, should reach milestones or conclusions in 1994. Others, such as the trend toward consolidation through duopolies and local marketing agreements, have already made a significant difference.

Free-speech issues will affect radio as long as there are stations and government agencies to regulate them. Recent technological advances would logically lead to new interpretations of "spectrum scarcity" and "public interest standard" and, therefore, less broadcast content regulation.

But public frustration with violent crime and rising numbers of out-of-wedlock births is driving politicians to seek more restrictions, especially on "indecent" and "violent" broadcast programming. First Amendment topics could well appear on *RW's* list for years to come.

All of the top ten in some way deal with the ways radio hopes to compete—perhaps just to survive—with new realities.

The day-to-day mechanics of running a

radio station have not changed very much from the time the first AMs were licensed in the 1920s and the first FMs signed on a couple decades later.

Broadcasting is searching for its place in a world that will soon offer more information than is contained in the Library of Congress at the fingertips via computer and telephone lines, and instant communications from almost any spot in the industrialized world.

A list's omissions often indicate as much

as the items it includes.

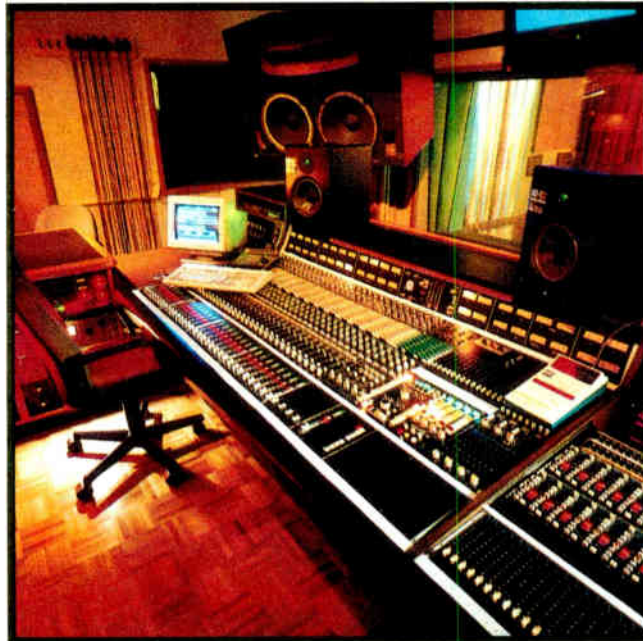
The Clinton Administration's new FCC and its attitude toward radio regulation was one item that might have been expected. But a new FCC never materialized.

Reed Hundt was sworn in as chairman late last month, and the administration still has not nominated anyone for the vacant Republican seat. At press time, it appeared that there would soon be another vacancy at the commission (see page 4).

In the interim James Quello, a Nixon nominee originally, did a solid job of leading the remnants of the Bush FCC through some old (mostly TV) business: cable regulation, TV financial and syndication rules, AM stereo.

Arbitron Ratings Co. had planned big changes in its radio ratings service in 1993, including large sample-size increases in all of its measured markets. Instead, less than 50 percent of the markets responded favorably to the plan.

AM stations began applying for slots in the expanded band (1605 kHz-1705 kHz) in mid-1993, but 1994 is likely to be the first year licenses are awarded. Station owners will be praying that the consumer electronics industry glut the market with expanded-band receivers, and, more importantly, begins heavy production of high-fidelity AM radios meeting the National Association of Broadcasters' AMAX standard, or better.



Digital superhighway is traveled successfully by Seattle's **Bad Animals**. See **Studio Sessions**, pp. 11-25



TOP 10: DUELING ALGORITHMS

The Virtues and Perils of Audio Compression Fanned the Flames of Industry Debate

An issue which took the industry by storm was introduced at the spring NAB convention by Chief Engineer Herb Squire of New York City's WQEW(AM)-WQXR-FM. Squire, with cooperation from ABC Radio, WNYC(AM), Corporate Computer Systems, Moseley Associates, Northeast Broadcast Labs and various audio consultants, conducted a series of tests that revealed severe sonic degradation of overall audio quality can occur by the combination of two or more data compression (reduction) schemes.

The results of the "dueling algorithm" tests revealed that as a signal path grows in complexity and as the audio is subjected to repeated compression, severe deterioration occurs in the quality of the audio. In the tests, Squire and company routed several original uncompressed music recordings through a series of digital devices and signal paths.

Since that presentation by Squire, debate has raged on the issue. Some critics of Squire contend that any audio (analog or digital) will suffer degradation when subjected to the number of passes built into the series of tests—a number,

many contend, that does not reflect real-world usage of audio in a radio station.

The presentation served to foster discussion in the press and at subsequent trade shows. Although heated discussion continues to prevail about the ability to and need for stacking compression algorithms, many industry and related production facilities are quietly and successfully using digital technology.

The Audio Engineering Society (AES) Show in New York hosted a series of demonstration rooms where big-name record producers conducted live recording sessions using digitally-compressed audio transmitted over phone lines to master pristine tracks (see *RW*, Nov. 23, as well as related story from Germany elsewhere in this issue).

As it stands, manufacturers and engineers are pushing for more information and further testing on the issue, as well as more exposure of the already-successful uses of "dueling algorithms." As digital storage media becomes more widely available and accessible (due to reduced costs) the issue of using algorithms to excess may become moot.

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NEWSWATCH

Denon To Give RDS A Boost

NEW YORK Denon plans to provide RDS (Radio Data Systems) encoders to 40 major market FM stations in exchange for the stations airing Denon product ads.

Denon plans to buy encoders from RE America to distribute to stations in San Diego, Los Angeles, San Francisco and New York City.

RDS is a 57 kHz subcarrier technology that can provide a variety of functions to equipped FM receivers including text display of call letters, automatic traffic

alerting, EBS alerting, automatic translator/booster switching, paging, information services and station selection by format.

Although there are nearly 100 FM stations on the air with RDS (based on the U.S. Radio Broadcast Data System standard), Denon is looking to increase radio broadcaster awareness.

Denon Sales and Marketing Vice President Steven Baker said that "RBDS has to be more widely available on the dial" in order get the word out to audio dealers and potential customers.

According to a Denon press release, Baker said: "Many broadcasters are

reluctant to commit scarce resources to the purchase of equipment for technology that is not yet widely available in the FM receivers found in the cars and homes of consumers. We (Denon) want to eliminate this perceived chicken/egg problem for both broadcasters and consumers..."

This is not the first time arrangements have been worked out with stations to go on the air with RDS. At the 1992 Winter Consumer Electronics Show (CES), the Electronic Industries Association (EIA) provided RE encoders to Las Vegas stations. RE provided encoders for a 60-day evaluation at the Summer CES in Chicago.

Denon currently manufactures two auto RBDS receivers and a home tuner. In 1994, the company will introduce two

new home receivers. Onkyo also offers RBDS radios, and other companies such as Delco with its planned line of OEM radios for GM cars, are promising such product lines.

Many companies already manufacture European RDS radios, and plan to modify them to fit the U.S. RBDS standard.

Hundt Assumes Top FCC Post

WASHINGTON New FCC Chairman Reed Hundt was sworn in Nov. 29 by Vice President (and personal friend) Al Gore.

Hundt, a former communications attorney, was nominated earlier this year by the Clinton administration. There is no word when the administration will nominate a candidate to fill the post left by Sherrie Marshall, whose term has expired.

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TOP 10: CONSOLIDATION

Relaxation of Radio Ownership Rules and Heightened Use of LMAs Underpin Recovery

In a move widely applauded by most segments of the radio industry, the FCC relaxed its radio ownership limits in late 1992 (see RW Sept. 9, 1992). At the time, the reaction from industry leaders was positive, although there were some who would have pushed for the more liberal relaxation originally proposed by the commission (then chaired by Al Sikes).

The commission's move to relax ownership and duopoly rules, as well as its allowance of LMAs (local marketing agreements), were part of its efforts to shore up the business; it felt, as did many in the busi-

ness, there were too many stations in too small markets with too much debt. Just over a year later, the commission's actions seem to be paying off for stations.

A recent report of radio stations sales activity, prepared by David Schutz, of Hoffman, Schutz Media, Capital Inc., reveals increased activity in 1993, indicating an economic upturn in the radio economy, according to the National Association of Broadcasters (NAB).

As reported in the NAB's "Trends in Radio Station Sales: 1991-1993," the total station sales volume of the first two

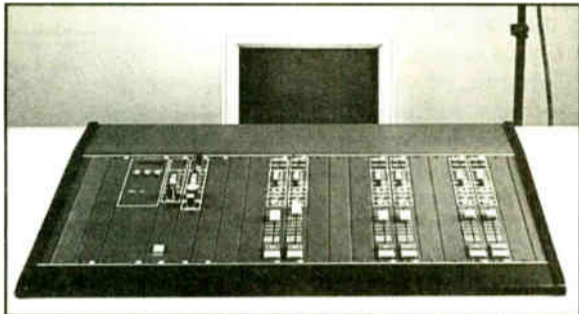
TOP 10: THE DIGITAL ERA

All-Digital Radio Station Becomes Reality As Manufacturers Unveil Wealth of New Gear

As it has the last few years, digital technology extended its hold on the broadcasting studio in 1993.

From the proliferation of digital audio workstations exhibited at the trade shows to transmitting digital audio by phone line, the technology of 1s and 0s was hard to ignore.

The year began with Sony's expected announcement that it would offer a professional version its consumer Mini-Disc technology, aimed especially at radio broad-



The Audiotronics Destiny 2000 is an all-digital on-air radio console.

casters. The intent was to replace the NAB analog cart machine, a target of many other companies over the last few years.

With the MiniDisc and other technologies using computer disk floppies and floptical drives, the digital media can offer quicker access and cleaner sound. Many of these products use data reduction to conserve disc space.

Sony has not yet delivered product to the broadcast market, but a company spokesman said units should reach the distributors in early 1994.

At the 1993 AES, Philips said it would introduce professional Digital Compact Cassette (DCC) equipment to the radio market in 1994.

For those who prefer the "compression-less" route, alongside more recent introductions, such as Digital Broadcast Associates and Air Corp. floptical cart machine prototypes, are time-tested compression-less automation and storage/playback systems that have been in use for several years.

Besides the cart machine wanna-bes, digital has infiltrated the studio-to-transmitter link, satellite delivery, processors, recorders (including the now-under \$3,500 Marantz CD recorder) transmitters, consoles, routing systems, programming (ITC's Digital Program Repeater, for example,) and even the phone lines with Switched 56 and ISDN.

Production editing is no longer tape splicing and razor blades, but full fledged digital audio workstations that continue to come down in price, many crashing the \$10,000 price barrier.

quarters of 1993 was 62 percent higher than the same period in 1992. The increase was 73 percent higher than the 1991 figures for the same two quarters.

Much of that activity involves large operators swapping stations with each other to be in preferred markets whereby they can operate with economies of scale. Viacom, for example, swapped Group W Radio two Houston stations for Group W's WCPT(AM)-WCXR (FM) in Washington—now co-located with Viacom's country power duo, WMZQ-AM-FM.

Likewise, WGMS-AM-FM is now co-owned with WTEM(AM)-WBIG-FM and former Group W President and Vice President, Jim Thompson and Mike Craven, respectively, have agreements in place to purchase, among others, Washington stations WXTR-FM and WHFS(FM).

Fears that two many duopoly and LMA-type situations would drive down business have been allayed by increasingly positive numbers reported to the Radio Advertising Bureau. Total radio revenue, driven largely by local revenue, has posted strong increases throughout the year—with third quarter figures (the latest available at press time) posting a 9 percent increase over last year.

Perhaps the most aggressive operator, in terms of moving to take advantage of relaxed ownership rules and the economies of scale, has been Infinity Broadcasting. Long one of the largest owner/operators of radio stations in large

markets, Infinity entered into and closed on deals to buy more stations in markets where it already had a presence (such as New York, Los Angeles and Washington) as well as deals to increase its fledgling syndication business.

In October, Westwood One announced the purchase of Unistar Radio Networks, a division of Unistar Communications Group. But within this megadeal, Infinity Broadcasting Corporation flexed its muscle and ended up with a significant slice of the pie.

The anatomy of the deal reveals: Mel Karmazin, Infinity's boss, took over the management of the Unistar network in February 1993. Along with the management agreement, Karmazin had the option to buy Unistar, but did not exercise it at the time.

The Westwood/Unistar/Infinity deal unfolded with Westwood One's purchase of Unistar's network business for \$101.3 million. Because Infinity had the option to purchase Unistar, included in the deal was Infinity's purchase of five million newly issued shares of Westwood common stock at \$3 per share, which constitutes a large stock voting block for Karmazin, but not control.

Karmazin also has the option to purchase an additional three million shares at the same price, once the deal is approved by the Westwood shareholders. (The transaction must go through the government required review period under the Hart-Scott-Rodino act.)

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Radio Is Influenced by Future and Past

WASHINGTON It seems that I've been spilling a great deal of ink lately, going on about imminent change and radio's niche in the future. It was a point driven home by the list of **RW's** Top 10 stories of 1993.

The technical issues in the forefront this year are numerous—and where they are leading radio is still unclear. But this is an industry of entrepreneurs and many of you are actively changing and molding the future. Individuals, too numerous to be listed, are running radio stations every day and thriving. Large companies like

business. Westinghouse, Gannett and CBS have been around (in one form or another) practically since the beginning of the business—there was a period of time when they were the business. And here they are, in the forefront again.

Their continued presence in the industry, next to the likes of relative newcomers like Infinity Broadcasting and Evergreen, help heighten the importance of radio in the grand scheme of things. Judging solely on the numbers (radio does garner only 9 percent of the total advertising pie) the industry might appear small.

But, radio does garner roughly 40 percent of total media consumption. And therein lies the importance of this business. It is a huge part of everybody's life. And the ability to grow is limited only by radio entrepreneurs' ability to effect change and steer the business onto the fast lane of the oft-mentioned "digital superhighway."

I find the dichotomy of past/future fascinating. Case in point is the feature we are introducing in *Studio Sessions* this time out. *Tube Talk*, by John Diamantis, will appear every other month and will deal with the vacuum tube and its place in your radio station. What could be more retro? But we are not talking fads here. Tube technology is alive

and well. And while you may be sending your audio digitally over Switched 56, ISDN or T1 lines, before your modem dials New York, you'll probably at least

consider (or should consider) how to make that recording sound "warmer."

John does an excellent job of tying the past and the present together, and pointing out that there are big-name manufacturers like Sony and Neumann and



Schoeps, all of which have recently introduced tube products for audio. Study the past and carry the best of it with you as you plan for your future. In the final analysis, listeners and advertisers don't care if your sound is digitally produced or not, just as long as it delivers the message and sounds good.

Having said that, I want to direct your attention to Michael Lawton's piece from Germany about Radio Kombi on page 8. Europe is the kind of place that exemplifies what I'm picturing. Nestled in the heart of Cologne, next to the world's tallest gothic structure (the Cologne cathedral) is a radio advertising operation that is leaping into the digital age with digitally recorded spots delivered via Switched 56, ISDN and T1 lines for efficiencies of time and cost.

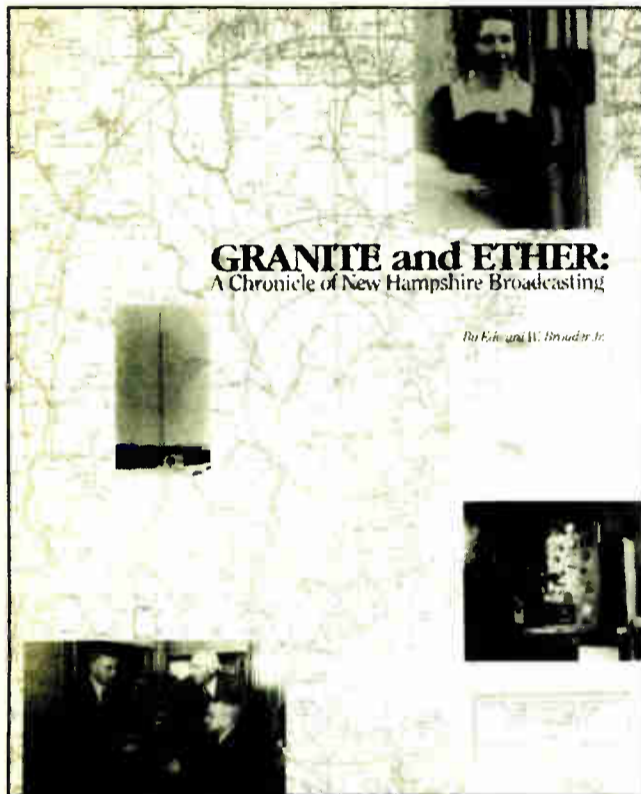
Here in the good old U.S., Bad Animals/Seattle (see Dee McVicker's piece on page 9) is pushing the same envelope from their high tech studio.

Of course as an industry there is still much to be done. As **RW** went to press, PBS announced it had lured away FCC Commissioner Ervin Duggan. Duggan, who was appointed to the democratic seat in 1990, will leave the commission by the end of January 1994 (give or take a few days).

This leaves the commission with two vacancies—one a republican seat and one a democratic. Lucky for radio it only took the Clinton Administration a year to fill the chairman's spot—in our *Newswatch* you will find an item on Reed Hundt's confirmation to the top post.

The FCC has a full agenda to tackle in cable, TV and new technologies (PCS, e.g.). For all the various industries' sakes, it would be nice if the next two appointments happen a little quicker.

One last item about the past. The New Hampshire Association of Broadcasters recently completed a three-year research project with the publication of "Granite and Ether: A Chronicle of New Hampshire Broadcasting." Authored by Edward W. Brouder Jr., the 100-plus page book lovingly details the state's history of broadcasting, with pictures, excerpts, and chronological tables. Copies of the book are available from the association's office for \$12, including postage. Write to Ed Brouder, New Hampshire Association of Broadcasters, 10 Chestnut Drive, Bedford, NH 03110; telephone: 603-472-9800.



The history of New Hampshire broadcasting

CBS, Group W and Gannett have their digital radio consortium.

What is striking about the latter three is their historical significance to this

A New Forum for Radio's Contract Engineers

Note from Tom McGinley, *RW* Technical Advisor:

It is estimated that more than half of all radio stations' technical service needs are provided by outside contract engineers instead of full time or even parttime chief engineers who are employees of the station. Up to now, the trade press has almost ignored the business of contract engineering.

RW changed that with the addition of a bimonthly series, devoted to the trials, tribulations, concerns, business practices, case studies, client relations, horror stories, and whatever else can be helpful or enlightening to contract radio engineers.

Topics are wide-ranging, but focus more on the business of contracting rather than the pieces which deal with fixing specific hardware. Articles on the latter are very welcome, but will appear in John Bisset's *Workbench*.

I'd like to invite any contractor to participate in this forum by submitting appropriate articles, roughly 800 to 1000 words, typewritten and double-spaced, preferably in WordPerfect (via modem or diskette) to either myself or **RW** Editor Lucia Cobo.

We started the series with a thought-provoking submission by well-known Midwest contract engineer Mark Persons in the Nov. 10 issue. Look for the next installment in the Jan. 12, 1994 edition.

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Old news

Dear RW,
I found it interesting that the front page of your Oct. 27 issue stated that two companies had "joined forces to introduce compressionless digital technology to attendees of the Radio Show." It seems that you have decided that the egg definitely preceded the chicken. Please allow me to set the record straight.

Digital audio products have been readily available since the early 1980s. Most of these products have always been "compressionless."

360 Systems has been manufacturing solid state digital audio products since 1980 when data compression schemes were just a glimmer in some engineers' eyes. DigiCart was introduced to the broadcast market in 1991 as a linear, compressionless, 16-bit digital audio recorder.

(Dolby AC-2 data compression was added to DigiCart in 1992 as a user-selectable option.)

It should be noted that the majority of digital audio storage and playback products advertised on the pages of your newspaper are compressionless, offering data reduction algorithms as an option to linear recording.

Regarding the issue of audio degradation when data compression is utilized, it should be noted that because of DigiCart's "hybrid" configuration (use of an internal hard disk and removable media), audio can be copied countless times without degradation. Audio transfers occur as bit-for-bit data transfers, and audio files are never decoded until they reach the analog output stage.

More to the point, DigiCart and many other fine products utilizing data compression schemes have been used in both radio and television on-air facilities for several years.

While data compression is necessary to accommodate the limited bandwidth capacity of current transmission systems, it is still not entirely clear what role, if any, it will ultimately play in the "all-

digital" broadcast studio.

In the meantime, most digital audio recorders currently on the market allow broadcasters to remain flexible and to make their own decisions by weighing the costs and benefits of both approaches.

Don Bird
General Manager
360 Systems
Tarzana, Calif.

Editor's note: The use of the words "introduce" and "technology" in the Oct. 27 front-page picture caption was unfortunate. The picture and caption were intended to display one of the many significant new products shown at the Radio Show and direct readers to Radio Show coverage inside. It was not meant to imply the introduction of compressionless digital audio. RW regrets the misunderstanding.

Cut shack some slack

Dear RW,
About Larry Albert's response to the \$3 charge for the Radio Shack catalog (RW, Nov. 23), keep in mind that Radio Shack is a consumer outlet, not a commercial or professional one. Other major consumer stores have been charging for their catalogs for years (J.C. Penney, Sears). It was only a matter of time before Radio Shack would have to cover their costs somehow.

The latest catalog does contain some coupons that help justify the cost. One of the coupons is for "\$3 off any single-item purchase over \$3." My local store removed this coupon and gave me a catalog. I basically "bought" the catalog, and got \$3 off.

Christopher H. Scherer
Station Engineer
WRMR(AM)-WDOK(FM)
Cleveland, Ohio

Dear RW,
Regarding Larry Albert's letter, I too have long had a problem with Radio Shack, however, not over the price of their catalogs.

Radio Shack built its company on the sale of radio receivers. In the current catalog (the one the store charges \$2.95 for), I counted 109 radios (AM/FM broadcast). Yet this same company, whose first name is "radio," refuses to advertise on local radio stations.

You see their full-page ads all the time in the local paper, but hear nothing on the radio, except for an occasional network spot. Is it because nobody listens to the radio? If so, why does the store sell 109 different models?

Perhaps we radio folks should boycott Radio Shack and other business (like Wal-Mart) that refuse to advertise on local radio. Why should we put money in their pockets? After all, it's the advertising revenue from those who do advertise with us that helps pay our salaries and buy new equipment.

Larry G. Fuss
President and
General Manager
WDTL-FM Cleveland, Miss.

NEMO info?

Dear RW,
Can you put out the word?—we need to

FCC's Unjustified Fines

Everyone has heard horror stories about citizens being pestered by silly edicts administered with no apparent thread of common sense by impersonal bureaucracies.

The conflict between KOA(AM) Denver and the FCC, described by RW columnist Harry Cole on page 34, seems to be such a horror story.

Someone actually complained to FCC because KOA aired five 60-second advertisements promoting businesses in the town of Cripple Creek, Colo., without explicitly naming the town's chamber of commerce as the sponsor.

In response, Mass Media Bureau Chief Roy Stewart's certified letter to KOA General Manager Leland Larsen (a public document released last month), declares the station in violation of the sponsor-identification regulations because, "there is no logical connection between these businesses and the Cripple Creek Chamber of Commerce."

The fine: \$10,000.
Try to make a list of the other entities that might pay to promote Cripple Creek businesses other than the town's chamber of commerce. It will probably not be a long list.

The commission justified the fine, saying it used "criteria set forth in the (FCC's) Policy Statement, Standards for Assessing Forfeitures," the Stewart letter says.

That policy statement apparently does not give the FCC staff freedom to judge situations on a case-by-case basis before handing out the fines. The sponsor identification rules are meant to guard against fraudulent commercial messages.

KOA will challenge the fine because, as Larsen somewhat understates: "We don't feel (the FCC's) review of the situation was complete."

Some broadcasters and station attorneys in Washington are beginning to worry that recent investigations like KOA's have been purposely incomplete. They worry that an under-funded FCC has instituted an unwritten policy of ridiculously high fines for nonexistent or minor infractions.

If it is a true picture, broadcasters should rise up to oppose it. If it is not a true picture, the FCC should do something to dispel it. It might begin by either reversing the KOA fine or giving the public a much better explanation.

—RW

settle a bet.
The antiquated word "NEMO" is often found on very old radio equipment. It refers to program sources that do not originate in the studios.

My general manager says he remembers it from his NBC Radio days in which the word meant: "Not Emanating Main Office."

I, on the other hand, distinctly remember being told by one of the guys I worked with 30 years ago that it was the name signed on the little wire marker tags left in the phone room by an old New York Telephone Co. man who called himself "Captain Nemo."

I'd be interested in hearing other versions of this story and some sort of

determination of which of us is right.
J.L. Sorensen
Chief Engineer, WTPX(FM)
Fort Lauderdale, Fla.

Corrections:

The Modulation Sciences Inc. Data Sidekick, mentioned in the Nov. 23 RW Buyers Guide, is a data subcarrier generator, not an RBDS/RDS product as the headline implied. The phone number for Factory Direct Sales, Dallas, appearing in Buyers Guide, page 46, should have read 214-335-3425.

Data Compression Survey

Many of the latest digital products—such as recording and storage systems, digital audio workstations, STLS, telephone links and satellite program services—are programmed to reduce the amount of data sent over channels routed within the studio or between studios before airing. RW invites station managers and engineers to share their experiences with these digital "compression"—sometimes called "data reduction"—systems.

1. How many digital products using compression systems (such as MUSICAM, SEDAT, apt-X) do you currently use? (Please list them.)
2. Some studies suggest that noise and audio distortions are created when two incompatible compression systems—often referred to as "dueling algorithms"—are linked in the studio chain. Have you or other station personnel ever detected noise you believe was caused by dueling algorithms?
3. Have you ever received listener complaints about noise you believe to be caused by dueling algorithms?
4. If you had it to do over, would you purchase your current compression equipment and services again? Why or why not?
5. How do you perceive the problem of dueling algorithms—Very serious? Somewhat serious? Not very serious? No problem at all?

Also feel free to offer comments on any other aspect of digital systems and data compression.

Responses may be used in an upcoming "In-Depth" RW report. Please indicate whether your name and/or station affiliation should be used in the report.

Send responses by Jan. 28, 1994, to the attention of Randy Sukow, Radio World, 5827 Columbia Pike, #310, Falls Church, VA 22041; or fax 703-998-8505.

Radio World

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**Next Issue of
Radio World
January 12, 1994**

TOP 10: DIGITAL AUDIO RADIO**Digital Audio Radio Testing Set to Begin; 1993 Snags Fixed and Proponents on Track**

The past year has seen both setbacks and progress in the development of a U.S. digital audio radio (DAR) system. The test DAR schedule was delayed a number of times, and a long-awaited FM in-band, on-channel field demonstration scheduled for the National Association of Broadcasters (NAB) convention last spring was cancelled at the last minute.

But DAR progress appears to be back on track as 1994 begins.

Five DAR proponents have agreed to testing by the Electronic Industries Association (EIA) and the National Radio Systems Committee (NRSC) starting on

Dec. 31, 1993. NASA's Lewis Research Center in Cleveland will be the site of the objective laboratory tests. Later in 1994, subjective tests will be conducted at the Canadian Research Center (CRC) in Ottawa.

The five proponents differ in their approaches to DAR. U.S.A. Digital, a consortium of CBS, Gannett Radio and Group W, and Amati Communications/AT&T favor an in-band, on-channel (IBOC) approach. (The U.S.A. Digital proposal includes IBOC systems for both AM and FM.)

AT&T is developing an in-band, adjacent-

channel (IBAC) system on its own. Eureka/Thomson Consumer Electronics favors using an L-band, terrestrial-based system, while NASA/Voice of America favors a satellite-based, S-band approach.

IBOC has many supporters among U.S. broadcasters. Cost estimates for DAR systems point to IBOC as the least expensive option in terms of conversion costs. Despite the setback, U.S.A. Digital's IBOC AM demonstration at the spring show was well received, and both the AM and FM systems are expected to be

its approach to international use.

Earlier in 1993, the federation of German public broadcasters delayed consideration of implementing Eureka-147 from 1995 to 1997. The reason cited was financial restrictions and questions about frequency allocations.

One bright spot for Eureka-147 is the BBC's commencement of British DAB tests in late September. After completion of the tests, the BBC expects to produce a proposal for the introduction of DAB services throughout the U.K.

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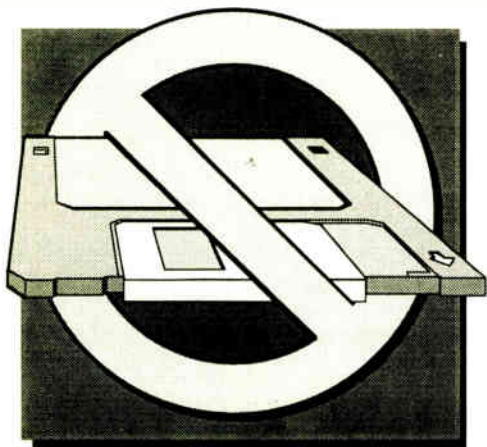
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NASA's Lewis Research Center will be the site for DAR testing set to begin Dec. 31.

ready for the EIA/NRSC tests.

The Eureka L-band approach is proven to work and has gained support in Canada and Europe, but faces strong opposition in the U.S.

In mid-August, the consortium of European governments, broadcasters and manufacturers developing the Eureka-147 DAB system decided to open its membership to non-European groups, and left open the possibility of adapting

The Eureka plan offers a high degree of flexibility and a wide frequency range that is not as cluttered as the 87.5 to 108 MHz range, however, projected lower implementation costs and momentum currently favor an in-band option.

While it is still uncertain how enthusiastic the FCC is about DAB, and while the promised start of testing is a welcome sight, uncertainty about the future of DAR is sure to continue into 1994.

TOP 10: WORLD MEDIA EXPO**Humble Fall Radio Show Blossoms into World Media Expo—A Group Effort Packing a Punch**

The trade show scene for broadcasters was changed significantly in 1993 when the National Association of Broadcasters (NAB), Society of Broadcast Engineers (SBE), Society of Motion Picture and Television Engineers (SMPTE) and Radio Television News Directors Association (RTNDA) announced they would join forces for the World Media Expo, beginning in Los Angeles, Oct. 13-15, 1994.

Also known as the "super show," this trade show extravaganza has been praised by many companies and the technical people who attend the fall shows.

One major selling point is the fact that the increasing number of fall trade shows has been spreading resources thin for exhibiting companies and attendees. Managers of radio stations and other broadcast-related facilities were beginning to balk at engineers attending so many shows.

The NAB, which will combine its fall Radio Show into the new venue, said it expects more than 15,000 in attendance and 350 companies to make the trip. NAB staff will handle the actual day-to-day management of the exhibition.

The Expo's format calls for a common exhibit area that will feature audio, video, broadcasting and the latest in newsgathering equipment. Each group,

however, will hold its own slate of separate conferences and technical sessions. Registration also will be separate for each group.

Expo critics have said there is a danger that the individual focus of each group—particularly radio—will be lost in such a vast technical gathering. The NAB's radio show will now be in the same arena as the slick and glossy high tech video equipment that is sure to be in abundance, as is the case at the NAB's annual spring convention.

The NAB believes, however, that combining with SBE will bring more radio engineers to the combined show. Radio engineer attendance has been low at the several NAB radio shows.

Representatives of SMPTE, SBE and RTNDA also have countered predictions that they could be overshadowed by the NAB's presence at the Expo.

Of all the groups, SBE may benefit the most from the combined show. Over the past five years, several national conventions have lost money, and members have been alienated by the changing venues each year.

The venue changes, however, will continue with the new Expo, but engineers, who often have to prioritize falls shows, are more likely to attend this one, show supporters said.

TOP 10: EBS UPDATE

FCC Initiates Final Stage in Overhaul of the Emergency Broadcast System; Field Tests Data Analyzed, Decision Expected in Early '94

FCC approval of a completely overhauled Emergency Broadcast System is expected in the first quarter of 1994. Even the name "Emergency Broadcast System" is likely to change.

The effort to modernize EBS began in 1992 with broadcaster complaints about the cost of the FCC's requirement that stations maintain an EBS operator at all times.

Broadcasters also complained that the public had become desensitized to the 22-second EBS tone aired during the required weekly on-air tests, and tended to ignore it during real emergencies.

1993 witnessed the emergence of three major EBS technology developers:

1. Sage Alerting Systems, Stamford, Conn., proposed the Sage Emergency Warning System (EWS), based on the radio broadcast data system (RBDS) standard. RBDS receivers built into radios, TVs and other consumer electronics equipment can receive and display emergency data and can be activated automatically, even if they are turned off. Sage developed both in-band and out-of-band versions of the system.

2. TFT Inc., Santa Clara, Calif., developed the EIS 911 Emergency Information System, an in-band system that builds on the current EBS network to allow broadcasters to keep much of their current EBS receiving equipment. The EIS 911 box,

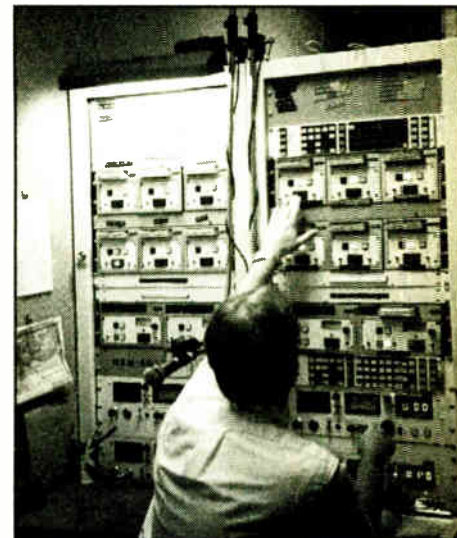
which would sell for an estimated \$750, is designed to receive in-coming emergency signals from multiple points in a "web" network structure to replace the current "daisy-chain" system.

3. Information Systems Laboratories (ISL), Vienna, Va., took a different approach with its Emergency Broadcast Satellite System (EBSAT), linking state, local and national emergency headquarters or mobile command centers to broadcast stations and cable systems by Ku-band satellite links using very-small aperture terminal (VSAT) technology. ISL says EBSAT would be especially useful in areas where rugged terrain blocks conventional terrestrial links, especially during violent storms.

The rules to be adopted by the FCC are likely to be based on a standard communications protocol, such as the established National Weather Service alert codes (WRNAME). All three major systems are already programmed to receive WRNAME. A multiple-systems EBS would allow Sage, TFT, ISL and several developers of other emergency subsystems to market their products and allow individual broadcasters and emergency agencies to choose the system that best fits their geographical area. Critics of this plan say a single EBS transmission system is needed to avoid AM-stereo-

like marketplace confusion.

The commission recently received comments on field tests of the proposed systems held last June in the Denver area (RW, July 28) and last September in the Baltimore area (RW, Oct. 13). The general agreement was that all three systems



The National Weather Service's Todd Heitkamp participated in Denver field tests of EBS proponents.

could accommodate the key goals of improved automation, tone elimination and breaking the daisy chain.

RW's Top 10 News Stories continue on page 26 ▶

TOP 10: RF RADIATION

FCC Collecting Input for Pending Standard For RF Radiation Exposure in the Workplace

A pending FCC ruling that will update RF (radio frequency) radiation exposure limits will likely be approved by spring.

To garner extra broadcaster input, the FCC has extended the comment deadline several times in 1993 at the request of the NAB and ABC and CBS. The latest extension cutoff is January 10 for comments and February 28 for reply comments.

The FCC will adopt a standard based on the ANSI/IEEE C.95.1-1992 standard—a two-tiered mark for worker exposure (1,000 mW/cm²) and general public exposure (200 mW/cm²). For the first time, the RFR standard also will deal with body absorption currents.

The new standard is intended to provide a benchmark for broadcasters and local lawmakers, whom the NAB feared would enact unreasonable overly strict standards based on unscientific rationale.

In the last few years, pressure has been put on lawmakers, local and federal, to enact regulations that would reduce RFR exposure risk. The concern was heightened last year when cellular, hand-held phones were thought to pose a health risk.

An unreasonable local standard could cost broadcasters thousands, even millions of dollars if the mark were too strict.

Another area of controversy surrounding the proposed RF ordinance is the body current absorption section, which, if adopted exactly as the ANSI/IEEE standard, would only apply to stations 100 MHz or lower. Since the FM band extends to 108 MHz, however, it is likely that the FCC will make some modification to keep the standard uniform for all FM stations.

To help broadcasters deal with the standard when it is adopted, the NAB is preparing guidelines similar to the old OST 65. The project, contracted out to Jules Cohen and Associates, will provide non-measurement techniques that can serve as a reference (charts, tables, etc.) to broadcasters to determine whether they are in compliance with the RF standard. In some situations, it is likely that a station will have to hire a consultant to make actual measurements.

Most broadcasters, however, are not likely to be adversely affected by the new standard, according to studies commissioned to ascertain the impact of the new rules.

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German Radio to Send Spots Via ISDN

by Michael Lawton

COLOGNE, Germany Germany's leading radio advertising distributor is going digital. Radio Marketing Services (RMS) plans to run its entire operation via ISDN circuits by the end of 1994.

One immediate improvement will be the process of distributing spots, which will be substantially shortened. Currently, most production studios deliver an analog tape of their advertisements to RMS in Hamburg. RMS then has to copy the tape onto its Barco-EMT BEDAS MOD recorder and transfer the spot into the

technology of each client station: carts, DAT or conventional spool.

Couriers then take commercials to the various stations all over the country, where the spots are reworked into the format the station customarily uses on-air. In many cases, the spot also must be rushed by courier to various local stations served by a regional advertising wholesaler (known as a Kombi).

The process traditionally takes a week. In the future, RMS intends to use ISDN circuits to transfer spots from the studios to RMS, which in turn will distribute them to stations.

RMS began distributing via ISDN in

April to three major customers: Radio NRW, which provides a sustaining service of news and music for 43 local stations in Germany's most populous state of North Rhine Westphalia; Radio ffn, a popular hit station in Lower Saxony; and the Radio Kombi Baden-Württemberg, which acts as advertising wholesaler for 23 local stations in the Southwestern state of Baden-Württemberg.

The Radio Kombi already has been successfully using ISDN circuits linked up with Dialog4's MusicTAXI to distribute spots to the local stations. The three major customers and RMS have been closely involved with Management Data of Hamburg, which developed the software. They agreed on MUSICAM compression parameters, because that is seen as the most likely standard for the future, with a bit rate of 128 kbps (64 kbps per B channel). The system requires a standard 486 PC with 8MB memory, 500MB hard disk and a MOD drive.

RMS copies the spots onto MOD, and then builds up packages on the computer tailored to the needs of the receiving station. These can then be called up either by the station or sent at a pre-arranged time. They are received on the station's PC, and transferred to the station's BEDAS MOD recorder, ready for use.

From MOD to MOD, the spots are treated

as data files, so that the information is thoroughly stable and there is no need for real time transfer.

In the case of the Radio Kombi Baden-Württemberg, the spots are then played from the MOD recorder through a MusicTAXI via ISDN lines to MusicTAXIs in the local stations. The software for this application also was designed by Management Data. It was originally intended that all partners would use the same MOD-to-MOD system, but that has proved to be impossible; a number of stations already are equipped with the popular hard-disk based Digispot system, and RMS and Management Data have been adapting the software for this application. As a result, the transfer is now also possible via ISDN lines using Digigram's MUSICAM-based PCX-5 card. RMS Computer Services Manager Martin Baumann commented that, although the two MUSICAM systems are not directly compatible, they have not had problems with cascading.

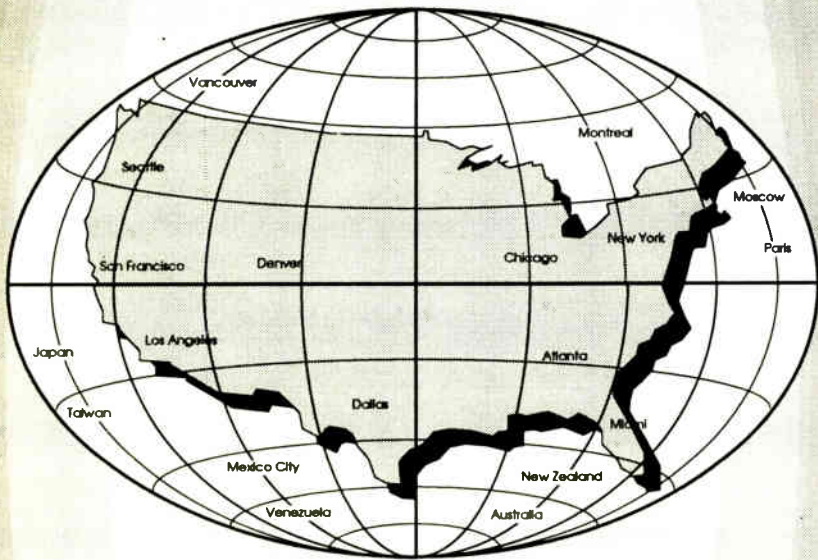
RMS already runs its booking and scheduling system for those stations that currently are linked up via ISDN, and expects all of its partner stations to go digital by mid-1994. RMS also is talking to 30 production studios with a view to their adopting the same technology, so that the distribution of advertisements can be brought into one technical system from beginning to end.

□ □ □

Michael Lawton covers the radio business for Radio World in Europe. He can be reached care of RW.

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SBE Increases Accessibility With Teleconferencing Series

by Randy Sukow

MADISON, Wis. The Society of Broadcast Engineers (SBE) national board of directors held the first of what it hopes will be a series of all-chapter satellite teleconferences last month in conjunction with the SBE Upper Midwest Chapters Conference in Madison.

The purpose of the teleconferences is to give rank-and-file engineers, who usually do not have the resources to attend the national conferences, improved access to the society's officers, said Chapter 24 Chairman Leonard Charles, who moderated the first meeting.

Membership reaction to last month's teleconference will determine whether the SBE will hold them on a regular basis.

The national officers used the first half of the one-hour meeting to update the membership on the SBE's several activities, and the second half was devoted to call-in questions from around the country.

SBE President Chuck Kelly used the occasion to urge members to expand their skills beyond engineering. He emphasized that hundreds of engineering positions at broadcast stations have been eliminated in recent years.

In spite of an improved national economy, "the trend is still downward and there is no indication it will get better," Kelly said.

Engineers will increasingly have to make themselves available for other functions around the station, Kelly added. Contract engineers will take up

an increasing amount of the station engineering workload, but even they will have to hone new skills, such as business management and accounting, to be successful, he said.

Chris Imlay, legal counsel to the society, said the SBE's effort to pass a bill requiring that at least one of the five sitting FCC commissioners have an engineering background has stalled since the bill's sponsor, Rep. Don Ritter (R-Pa.), was defeated in the 1992 elections. While the search for another sponsor goes on, the society is promoting approval of an in-house FCC directive requiring at least one of each commissioner's top three aides to be an engineer.

SBE Executive Director John Poray discussed SBE's current member services, including a new sample contract for contract engineers. He also reviewed the details of the recent SBE decision to participate in a joint fall equipment exhibition in cooperation with the National Association of Broadcasters (NAB) Radio Show, the Radio-Television News Directors Association (RTNDA) and Society of Motion Picture and Television Engineers (SMPTE) annual conventions.

One benefit of the current trend toward trade-show consolidations, Poray said, is that SBE members will be eligible for the NAB member discount rate for registration at NAB's spring show. SBE is organizing the entire technical papers conference at next year's spring show, scheduled for March 19-24 in Las Vegas.

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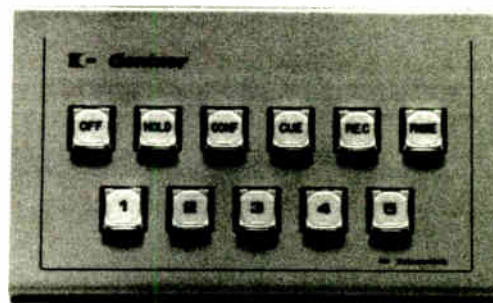
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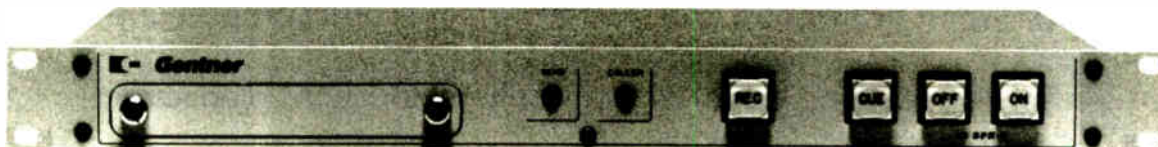
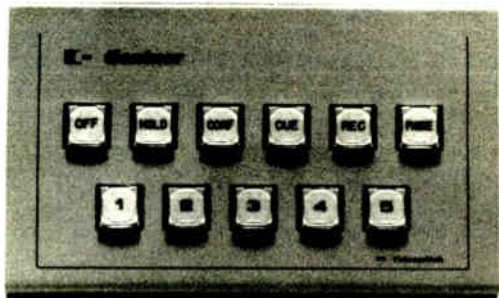
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Tube Talk by John Diamantis debuts on **page 18.**

Equipment and Applications for Radio Production and Recording

PRODUCT EVALUATION

Alesis ADAT: Multitrack for the Masses

by Ty Ford

BALTIMORE A couple of years ago, when the first Alesis ADAT ads appeared in the project studio trade magazines, they caused a flurry of excitement.

For a list price of only \$4,000, the ADAT offered eight tracks of 40.4 kHz to 50.8 kHz, 16-bit linear PCM, 64 times oversampled audio on an S-VHS video tape, and each of the eight channels has its own dedicated converters.

Considering there were, and still are, eight-track analog machines that cost more, it seemed too good to be true. And at first, it was too good to be true; you couldn't buy an ADAT because production ratcheted up slowly.

But that was a couple of years ago. Currently, Alesis is boasting that more than 20,000 ADATs are in the marketplace. In addition, the technology has been licensed to Fostex.

Features

Alesis has demonstrated its dedication to serving the often financially-strapped recording marketplace by including some simple but well thought-out prob-

stand the ADAT philosophy.

One of the first big questions asked was whether the great amount of shuttling that occurs in most project studios would burn out the ADAT transport. Alesis' Jess Negron said: "it's an old very heavy-duty transport made in Japan with heavier gauge metal and a bigger pinch roller. When we get it, we include a large vertical plate to increased rigidity. We add our own capstan rollers and belt for speed. We have our own heads made and we put them on here in Culver City (California)."

Threefold speed

Because of the density of the data, each 120-minute, high-quality S-VHS tape cassette runs three times as fast as it would in a video machine, so it holds only about 40 minutes of eight-track audio. According to Alesis, TDK T-160 S-VHS tape extends the time to about 53 minutes.

The first two minutes of each tape are used to store the "housekeeping" and BRC data required to keep the ADAT on track. When using, the data is transferred at start-up from the first ADAT drive to the BRC. Tapes can be initialized in advance in one real-time pass, or as you record by leaving

comes off of the tape and before it comes out of the machine.

You can operate an ADAT by itself, or slave a bunch of them together and control them with the BRC. Since the sync

information is recorded on the data track, you don't waste an audio track for SMPTE time code.

I test drove the basic ADAT without BRC. By itself, it's a relatively straightforward piece of gear. There are eight -10 dB analog I/Os on the back and a 56-pin Elco connector for balanced lines. A 10-foot Elco/XLR cable costs about \$240, continued on page 17 ▶



Alesis claims its ADAT sales total more than 20,000.

lem solvers in the ADAT.

First, all of the even and all of the odd unbalanced input jacks are normal. If you have a two-bus board, you can plug into inputs one and two, and use the record select buttons on the ADATs front panel to assign input audio to tracks 1, 3, 5, 7 or 2, 4, 6, 8. Plugging in after inputs one and two interrupts the "normalling." Both unbalanced and balanced inputs are usable simultaneously.

In addition to using the LRC (little remote control, more about that later) to do punch in/out work, you can also use any momentary SPST footswitch, either normally open or closed, plugged into the jack on the back panel. The ADAT changes pitch (+100 cents to -300 cents) by varying its sample rate from 40.4 kHz to 50.8 kHz, with -167 cents equalling 44.1 kHz. Pitch changes effect all eight channels simultaneously.

The ADAT comes with a reasonably comprehensive manual and an extensive video that spends a lot of time explaining the uses of multiple ADATs and the BRC (big remote control, more on that later as well). Alesis also has a well-written "white paper" about ADAT technology that may help you better under-

stand the ADAT philosophy.

enough room after your last recording to allow for a clear punch-in. Reinitializing a tape also erases any audio you may have recorded. The transport seems to handle the tape very gently. While fast forward and rewind left me tapping my fingers in expectation with the rotary head engaged (almost three minutes from end to end with a 120-minute tape), the faster disengaged mode only took one minute, 45 seconds.

How about the robustness of the ADAT format? According to Alesis Broadcast Specialist Gary Lynn, "each helical scan is divided into eight PCM data blocks separated by interblock gaps. Each block contains Alesis' proprietary (not Reed-Solomon) 32-bit sample-accurate time code stamp, PCM audio and error correction data for one track."

Error correction activity is shown by the blinking decimal point in the time display.

Using the ADAT

The ADAT is designed with sample accurate editing. That means, when using the 48 kHz sample rate, multiple ADATs are accurate to 1/48,000 of a second. Each of the eight analog outputs goes through a RAM buffer that aligns the audio after it

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Good Spots from Bad Animals

by Dee McVicker

SEATTLE John Cullum, a star of the TV series "Northern Exposure," walked up to a mic and began doing a voice over. It did not seem unusual.

But this was no ordinary gig, not even for John Cullum. In the next few minutes, a fiber optic digital highway would carry his voice cross-country from Seattle to New York City at the speed of light.

Was he working on another zany episode of "Northern Exposure"? Hardly. Cullum was recording a Fleischman's EggBeaters radio commercial from Bad Animals/Seattle, the \$2.5 million, high-tech recording studio opened last year by recording producer Steve Lawson and members of the rock group Heart.

Like many others to visit the studio, which was named after Heart's comeback record "Bad

Animals" and is frequented by big-name rock artists like Pearl Jam and Nirvana, Cullum was transporting his talent over fiber optic lines to a recording studio on the other side of the continent. The studio has Switched 56, ISDN, and T1 services available for such journeys and, according to Bad Animals/Seattle President Steve Lawson, is now able to compete on a grander scale because of the technology.



Numerous radio spots are prepared by Bad Animals Engineer Vince Werner.

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For studios and talent in secondary markets like Seattle, Lawson said, digital lines are bridging the distance for music and radio commercial production to be done from anywhere in the world.

Opening the lines

With a large regional clientele using the studios for producing radio commercials, Bad Animals/Seattle uses digital lines to bring announcers into the city from Los Angeles, New York, or Chicago.

The reason: "Our talent pool tends to get overexposed in our market, so what people do is hire a spokesman from somewhere else to give their commercial a unique sound," Lawson said. "The flip side is that the Seattle pool is available to the rest of the world via Switched 56, ISDN or T1."

In the case of Cullum, this Northern talent was made available to the New York studio Howard Schwartz Recording using Digital Patch Systems and Digital Multichannel System (DMS) T1 from Entertainment Digital Network (EDNet), a large digital network that studios, broadcasters, directors, advertising agencies and performers tap into for this purpose.

EDNet uses the fiber optic lines laid across the country by telephone companies and long-distance carriers. T1 transmits bi-directional, true stereo at 20 kHz bandwidth and provides SMPTE timecode synchronization. Compression of 4:1 is accomplished using Dolby AC-2 bit-rate reduction.

It took 14 video frames, or about a third of a second, to get Cullum's voice and picture from Seattle to New York, where the commercial's director and producer were located. The two studios were locked in time by a timecode sent over the digital network—with a 14 frame offset between them.

Syncing audio/video

"New York was about 14 frames behind us, so we offset our video recorder about 14 frames ahead of the video recorder in New York," explained Lawson, who has

continued on page 14 ►

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World Radio History

Radio Spots Are Bad Animals' Specialty

► continued from page 12

devised similar schemes to carry the voices of other talents, including "Saturday Night Live's" Phil Hartman.

Superhighway

Lawson had heard about the digital superhighway three years ago during a conversation at AES with EDNet Founder Tom Kobayashi, who

at the time was working for Skywalker studios and had used a fiber optic link to connect Skywalker North and Skywalker South.

As the story goes, EDNet was born out of Director Ron Howard's need to participate in the audio mixing of the movie "Backdraft" from Skywalker North in Santa Monica, Calif., while the rest of the movie's

crew participated in the mix at Skywalker South more than

Bad Animals/Seattle was one of the first studios to get on

Bad Animals/Seattle uses digital lines to bring announcers into the city from Los Angeles, New York or Chicago.

400 miles away. From this project, EDNet was born.

the EDNet bandwagon. Previously, the studio had used

satellite and phone patches and had investigated starting its own fiber service to expand its marketability and reach. "We tried to get our own fiber service going for the past four

years, but we found it was impossible," Lawson said. Most of the difficulty, he explained, was in the ergonomics of networking various local telephone carriers.

Unlimited talent pool

Now with the EDNet link, Bad Animals/Seattle is able to tap into nation-wide recording and extend its studios to others on the network. Bad Animals/Seattle's Studio X, in particular, is in great demand. This is literally the heart of the facility as the home-base studio for the rock group Heart. Studio X is a venture between Heart's Ann and Nancy Wilson and Lawson Productions Inc., Steve Lawson's recording and production company.

Studio X is a Bauton design. In addition to its sophisticated equipment, including a Solid State Logic console with Ultimotion fader/VCA automation system and Total Recall, Studio X has a complete kitchen/lounge area and a sunken living room.

Another studio at Bad Animals/Seattle is a Tom Hidley classic, one of the first Hidley designs ever done, according to Lawson. Elton John and Steve Miller recorded in this studio in the late 1970s, when the facility was built by Danny Kaye for his recording company Kaye-Smith. More recently, the Hidley studio has been visited by R.E.M. and Nirvana.

With a digital link to these studios and the others at the facility, Bad Animals/Seattle is in many ways on equal footing with studios in the primary recording markets of New York, Chicago and Los Angeles.

In short, Lawson said, Bad Animals/Seattle has joined the global village for music and commercial production.

As an example of its foothold in the world market, Bad Animals/Seattle is planning to kick off the next Heart album with a one-hour program from Studio X uplinked via satellite. "It'll be broadcast all over the world via satellite, and we'll probably send that via Switched 56 to Los Angeles for the uplink," Lawson added.

□ □ □

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

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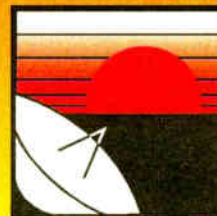
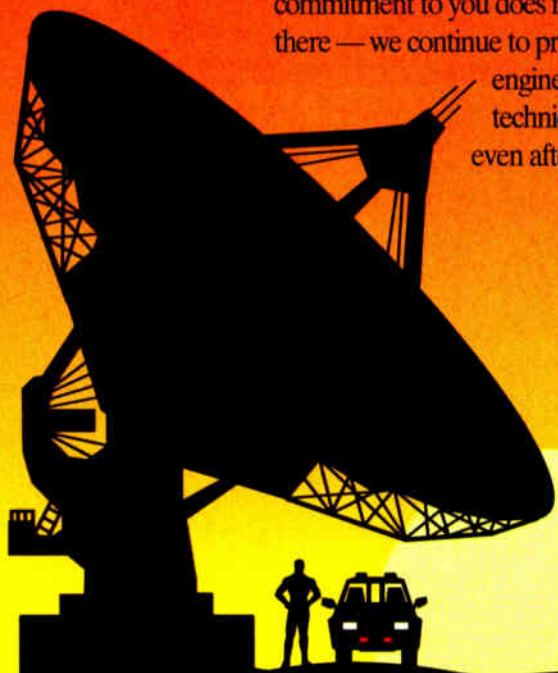
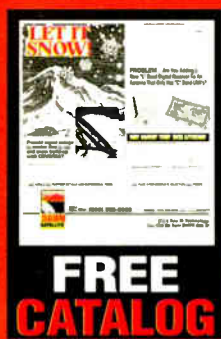
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World Radio History

Good Interviews Critical to Documentary

PART III of V

by Steve Rowland

NEW YORK Interviews are very often the building blocks of a radio documentary. They provide a way to introduce listeners to a variety of people and a variety of points of view on a particular subject.

Interviewing experts also gives the producer a way to learn the subject matter as the program is being researched and produced. Because so much information is conveyed through the interview, its recording quality is very important.

Unfortunately, in TV production, the sound quality of the interview is not considered to be so critical, and a lot of audio blemishes are accepted because the viewer is concentrating so much on the picture. The techniques and frame of mind can carry over to radio, and the result is that producers often will accept inferior audio in a radio production.

Capturing the character

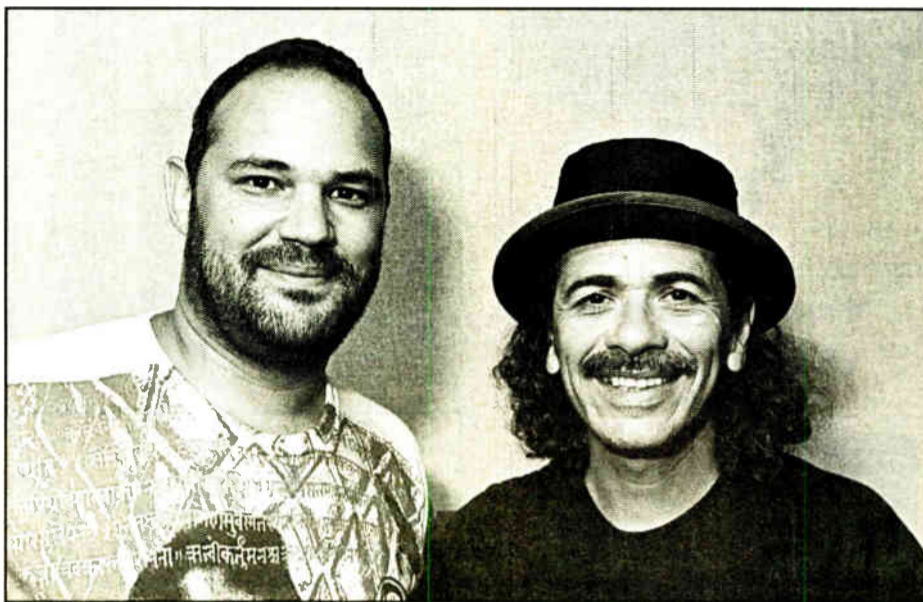
Remember, it is not just the words that tell the story—it is the person's presence, demeanor and charm that you are recording, and you are trying to convey these characteristics with just sound.

A documentary producer must try to get as clean a signal as possible to begin with because of what audio may encounter on down the line: i.e. the loss of highest frequencies, merciless compression by the time it reaches broadcast, or perhaps the effect of being downlinked from the satellite onto quarter-inch tape at 7.5 inches per second.

I have already spoken about the equipment needed to achieve superior location

sound. Here are a few things to watch out for while using the equipment:

As producer/engineer one must try to (gently) take as much control over the environment as possible. This means asking to temporarily turn off air conditioners



Producer Steve Rowland (l) and interviewee Carlos Santana

and refrigerators, asking to close windows (even if it is hot outside), and even moving your interview subject into a different room.

Get comfortable

One tried and true method of conducting and recording an interview at the same time is to sit next to your subject on a sofa, or in chairs drawn together. Then hold an omnidirectional mic, off-axis, and pointing up toward the corner of the mouth.

The rationale for this technique is that an

omnidirectional mic is much less subject to handling noise, and is can also be brought in closer to the source without developing a "proximity effect" resulting in too much bass. The mic is held down and off-axis to reduce "P" pops and some sibilance and

and strong interviews. Again, your goal is always to forget the equipment, and focus on the story—on the human element.

Some producers like to follow the TV convention and use lavalier mics. The argument is that a "lav" is less intrusive, but I don't buy it. While there are some great "lavs" around, I haven't heard one that sounds like my Neumann or a Schoep. Besides, I've had very few problems getting people who have agreed to be interviewed to talk into a microphone.

Limit "lav" use

However, one great way to use a lavalier is to use a wireless system to record someone talking and doing something at the same time. I used a wireless lavalier to record Miles Davis talking while he was standing at an easel working on a painting (with a second, cardioid mic, to record the sounds of his brush on the canvas.) This was one of the more relaxed, probing and insightful of all the interviews which we recorded with Miles.

While I'm trying to keep this article focused on the technical side of documentary production, I would be remiss if I didn't talk just a little about approach.

The most important, the most simple, and the most often overlooked thing to do in recording interviews for radio, is for the interviewer to be quiet and let the subject talk. In documentary production, it is only

continued on page 17 ▶

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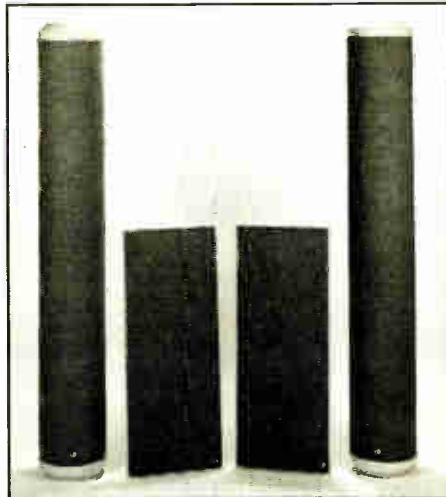
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For more information, contact DIC Digital at 201-224-9344; or circle Reader Service 119.



ASC Acoustic Control Systems

For getting the right live sound in your studio, ASC (Acoustic Sciences Corp.) offers the Studio Tower and the Studio Panel. The Studio Tower is a six-foot high, ten-inch diameter tube trap that controls low frequency resonances down to 90 Hz. They are most effective when placed in room corners, according to the company.

The Studio Panel is 14-inches wide and 36-inches long and is designed to tame midrange and high frequency reflections.

ASC also provides evaluation of studios to determine acoustic control needs. For more information, contact ASC at 503-343-9727; or circle Reader Service 52.

Manley Laboratories Langevin CR-3A Microphone



The new Langevin CR-3A cardioid FET microphone is said to be well-suited for general studio or broadcast use, according to the company.

Features include high pass filter switch, -10 dB pad switch, and versatile 48V phantom powering.

Available accessories include suspension mount, fixed hard mount, foam windscreen and carrying case. Price is \$800.

For more information, contact Manley Laboratories at 909-983-0511; or circle Reader Service 182.

Midiman's Mini-Macman

For those who take the MIDI route, Midiman's Mini-Macman is an inexpensive (\$40) MIDI interface for Macintosh computers.

The Mini-Macman is a one in/one out with MIDI indicator. It comes with a lifetime warranty.

For more information, contact Michael Paul Inman at Midiman, 818-449-8838; or circle Reader Service 145.



Roland DM-80 Firmware/Software

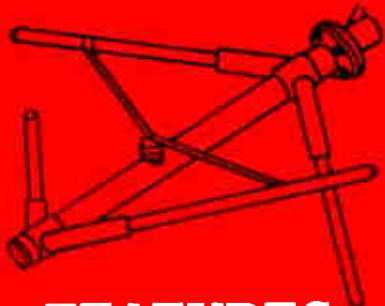
Roland has introduced Version 2.0 firmware and Version 2.0 software for the DM-80 digital audio workstation.

Version 2.0 firmware adds a number of new features including audio profile display on the remote controller, Group Move, enhanced back-up, unused memory recovery, mixer snapshots and more.

Version 2.0 of the Multitrack Manager System for Macintosh software now provides ability to lock up to four DM-80s together for 32-track recording capability. Other features include automated control of the DM-80's internal mixers, graphic waveform editing and new screen display options.

For more information, contact Roland Pro Audio/Video at 213-685-5141; or circle Reader Service 103.

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Alesis S-VHS-Based Multitrack ADAT

► continued from page 11
according to a local pro audio store.

Also on the back panel are the proprietary eight-channel digital optical I/Os that link multiple ADATs together, Sync I/Os, nine-pin D connector for the optional remote meter bridge, a jack for a momentary SPST footswitch and a jack for the LRC. The LRC contains all of the transport controls, three-point autolocate system and monitor function switching.

No you didn't miss anything; there are no other digital I/Os. In order to input digital audio directly to an ADAT you need the optional AII (\$895) sample rate and format converter. The AII lets you digitally input or output two adjacent ADAT tracks at a time via the AES/EBU or SPDIF format at 44.1 kHz or 48 kHz.

With four AIIs you can simultaneously transfer eight tracks digitally. When you add a BRC, you can also transfer any tracks, not just adjacent tracks.

Sound Quality

Although capable of producing first rate digital audio, the first ADAT shipped to me had a problem with head-motor noise and noise pulses from the strobing record-ready lights. During playback of one or two channels at normal levels the noise was inaudible. However, during quiet passages, with all eight channels up, and with all eight of the record ready light blinking, the noise was noticeable.

The next unit I received was much quieter, and although I could still hear some of the same noise, it's fair to say that, at the jacked-up levels at which I was listening, any normally-recorded audio coming

out of the machine would have been loud enough to rip my face off.

According to Alesis' Lynn, there presently is an engineering change order (ECO) to inspect and correct that problem in any new ADATs, or ones that come back from the field. If your intent is to use all 92 dB of the ADAT's quoted dynamic range, you should listen closely to low level recordings to determine if the noise is a factor.

The ADAT offers a selectable monitor path either directly from the inputs or after the digital-to-analog converter (DAC).

Alesis makes the point of mentioning that DAC monitoring is not quite the same as "monitoring off the record head" and that this mode produces glitches that, while disturbing, do not end up on tape.

The default crossfade time for edits and punch-ins is 10.67 milliseconds. Three

others, 21.33 milliseconds, 32.00 milliseconds and 42.67 milliseconds, are front-panel selectable. Long crossfades are suggested for sustained or low frequency note, short crossfades work better for high frequency sounds.

If an external digital clock is not present, the ADAT automatically uses its own 48 kHz master clock, which can be manually disabled. The master ADAT in a multiple stack must be set to "internal" when receiving digital input from any slaved ADATs.

In summary, if you're still in the tape-based multitrack analog world, the ADAT offers digital clarity at a fraction of the footprint of an analog multitrack machine. If you're now mastering analog multitrack to DAT, the ADAT is a logical choice.

Product Capsule: Alesis ADAT

	Thumbs Up		Thumbs Down
✓ low price		✓ no quick start	
✓ input patching		✓ no output controls	
✓ sound quality		✓ head noise	

For more information, circle **Reader Service 152**; or call Alesis at 800-5-ALESIS

Documentary Interviews

► continued from page 15
in rare instances that you will want to use the interviewer's questions. Normally you are looking for answers given in uninterrupted full sentences. So ask short questions and give your subject time to think, and to give you a full answer in his/her own words.

Above all, do not talk during the answer; do not even say "yes"... or "uh-huh"... or "right," or anything. Wait for the end of the sentence, even better, use silence. Sometimes, if you just pause at the end of a story, your subject will continue into a new thought.

Try to make the person as comfortable as possible. Lots of eye contact is important. Do your research in advance. I always write up a list of questions before the interview, but don't usually refer to it, unless my mind goes blank and I need prompting. It is best to have a direction in mind, but be flexible, if things which you didn't expect come up. Listen carefully, and use follow-up questions—good simple ones include "Can you explain that?" or "Tell me more." or even "I'm not sure I understand." Listening well will allow you to feel much more in touch with your subject, and will make him/her feel more comfortable.

□ □ □

Steve Rowland is a principal in the production company, *The Music Makers*, in Philadelphia. He can be reached at 215-843-4388.

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Allure of Vacuum Tubes Is Still Strong

Editor's note: Tube Talk is a new column focusing on tube technology and equipment for radio production. The forum will run bi-monthly in Studio Sessions.

by John Diamantis

WASHINGTON Vacuum Tubes!?!?! You mean those antiquated, failure prone, heat producing, inefficient, fragile, take 'em in a bag and test 'em at the drug store tube tester, Vacuum tubes?? Hollow state devices? Valves? Fire bottles?

You betcha!
While no one will disagree that solid state devices have revolutionized the way our industry operates, some people in broadcasting, and a whole lot of people in the music industry feel that sometimes, there's nothin' like havin' a tube in the circuit to make it *sound* just right. Or different. More real. Less harsh. Smoother. Warmer. Insert your favorite adjective.

Overload gracefully

Some theorize this difference in sound is due to the vacuum tube's gradual overload characteristics, as opposed to

the abrupt overload characteristics of solid state devices. Others believe it may be due to the tubes more benign distortion characteristics—low-order, even harmonics (abundant in music), rather than the higher order odd harmonics seen in solid state (not usually musically related).

Research presented before the AES in the mid 1970s seems to support these theories. Still others maintain that tubes sound better because the circuits are simpler, and I once read an article that attributed the differences to the operating characteristics of both devices at the atomic level: continuous electron flow in a vacuum vs. non-continuous release of electrons in silicon via chemical reaction.

On the other hand, there are many engineers, producers, etc. who are convinced that this tube thing is all nonsense. They are of the opinion that people who like the sound of tube equipment like distortion, rolled off high frequen-

cies, boomy bass, etc.

At this point, we could get into an endless, no doubt heated, debate about the difference in sound quality between

tubes and transistors and which is better, what are the reasons for this difference, etc., but we won't. Opinions on audio quality are like bellybuttons—everybody has one and everyone's is different. After the dust settles, all that matters is what works for you.

Tubes in radio

The purpose of this column will be to discuss the use of vacuum tube audio equipment in modern day broadcasting, production and recording studios. I will cover the basic operation of the vacuum tube, where to buy them, where to find reading material on tubes, and how to test them. Equipment wise, we will review some vintage pieces of equipment that find their way into today's studios;

A typical vintage piece of tube audio gear, suitable for use in today's studio, has a relatively simple topology.

what to look for, where to find them, how to restore them, and how much to pay for them. We will also be reviewing and testing current production vacuum tube products.

If you're wondering why anyone living at the edge of the 21st century, with technological marvels available like compact disc, DAT, MiniDisc, digital sound editors, digital music this, digital effects that, would want to purchase and use a "retrograde" technology like vacuum tubes, consider this.

You could take one of the new digital effects boxes and create any one of an almost infinite number of alterations to a voice track you're recording. However, maybe the only way you can make your recording session click is to patch in 10 dB of compression; something with "warmth" and "punch." Using a vacuum tube compressor would be ideal. A farfetched idea? Not considering my personal experience and those of many other engineers and production people.

These devices, like the others in your "bag of tricks" are tools to get the job done, give you an edge, and provide your audio with a unique sonic signature. (I know, it sounds like ad copy, but it's true.)

Plethora of gear

It's for this reason that vintage compressor-limiters, like the Teletronix LA-2A, or the Fairchild 670 are in such demand, and command obscenely high prices; they have a unique sound, that isn't duplicated in other devices, and they are hard to find.

Tubes have gotten a bad reputation over the years for being unreliable and temperamental, but in most cases you'll find that the equipment in question was either overly complex, or designed and built poorly: with inadequate ventilation, improper operating voltages, cheap parts, etc. Your typical vintage piece of audio gear, suitable for use in today's studio, has a relatively simple topology, and is still operating with most if not all of its original parts. In fact, I've inspected pieces of gear that are at least 30 years old that have had the original

tubes in them, and they still measure within spec.

While it's true glass envelope tubes are physically fragile, electronically, they are fairly rugged, easily surviving power surges and other abuses that can quickly turn \$3,500 of sophisticated micro-processor controlled wizardry, into a \$30 project case and 10 cents of plastic covered silicon. At my last station, I had several pieces of vacuum tube equipment in my air chain for four years, and I did not experience a single breakdown.

Surprisingly, most vacuum tube types are still readily available, with prices for most common types very reasonable. For example, the ever popular 12AX7A, is available from a variety of countries of manufacture, as well as variety of levels

of performance. The Chinese version of this tube is a favorite for many users, and is priced from about \$5 for your average performer; \$15 for a low noise type, and around \$25 for a selected, gold pinned, low noise, low microphonic version.

Tubes for sale

If you do your homework, and don't mind making a few calls, you could probably better these prices by 30-50 percent by dealing with some of the smaller mail order firms that specialize in buying out unsold stock from other sources, and selling these goods at a discount. While these types of places don't always have the same items in stock, you can wind up getting some great deals by checking with them regularly.

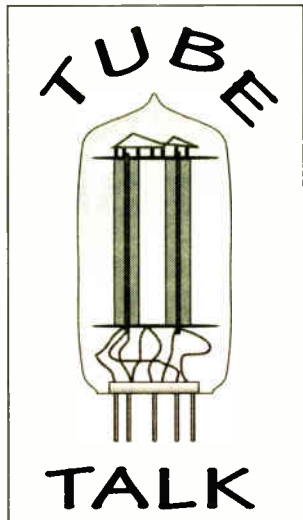
Likewise, there are many currently produced pieces of "professional" vacuum tube equipment available, and the list seems to grow every day. Most of this gear is manufactured by "specialty" companies, like Demeter, Anthony DeMaria Labs, Tube Tech, Summit Audio, Groove Tube, D.W. Fearn and VTL (which stands for Vacuum Tube Logic), to name a few. However, Sony Corporation has been manufacturing a tube microphone for about a year, proving to me that professional use of vacuum tube equipment is occurring in numbers much larger than what is often described as the "lunatic fringe."

One last note, especially if you are not technically oriented; vacuum tube equipment utilizes operating voltages that are potentially lethal! Not just your normal household 120 volt wall outlet type, but the type operating with voltages between 300-600 volts DC are typical. This is a far cry from your typical 30 volt DC operating voltages in most solid state equipment today.

If you have the slightest doubt about your ability to safely service this equipment, please find someone qualified to do so. If you are qualified, make sure you follow all safety procedures before servicing any equipment.

□ □ □

John Diamantis is engineering manager for WGMS-FM, WBIG-FM and WTEM (AM) in Bethesda, MD.



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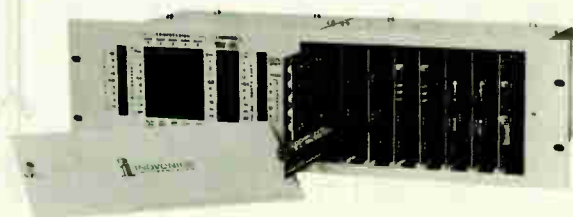
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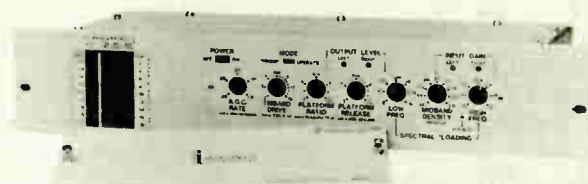
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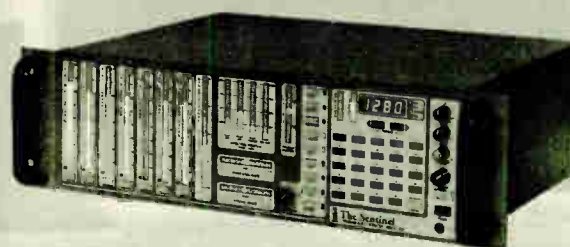
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World Radio History



SIGNAL-TO-NOISE

Wes Dooley's M/S Stereo Technique

by Frank Beacham

NEW YORK Sometimes one man becomes so identified with a technology that he becomes the personification of it. When I think of M/S stereo recording I immediately think of Wes Dooley. Call it his niche, or his passion, but Wes and this very popular stereo recording technique have become inseparable.

Wes runs a small company called AEA in Pasadena, Calif., where he designs and builds electronic components for M/S stereo applications. You'll find him evangelizing about the virtues of M/S at just about every professional audio trade show.

It was one of Wes's papers on the subject that enlightened me to the M/S technique many years ago. If more people in radio broadcasting would listen to Wes they could add big time production value to their sound at a very modest cost.

With M/S, creating high impact stereo sound is easy, virtually foolproof and completely mono compatible. "It's liveness provides a real sense of being there," Dooley said. "M/S is ideal for capturing outdoor atmosphere and crowd reactions. The technique delivers more crowd response for the stereo audience

without compromising announcer intelligibility for the mono audience."

Though "panned mono" with a mixer is the most common way to create stereo for broadcast sound, "true" stereo microphone placement is a useful technique that's being re-discovered for live remotes or field recording. True stereo uses a pair of microphones to pick up ambient sounds.

Mic placement

There are two common methods for true stereo: spaced-mic or coincident. Within each category are many variations of microphone placement. Spaced-mic techniques use two microphones mounted at varied distances apart. Though such placement methods can result in great stereo separation and spacious ambience, mono compatibility for broadcast can be dicey. Coincident placement uses a pair of microphones that are sandwiched closely together in the same plane.

M/S, which means Mid-Side, is one of the most popular and easy-to-use coincident recording techniques. Though M/S has traditionally been used to record acoustical music, advocates like Wes Dooley have continued to alert the industry to its possibilities in news gathering,

documentary, sports and other live events.

M/S pickup can be achieved either by using two separate microphones or a single microphone containing two capsules. A cardioid or hypercardioid capsule (M) faces the front and is pointed directly toward the sound source. A bidirectional, or figure eight capsule (S), is positioned at the sides, at right angles to the M capsule. The outputs of the two microphones are then routed through an adjustable sum-and-difference matrix, which extracts two-channel, left and right, conventional stereo that can be recorded or broadcast directly over the air.

Though separate directional and bidirectional microphones may be successfully coupled for M/S applications, combining the two elements into a single mic case creates a less cumbersome and more convenient system for broadcasters, especially on live remotes.

Adding the matrix

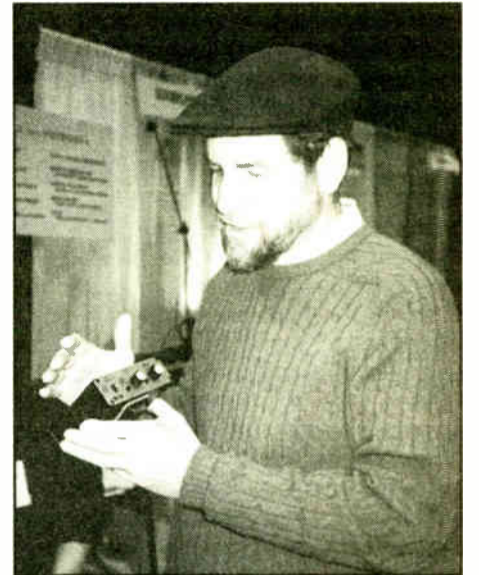
Many recordists prefer to avoid use of the matrix until post production. There they can more carefully "paint" the soundfield to create the desired mood. In such cases, the field recordist simply treats the M/S microphone as two separate units, routing the signal from the M capsule to channel one and the signal from the S capsule to channel two of the recorder. Wes calls this "component" M/S, a bow to the vocabulary of the video generation.

By recording the M and S channels discretely, the post production sound editor has a range of choices. Perfect mono may be chosen by selecting the M channel only. By processing the M and S channels through a matrix, the ratio of side level and mid level can be controlled and the stereo perspective varied in the mix. One can even "undo" audio previously processed through a M/S matrix and re-process it again for more suitable results.

Several one-piece M/S microphones well suited to broadcast use are now available. Shure's VP-88, street priced at under \$700, is an excellent choice for radio stations doing sports and news remotes. The mic has a switchable

internal decoding matrix, making it a self-contained "plug and play" stereo broadcast system. Other more expensive M/S microphones are made by Neumann, Sanken, Schoeps and Sony.

Wes Dooley's company makes two M/S decoder components. The AEA MS 38 Lite, priced at \$300, allows a field recordist to lay down non-matrixed "component" Mid and Side tracks on tape while monitoring the sound through an M/S



Wes Dooley shows his MS 38 Lite headphone amp with M/S matrix decoder

matrix in headsets. The AEA MS 38 MKII double matrix model, priced at \$585, is designed for post production use and allows a lot of sophisticated audio tricks with M/S after the recording is made.

M/S stereo miking is an inexpensive tool that can help make audio productions stand out in the crowd. As Wes Dooley keeps telling us, "it can have a dramatic effect on news and sports programming." Just because most broadcasters don't use or understand it is no reason for the more innovative creators of audio programming to remain on the sidelines. Once you experience the difference, there will be no turning back.

Wes Dooley's address is 1029 North Allen Ave., Pasadena, CA 91104; telephone: 818-798-9128; fax: 818-798-2378.

□ □ □

Frank Beacham is a writer, director, producer and consultant. His address is 163 Amsterdam Ave. #361, New York, NY 10023.

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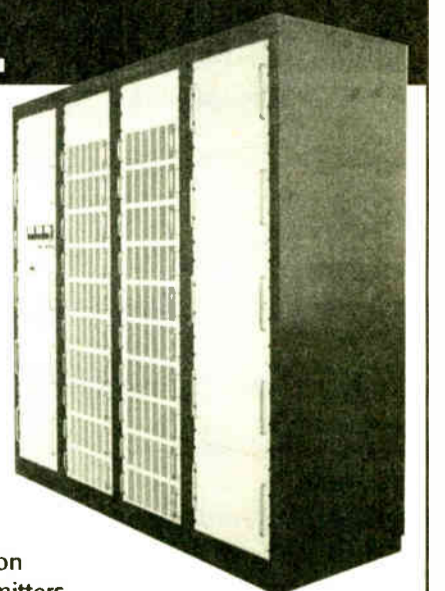
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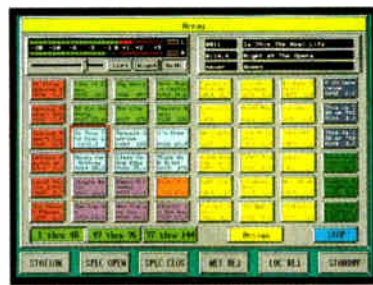


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DIGITAL DOMAIN

The Ins and Outs of Digital I/Os

by Mel Lambert

STUDIO CITY, Calif. Modern technology can be both a benefit and a mystery. I recall from my high school physics days, a favorite teacher who often stood for several minutes reflecting upon the marvel of turning on a light switch here...and having the ceiling lamp come on...there! (I often wonder what he would have made of CD players, workstations and DAT machines?)

In many ways, we can all be accused of taking digital technology for granted. Having convinced ourselves that anything digital must be inherently superior to analog, we maybe do not consider some of the basic laws of physics involved in getting a signal from one location to another.

By and large, just so long as we pay attention to some fundamental considerations, data transfer is a seamless and reliable process. As I have mentioned in previous columns, with the use of good-quality cable and connectors—plus understanding the electronic and electrical differences between consumer-grade (IEC 958 Type II, "S/P DIF" and their variants) and professional I/Os (AES/EBU-formats)—life in the digital jungle can be reasonably safe.

Like clockwork

Of course, in its most basic terms, the transfer of a digital bitstream from one device to another can be likened to the operation of a high-speed train service. Just as Amtrak needs to make sure that a railroad car is placed beside the platform at locations where we are likely to gather, and at times we agree would be convenient, and then whisk us off to our chosen destination, we can synchronize our departure and arrival times with business and other appointments.

Digital I/Os are not dissimilar. Just so long as we agree on a common sampling rate, railroad cars—excuse me, 16- or 20-bit data words—can be used to carry digitized information from a DAT machine, for example, to a digital audio workstation. One obvious drawback of the majority of currently utilized consumer and professional interfaces is that, quite literally, they have no universal sense of timing.

To return to our railroad analogy, we arrive at the station just as the train pulls in, and locomotives arrive at their destinations in time for our meetings (most of the time!), simply because everyone involved in the process is using the same timing references. Here, we all synchronize our watches and clock at some common reference, and then expect each and every event to occur at its advertised times.

In the world of S/P DIF and AES3, however, we often do not have an independent timing reference. A digital output from our DAT machine, assumed to be running at 48 kHz, needs to be buffered through a phase-locked loop at the workstation's input, and then relocked against the system's master crystal reference, so that inputs from different sources can be stored to hard disk and/or processed within DSP sections.

Master timer

While the timing or clock reference of each incoming bit stream can be determined from the unique sync words that define the start of each individual audio

channel and Channel Status block, small perturbations in these values can cause dramatic sonic differences.

Of course, an ideal way of getting around the majority of such problems would be to use a master timing source, and then make sure that all of the individual timing references and DSP clocks within individual systems and sub-assemblies are locked to the same synchronization source. Just as WWV is used in the radio industry to make sure that our wall clocks display the same value as the guys in New York (or Los Angeles or Washington) who are

about to start a top-of-the-hour news feed, for example, then for reliable sample-accurate synchronization, all digital audio

A drawback of many currently utilized I/Os is their lack of a universal sense of timing.

devices should share a common clock source, preferably conforming to AES-11.

But even the best schemes can run a foul in one important area. Just as a clock that runs fast and then slow would hopelessly disrupt even the best planned railroad timetable, so random or periodic variations in the periodicity of an incoming data stream—or jitter, to give it a formal label—can cause sync and replay problems.

Jitter can be defined as the timing differences between the place that a bit of information should be and where, because of timing anomalies in output drives and cable impedances, the actual data value occurs. While I do not have space here to cover all possible causes of jitter—I plan to delve deeper into the subject next month—a major contribution comes from bandwidth limiting the data channel. (Which goes a long way to explain why

continued on page 25 ▶

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LINE-OUT

Mixing Live Sound for Broadcast

by Bruce Bartlett
with Jenny Bartlett

ELKHART, Ind. Live concerts can enhance a radio station's programming and draw in listeners. Hence, it is important to make sure the live mix is done properly.

By following some basic rules, mixing a live concert for broadcast should make the task go smoothly and sound professional.

First, let's start with mic techniques.

Place mics close to instruments and vocalists. That way, each mic picks up less leakage from other instruments, and less feedback from the monitor speakers.

If you lack enough inputs for a complex mix, use a submixer on stage or at your mixing location. Run all the drum mics through the submixer. You can also use a mic combiner to feed two mics into one input.

Often a small drum set can be miked with a single miniature omni condenser mic. Clip it to the snare-drum rim, in the

middle of the set, about four inches above the head. It will pick up the snare, hi hat, toms, and cymbals all around it. Add a little bass and treble boost. You can put another mic in the kick drum.

On vocal mics, use a foam pop filter. Have the singer use the mic with lips touching. There's less breath pop, leakage, and feedback at this distance than at a few inches from the mic. Most mics boost the bass when used up close, so you'll need to roll off the bass to get a natural sound. Try -6 to -10dB at 150 Hz. If you roll off at 60 Hz, the 500 Hz range will still be emphasized, giving a puffy sound.

Use a direct connection to electric bass and keyboards. Since no mic is used, this eliminates leakage and room acoustics. Plug a phone-to-phone cable into the instrument, and into a Radio Shack 1/4-inch XLR adapter (No. 274-017). Plug the adapter into your snake.

Most guitarists and keyboard players run their instruments into effects boxes. You will record the signal direct from the effects output. This gives a fully produced sound with a minimum of effort. With many direct instruments, the players have a clear idea of what their sound is, and give you that preprocessed direct sound. If they are studio players, they often have a better handle on effects, preamps, and so on, than you might as the engineer.

Monitors

Once your mics are set up, monitor the aux bus (monitor bus) in headphones to set up the floor-monitor mix. Ask the performers if they can hear themselves okay. If the band wants effects in their monitors, bring the effects returns into input channels on your mixing board. On these channels, turn up the aux send (monitor send) to feed the effects to the floor monitors. Normally a monitor send

continued on page 26 ▶

Digital Ins and Outs

▶ continued from page 23
some of the current-generation, low-impedance 110-ohm digital audio cables can sound a great deal better than a length

of common mic cable. And why AES3-format I/Os are often more reliable for long-distance transmissions than consumer-grade ports.)

machines, using the new PrismSound DSA-1 hand-held analyzer (see chart).
New month I will return with a more detailed examination of jitter, including

Unit	Output Format	Jitter	Sample Rate
DAT Machine #1	IEC-958 Coax	6.3 nS	+15 ppm @ 44.1 kHz +10 ppm @ 48 kHz
	AES/EBU	3.1 nS	+15 ppm @ 44.1 kHz +10 ppm @ 48 kHz
DAT Machine #2	IEC-958 Coax	5.3 nS	+15 ppm @ 44.1 kHz +20 ppm @ 48 kHz
	AES/EBU	3.2 nS	+25 ppm @ 44.1 kHz +20 ppm @ 48 kHz
DAT Machine #3	IEC-958 Coax	3.7 nS	-1 ppm @ 44.1 kHz +2 ppm @ 48 kHz
	IEC-958 Optical	6.3 nS	0 ppm @ 44.1 kHz +2 ppm @ 48 kHz

of common mic cable. And why AES3-format I/Os are often more reliable for long-distance transmissions than consumer-grade ports.)

In terms of "typical values," I present here some of the preliminary jitter and sample-rate values that I recently measured from three well-known DAT

sonic effects, and how it can be minimized in digital interfaces.

□ □ □
Mel Lambert is a principal of Media&Marketing, a Los Angeles-based consulting service for the professional audio industry. He can be reached at 818-753-9510.

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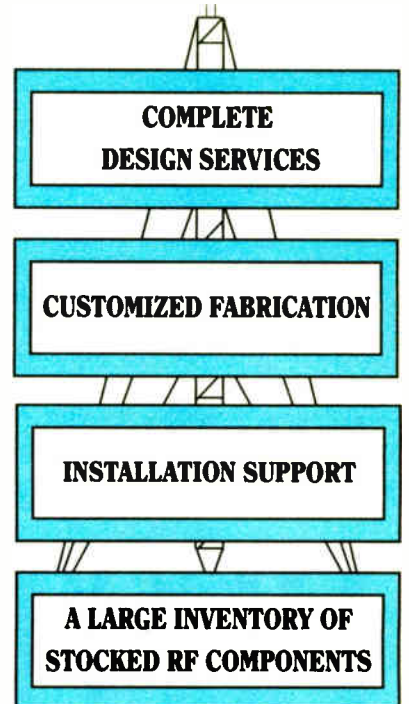


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▶ **RW's Top 10 News Stories continued from page 7**

TOP 10: AM STEREO

**Reacting to Congressional Mandate, FCC Names Motorola's C-QUAM
The Single Standard for AM Stereo Transmission in the U.S.**

Nearly two decades of AM industry conflict culminated in late October with the FCC officially naming Motorola's C-QUAM the single U.S. AM stereo transmission standard. C-QUAM was chosen over its chief competitor, the Kahn ISB system, developed by Kahn Communications Inc., Westbury, N.Y., which was the lone alternative to C-QUAM during most of the years since 1975, when the FCC opened its AM stereo proceeding.

AM stereo had been a nearly dead issue. A large majority of AM stations have not installed C-QUAM or any other AM stereo system, although AM broadcasters have been cleared to broadcast stereo since 1982. The FCC approved AM stereo transmission that year, but declined to set a single standard.

Although C-QUAM has long appeared to be the de facto standard, many have blamed lack of widespread interest in AM stereo on the commission's failure to name a single system.

The FCC probably would never have standardized any system had it not been ordered to do so by Congress in the 1992 Telecommunications Authorization Act. Senator Larry Pressler (R-S.D.) quietly introduced an AM stereo amendment to that bill just before its October 1992 enactment. The amendment passed without debate.

The commission opened the new AM

stereo standardization proceeding before the end of 1992 and did not close it until the Congressionally mandated deadline of Oct. 27, 1993. The FCC proposed C-QUAM over Kahn ISB, citing the larger number of stations broadcasting C-QUAM, both in the United States and worldwide, and the absence of Kahn ISB receivers on the consumer market.

Most broadcasters and other interested parties commenting on the AM stereo proceeding concurred with the commission, although a significant number of those

commenting opposed C-QUAM. Some opponents argued that the Motorola system was technically inferior to Kahn's, while others said neither system would adequately serve the AM industry (RW, May 12).

In its final AM stereo order, the FCC gave stations operating with Kahn ISB or other alternative stereo transmission systems (systems developed by Harris Corp., Magnavox and Belar were briefly marketed in the early 1980s) one year to cease broadcasting with them. However, stations using Kahn AM stereo exciters with the "POWER-side"

option were granted permission to use them indefinitely, as long as identical program material is fed to both channels.

Kahn Communications President Leonard Kahn continues to press five-year-old litigation in the Southern District Court of New York, charging General Motors (owner of Delco, leading car radio manufacturer) with patent infringement.

AM stereo's future remains uncertain. Many AM stations have switched to news/talk formats that do not require stereophonic sound, while some AM music broadcasters say stereo does nothing to improve audio on low-fidelity consumer AM radios sold today.

The future is further complicated by AM stereo's incompatibility with the proposed U.S.A Digital AM in-band, on-channel digital audio radio system.

Live Sound Mixing Tips

▶ continued from page 25

is pre-fader. But you might want to set it post-fader; that way, the band members can hear the wet/dry mix that is going on tape.

Mixing

If you will be mixing a group whose music you aren't familiar with, listen to some CDs of their type of music to get an idea for the production style. If you have no clue how to mix the music, just be sure you can hear every instrument. They all should be about equally loud.

While mixing, take your hands off the mixing board and just listen, as if you

were listening to a record. If you hear anything you don't like, fix it.

When you record a performance that is not for a live audience, you can do multiple takes to perfect your mix. Ask the band to play the song for about a minute while you set up the mix. Record it on DAT or cassette, and play it back to the band for their suggestions.

Compress the vocals, or at least the lead vocal. Otherwise the vocals will get too loud or too soft relative to the instruments. You might want to set all the input faders to -10, then adjust the input trims to get a rough mix. All the faders will line up. After you move individual faders for solos, etc., you can easily reset the normal mix by lining up the faders.

To avoid missing cues, turn temporarily unused faders down, but not off. For less noise, mute (remove from the bus sends) any mic that is not being used in the current mix.

Mono compatibility

The mix or balance should sound the same in mono and stereo. Instruments that are panned all the way to one side tend to sound too quiet in mono. To prevent this, don't pan hard-left and hard-

right. Try three-quarter left and three-quarter right instead.

The same goes for stereo reverb. Reverb is more audible in mono than stereo. Panning stereo reverb slightly toward center will make the mono and stereo reverb more equal.

Recording

Log the DAT start and stops times of each song for later editing. So that you don't miss the beginning of a song, let the tape run continuously. If you want to stop the DAT between songs, allow

If you have no clue how to mix the music, just be sure you can hear every instrument.

plenty of space between songs on tape to avoid erasing song endings. Also, start recording well before the song begins.

Aim for a DAT recording level of -3 dB maximum, rather than 0 dB. That way, if the levels accidentally get too high, you'll have a little headroom.

□ □ □

Bruce Bartlett is a microphone engineer and technical writer for Crown International, and the author of "Practical Recording Techniques," published by Howard Sams. Jenny Bartlett is a technical writer. Bruce can be reached at 219-294-8388.

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TOP 10: RBDS/RDS

RBDS/RDS Technology Gains Stride in 1993; 1994 Should Prove Bellwether Year for RBDS

Radio broadcast data system (RBDS) developments were regularly in the news in 1993, but next year should be an even more eventful and pivotal year, which should mark whether the technology will succeed in the United States.

The RBDS standard was approved a year ago by the National Radio Systems Committee (NRSC) during the Electronic Industries Association's Consumer Electronics Show (CES) in Las Vegas (RW, Feb. 10). It is fully compatible with the decade-old, European-developed radio data system (RDS), which delivers digitally encoded text and other signals over the 57 kHz FM subcarrier.

Several major receiver manufacturers are expected to announce rollout of RDS products at next month's CES. Only a handful of consumer electronics companies have had product announcements so far. Onkyo and Denon are now selling RBDS receivers, and General Motors' Delco says RBDS will be offered as an option on GM cars beginning in mid-1994.

At the time NRSC approved RBDS standard, about 50 FM stations had RBDS

encoders installed. Many of those installations were concentrated around Las Vegas and Chicago, where stations were brought on line to accommodate CES demonstrations. The number of installations is currently estimated at 100 (RW, Oct. 27).

NRSC is finding it much more difficult to set an AM RBDS standard. Because of AM's physical limitations, whatever system may be chosen will have about half the data capability of FM RBDS. European broadcasters never developed an AM RDS standard for the committee to use as a starting point.

Proposed AM data systems considered by NRSC so far have been flawed. One would require a brief audible tone whenever an RBDS message is transmitted. Another is incompatible with AM stereo.

During the recent Baltimore field tests for new Emergency Broadcast System (EBS) technologies (see "EBS" item, page ...), Sage Alerting Systems, working with receiver manufacturer Rohde & Schwarz, claim to have demonstrated a silent, stereo-compatible AM system. It was

reportedly receivable 18 miles from the transmitter at 160 watts over 1630 kHz (an experimental authorization).

The Sage/Rohde & Schwarz transmissions were, however, demonstrations only and not part of the official EBS test record. Rohde & Schwarz has not yet proposed the system to the NRSC.

Meanwhile, NRSC has begun considering standardization of what might be the next step after RDS/RBDS. A high-speed FM data system subgroup met officially for the first time in early November to consider systems that transmit data at 16 kilobits per second (kbps) or more. (RBDS operates at 1.2 kbps.) Charles Morgan of Susquehanna Radio Corp., and chairman of the overall NRSC, was named chairman of the high-speed data subgroup as well.

Japan Broadcasting Corp. (NHK),

developer of a 16 kbps system now in experimental operation in Japan, exhibited at the National Association of Broadcasters Radio Show in Dallas last September. A full field demonstration of its system is planned for the 1994 NAB spring convention.

Seiko Telecommunications Systems Inc., Beaverton, Ore., a subsidiary of the Japanese watch manufacturing company, is developing a high-speed system to be receivable on consumer wrist and pocket watches.

Mitre Corp., McLean, Va., is under contract with the Federal Highway Administration to develop high-speed FM subcarrier technologies for traffic alert applications as part of the government's IVHS (intelligent vehicle-highway systems) project.

TOP 10: FIRST AMENDMENT

The Courts, the Commission, and Congress Struggled to Re-Interpret First Amendment

The past year saw Congress, the FCC and the court system address several First Amendment issues of importance to broadcasters, including attempts to mandate audio warning labels on beer and wine commercials and to codify the fairness doctrine.

At the same time, the FCC imposed record fines against Infinity Broadcasting Corp. for violations of indecency rules by its star morning personality, Howard Stern.

In August, the commission levied record fines totaling \$573,570 against KFBI(FM) Las Vegas and four other Infinity stations for nine Howard Stern programs broadcast between November 1992 and January 1993.

The FCC determined the broadcasts to be "indecent" speech, which is defined as "language or material...that describes, in terms patently offensive as measured by contemporary community standards...sexual or excretory activities or organs."

Broadcasters won a round late in the year when the U.S. Court of Appeals in Washington ruled the latest round of FCC indecency regulations unconstitutional.

The rules, mandated by Congress in 1992 and written and approved by the commission in 1993, limited indecent programming to the "safe harbor" hours of midnight to 6 a.m.

Judge Patricia Wald wrote: "The government did not properly weigh viewers' and listeners' First Amendment rights when balancing the competing interests in determining the widest safe harbor period consistent with the protection of children."

The court did not take issue with the FCC's definition of indecent speech, but with the safe harbor concept, saying that, as written, it was too broad to stay within constitutional free-speech boundaries.

The FCC reacted by expanding the safe harbor by four hours, from 8 p.m. to 6 a.m. It is uncertain whether or not this will satisfy constitutional concerns. The Clinton Administration has not indicated whether

it will appeal to the Supreme Court.

The appeals court decision could have an affect on the Stern indecency fines, Infinity attorney Tim Dyk said. But FCC Commissioner James Quello said in The Washington Post, "We don't think they're [the fines] moot. He [Stern] is still, in a sense, indicted."

Congress came closer to codifying the fairness doctrine, the FCC regulation dating to the 1950s, which was repealed by the commission in 1987. It reads: "A broadcast licensee shall afford reasonable opportunity for discussion of conflicting views on issues of public importance."

Several Congressional attempts to reinstate the doctrine since 1987 were stalled by President Reagan's vetoes and threatened vetoes by President Bush. The Clinton administration is expected to let the fairness doctrine pass into law.

Reimposition of the doctrine is part of a Senate campaign finance reform bill, but is not included in House campaign reform bill, passed in November. A joint House-Senate conference committee will decide whether it survives in the final bill, which expected to reach the White House in mid-1994.

In May, Senators Strom Thurmond (R-S.C.) and Paul Simon (D-Ill.) introduced The Sensible Advertising and Family Education Act (S. 674), which would mandate several seconds of air time following an advertisement for beer or wine be dedicated to a Surgeon General's warning.

The bill requires one of seven messages be read in rotation "as part of the advertisement in an audible and deliberate manner and in a length of time that allows for a clear understanding of the health message by the intended audience."

Broadcasters were concerned about possible lost revenue from advertisers unwilling to pay for the time to air the warnings. Advertisers and broadcasters said existing warning labels on every bottle and can of alcohol should sufficiently promote the government's message.

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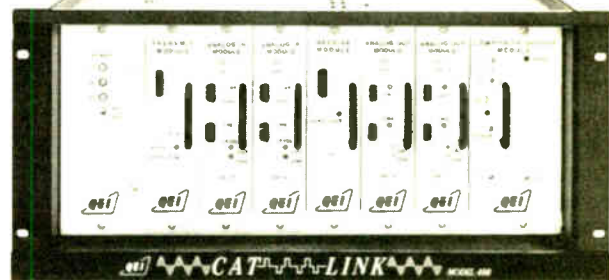
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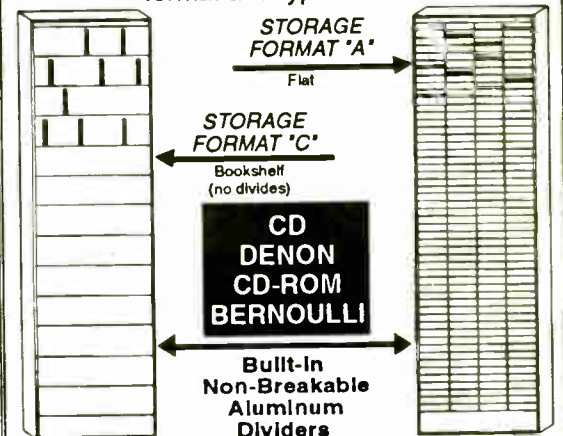
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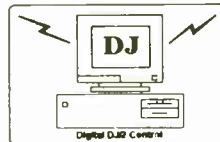
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KEYBOARD CONNECTION

CD-ROM Dispenses Instant Knowledge

by Barry Mishkind

TUCSON, Ariz. The more we utilize the capabilities of the latest-generation computers, the more our world changes. Things done manually just a few years ago are now wholly automated. Micro-processors are everywhere, from control room to transmitter. Information floods into the station from all directions.

Getting that flood channeled and filtered for presentation on the air is a real challenge.

Quiet teletype

Perhaps you remember the old teletype machines used for years to provide information to the news department. Those Type 30s clanked along, spitting rolls of paper all over the place. Staffers separated the stories apart and hung them on nails for later retrieval. But there was so much information that most of the paper actually ended up in the trash.

Nails were usually set aside for features, almanacs, daily events and other information often of interest to the talk show hosts and public affairs departments. Murphy dictated that the information you wanted was almost always on the floor somewhere or missing.

Associated Press and other information services now offer complete systems via computer that not only automate the selection and display of incoming data, but eliminate the piles of unused teletype information as well.

An AP system subscriber can instantly jump to news headlines, or in-depth treatment a particular story, the latest sports scores or the local weather forecast.

What if news breaks in an unfamiliar community and you're not sure of how to get there? Type in a city name and find its location in a second, as well as distance and direction from you. It's as easy as following the menu selections.

It's not just the newsroom that benefits from computer information access.

DJs no longer have to hustle to find the latest football scores or desperately search for the temperature and forecast while the weather jingle is playing. Custom infobases can also provide all sorts of information on the music and artists featured on the station.

Finding the answer

Perhaps the greatest tests for information retrieval come during the talk shows. While there are hosts out there with photographic memories who can tell you who

pitched in the third game of the 1954 World Series, most of us need to rely on reference books. This is where the computer shines.

The term "CD-ROM" might make you think of those computer games your teenage son plays all night. But it is much more. One CD-ROM can hold nearly 700 megabytes of information, the equivalent of several hundreds of thousands of pages—literally entire encyclopedias.

There are thousands of different titles available on CD-ROM, covering almost every imaginable topic.

"Compton's Interactive Encyclopedia" allows you to search for a topic or name of interest, and pulls up the information to research a subject before an interview or settle an on-air argument. It is a full encyclopedia, complete with pictures and audio from important people and events.

"Microsoft Bookshelf" provides a more general compilation of information, with abbreviated encyclopedia, dictionary, thesaurus, almanac, quotations reference and atlas all contained on one disk.

If your talk show deals with food and nutrition, "Food/Analyst Plus" from Hopkins Technology will provide instant information on food content as well as dozens of nutrition subjects.

Dealing with current events? The "CIA World Fact Book" or the "World Terrorist Update" from Quanta Press will give you the facts to analyze and coherently comment on a fast breaking story.

Sports departments will like Quanta's archive of sports facts.

Even the "Guinness Book of Records" is on CD-ROM, so you can instantly find the first, fastest and oddest in many categories.

Religious stations might appreciate one of the CD-ROM Bibles, available in a variety of translations, with other related reference books.

At your fingertips

CD-ROM products listing nearly every phone number in the U.S. or business names in every category are available. Radio sales departments might find that information useful.

To unlock the information on CD-ROM, all you need is a CD-ROM reader in your computer. If one wasn't provided when you got your computer, installation is quick and straight-forward, taking little more time to install than to install a modem.

What sort of unit should you buy? There are many good ones out there now, and

prices have dropped to start at around \$200. The key technical point to keep in mind is

One CD-ROM can hold nearly 700 megabytes of information.

to get one with an "access time" of 300 milliseconds or less, and a "throughput" of greater than 175 kilobits per second.

Often these machines will be labeled "MPC Compliant." This means they are designed to provide sufficient speed and throughput for pictures and audio. Check your local computer retailer for more detailed information and suggestions.

For further information from AP, call 800-821-4747. Many CD-ROMs, such as "Compton's Interactive Encyclopedia" or "Microsoft Bookshelf" can be found at your local computer software store. Hopkins Technology is at 800-397-9211. Quanta Press is at 612-641-0741.

□ □ □

Barry Mishkind can be reached at 602-296-3797, or on FidoNet at 1:300/11.3 or "barry@coyote.datalog.com" on Internet.

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1994 BUYERS GUIDE CALENDAR

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WORKBENCH

Stocking Stuffers for the Engineer

by John Bisset

FALLS CHURCH, Va. If you haven't finished holiday shopping and have some engineers on your gift list, here are some relatively inexpensive gifts with an engineering twist.

If you have no engineers to buy for, tear out this article and give it to your significant other so that you get more

than ties this year.

You say your budget is such that you can't afford to give much? Drop on over to your local hardware or building supply store and pick up some five-gallon plastic buckets. They only cost a couple of dollars each, and can be a lifesaver.

Rich Sweetman, a contract engineer in Central Iowa, uses these buckets to store

his technical manuals at each station's transmitter site.

During the floods earlier this year, while other stations' manuals and schematics were destroyed by rain and mud, Rich's stayed dry. The buckets just floated around inside the building.

If you don't want to spring for new buckets, consider washing out a building contractor's drywall buckets. They are

big enough to hold a loose leaf notebook, so even transmitter manuals are covered.

Rich adds a cautionary note: Don't put desiccant in along with your manuals. The bucket is air-tight when the lid is snapped in place, and the desiccant will draw the moisture out of the paper. The result will be cracked and crumbling manuals.

★ ★ ★

Audio Precision's 188-page "Audio Measurements Handbook," at \$12.95, is a real bargain. It's not specific to Audio Precision's line of equipment—after a discussion of types of test equipment, the book delves into the test procedures of pretty much every audio measurement ever devised. There's even a section on digital audio and converter measurements.

To order your copy, contact Audio Precision at 800-231-7350. For more information, circle **Reader Service 64**.

★ ★ ★

The remote engineer will enjoy receiving The Tone Wand™ manufactured by Thomas Electronics, Fort Worth. This small hand-held oscillator measures six inches long and has a male XLR-type output plug for connection to mixer inputs or mic cables. The nominal 1 kHz, -50dBm test signal is ideal for level adjustment, continuity or channel status when you're working in the field.

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★ ★ ★

Another pocket-sized lifesaver is the Conductive Pen from Circuit Works, sold by many electronics wholesalers. It looks like a ball-point pen, but when the tip is depressed, it applies a highly conductive silver polymer that can replace torn or missing circuit board traces, link circuit board components or make smooth jumpers. The polymer can be heat treated with a hot-air gun so that terminations can be soldered.

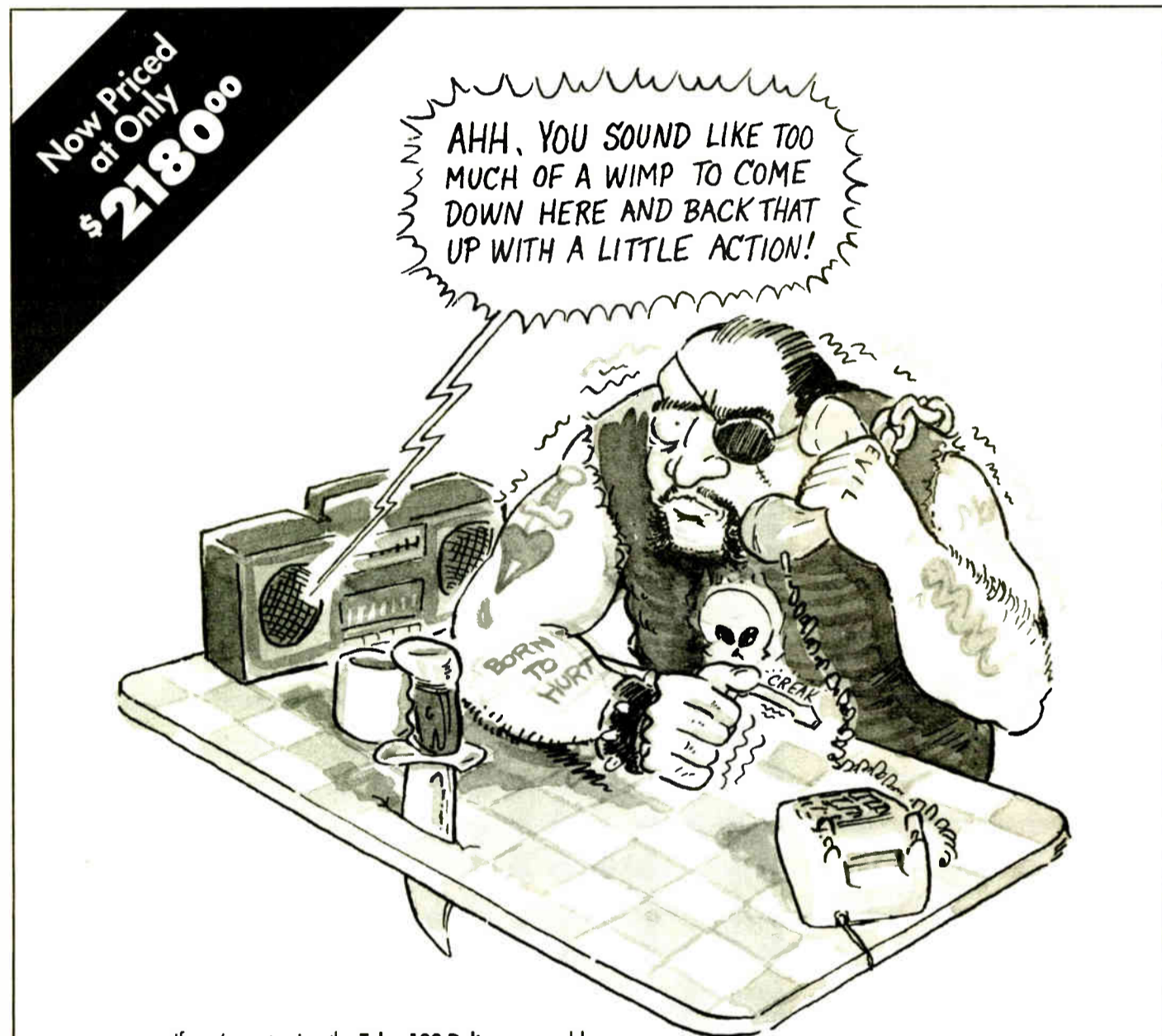
Distributor information is available from Planned Products, 408-459-8088. For more information, circle **Reader Service 215**.

★ ★ ★

One of the most useful tools for any engineer is Brookstone's "Six-in-One Wonder Tool," combination of a hammer, wrench, wire cutter, screwdriver and other useful tools. I know an engineer who carries a complete tool kit in his car, but never uses it because he carries a Six-in-One with him.

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continued on page 34 ►



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However, if you just want to get practical about the whole thing, you can look at it this way, too. The CD Autochanger makes audio programming so absolutely efficient and error-free that your life will be made easier and your business could become more profitable. Which makes it seem rather impractical not to find out more.

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The source is clearly displayed AT ALL TIMES

UDS clearly shows you what's ON THE AIR, what event is ready to air next, and what is next to follow

The screenshot shows the Ultimate Digital Studio interface. At the top, it displays 'TMC1 2:22 PM ULTIMATE DIGITAL STUDIO Tuesday 01/04/94'. The main area is divided into sections: 'ON THE AIR 1:04' with details for 'DECEMBER, 1963' and 'FOUR SEASONS'; 'READY TO AIR' with details for 'IT HIT ME LIKE A HAMMER' by 'LEWIS, HUEY & THE NEWS'; and 'NEXT TO FOLLOW' with details for 'SET THE NIGHT TO MUSIC' by 'FLACK, ROBERTA WITH'. A pop-up window titled 'VIEW EVENTS' is overlaid, showing a list of events with columns for time, duration, and source. A 'System' window is also visible on the right with options like 'AUTO/SEGUE', 'LOADING', 'LOGGING:ON', and 'TIME UPDATE'. A 'Help' button is also present.

Time	Duration	Source
2:19 PM	4	Hormel #1
2:20 PM	D	Pizza Hut #1
2:20 PM	D	Mix 105 #3
ON AIR		DECEMBER, 1963
02:28 PM	:15	IT HIT ME LIKE A HAMMER
02:32 PM	:01	SET THE NIGHT TO MUSIC

USER FRIENDLY WINDOWS POP UP WITH ONE KEY STROKE

View what has played and what is coming up without access to schedule

TM CENTURY HAS DELIVERED OVER 400 Ultimate Digital Studio systems worldwide. The software and hardware components that comprise the UDS ARE HIGHLY RELIABLE AND PROVEN.

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TM CENTURY would like you to see the SCREENS you LIVE AND WORK WITH BEFORE you've MADE your choice for AUTOMATION or LIVE ASSIST...

The screenshot shows a software interface for radio station management. At the top, it displays 'TMC I 2:46 PM ULTIMATE DIGITAL STUDIO Tuesday 01/04/94'. The main area is divided into sections: 'ON THE AIR' (I WONDER WHY by STIGERS, CURTIS), 'READY TO AIR' (Raid Max), and 'NEXT TO FOLLOW' (CERTS). A large '24' is displayed in the center. On the right, there is a 'System' panel with 'AUTO | SEQUE', 'LOADING: 1', 'LOGGING: ON', and 'TIME UPDATE'. Below this are function keys: F1 Help, F2 Manual, F3 View Events, and F4 Edit Events. A copyright notice at the bottom reads 'Copyright 1990 - 1994 TM Century, Inc. Dallas, Texas'.

ENDINGS ARE CLEARLY SHOWN AS Cold (C) OR Fade (F)

LARGE COUNTDOWN clock SHOWS THE EXACT TIME before the VOCAL BEGINS! IT CAN'T BE WRONG!

GET HELP AT ANY TIME WITHOUT INTERRUPTING ANY PART OF THE PROGRAM

Switch TO MANUAL play if you NEED OR CHOOSE TO STOP THE PROGRAM

EDIT EVENTS ALLOWS ACCESS (CAN BE PASSWORD PROTECTED) TO SCHEDULE TO FIND SONGS by TITLE, ARTIST, OR LENGTH ON THE fly IN REAL TIME WITHOUT INTERRUPTING play.

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FOR YOUR PERSONAL SALES REPRESENTATIVE CALL:

COLE'S LAW

FCC Fine Setting Raises Questions

by Harry Cole

WASHINGTON I've written about fines and forfeitures a lot in the last year or two, and sure, it's the holiday season and we'd all like to think about more pleasant things. But every now and then the FCC does something that you just can't ignore.

This time, it seems, fines were issued to KOA(AM) in Denver for the offense of airing five 60-second spots touting the glories of Cripple Creek, Colo.

The spots promoted Cripple Creek's commercial services and businesses.

They were paid for (not surprisingly) by the Cripple Creek Chamber of Commerce and included the Chamber's "800" number.

FCC response

Unfortunately, none of the spots specifically identified the "Cripple Creek Chamber of Commerce" as the sponsor.

Somebody filed a complaint about this to the FCC, and the commission sent out a letter of inquiry. KOA acknowledged running the spots, and asserted that no specific sponsorship identification was necessary because the references to the "attrac-

tions of Cripple Creek constituted a 'mention of the name of the product that constitutes a sponsorship identification,'" as required in Section 73.1212 of the commission's sponsorship identification rule.

The commission disagreed.

In the FCC's words: "There is no logical connection between the businesses (mentioned in the spots) and the Cripple Creek Chamber of Commerce. A listener hearing of Cripple Creek's restaurants, lodgings, tours, train rides and other offerings does not think automatically of the Cripple Creek Chamber of Commerce. The two entities—businesses

and chamber of commerce—are not obviously intertwined in the public mind."

Now, maybe I'm missing something here, but isn't a "chamber of commerce" an organization of "businesses?" Isn't the promotion of a community's businesses one of the purposes of a chamber of commerce? Wouldn't it be not only logical, but expected for a chamber of commerce to try to promote its community's "restaurants, lodgings, tours, train rides and other offerings?"

continued on page 37 ►



► continued from page 30

ordered using their toll-free order line: 800-926-7000. Ask for Item 121285.

★ ★ ★

If RF cable preparation is a highlight of your job, RF Industries has assembled a kit of cable prep tools (see photo). The RFA-4081 contains cutters, a wire bender and a variety of straight and bent-nose pliers. The kit is packaged in a zippered leather case and retails for \$59.50. Contact RF Industries at 800-233-1729. For more information, circle **Reader Service 25**.

★ ★ ★

Bill O'Neill of WNYC-AM-FM New York called, looking to find copies of the NAB Test CD. None of his area distributors had them, it seems. If you're interested in the test CD package, contact National Association of Broadcasters Station Services, 202-429-5300. For more information, circle **Reader Service 170**.

★ ★ ★

I'll wrap the list up with some high-quality deoxidizers from CAIG Laboratories. This is the company that makes Cramolin, that red and blue liquid that makes MCI-JH-100-Bs run.

Recently, you may have had trouble finding spray cans of Cramolin Red or Blue. Their new product line doesn't contain chloro-fluorocarbons, in keeping with EPA requirements.

CAIG now distributes DeoxIT™, a single-step deoxidizer, cleaner and preservative all in one can. The DeoxIT™ line comes in an aerosol can with an extender tube for fitting in between boards or components. An impregnated wiping cloth is also available for TRS or phono plugs.

Only a drop or short spray burst is needed, so a can of DeoxIT™ lasts a long time. DeoxIT™ is also sold in pen dispensers to treat oxidation in female connectors.

CAIG Labs has printed up a product application bulletin to describe how their products tackle several commonplace electronic problems. Its products are available from any electronic supply distributor. For more information, phone is 619-451-1799, or circle **Reader Service 97**.

Have a great holiday season, and thanks for your contributions to Workbench.

□ □ □

John Bisset is a principal in Multiphase, a contract engineering and projects company. Workbench submissions can be mailed to RW, or faxed to his attention at 703-998-2966. Published submissions qualify for recertification credit for all levels of SBE certification.



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AM Simulcast Makes Way for 'Touch'

Dear Luci,

Biiiiig changes came down the pike for my station here...or should I say "stations?" We just launched a new AM operation.

When I arrived in Harrisburg only six months back, we were simulcasting WNNK-FM on our AM station, pausing now and again for Harrisburg Senators baseball coverage. Our new owners' vision was to create a new identity for our sister station down the hall...which

tance setting up the DCS hard drive for commercial playback. Any anxiety I ever had about hard drives (*pun alert*) went out the Windows (*pause for laughs*) once I read up a little on them.

Unlike the disastrous headcrashes the old MFM-style drives used to experience, modern IDE units can sometimes boogie up to 34 years without a problem—unless they run into someone like me.

Fast forward to a press party a couple of

a little attention away from the CPU. It was no threat to our plans, but highly uncharacteristic and only two hours away from air.

A quickie CHKDSK in DOS revealed a goober in one file which was cleared away in due time. A 30-second reboot later we were in good shape, just in time for our next potential derailment, solar outage.

Our on-air debut was to coincide with a lull in the mayor's schedule, allowing him to be present for the moment WTCY went on. When the big moment arrived—1:45 p.m., EDT, on Oct. 6—the sun was squarely in the center of our satellite dish, turning our signal into confetti. Had we faded up at the proper moment the Mayor of Harrisburg would have declared: "Welcome to The Touch Fssssh-cch-sssh-cccsh..."

Eight minutes and a platter of shrimp puffs later, the sun moved far enough out of the way for us to begin, and SMN and our hard drive have been rock-steady ever since.

I should mention our carpeting looks great. The walls are up and look as if they've been there forever. The paint job came out just right and we've all recently stopped hallucinating from the smell of various adhesives and solvents.

The Atlas mic stand shook off the abuse

continued on page 37 ▶

FROM THE TRENCHES

by Alan Peterson



allowed me the opportunity for a little officially sanctioned havoc.

Part one of the plan: Pick up SMN's "Touch" format, delivering an outstanding urban music mix to an under-served audience in Harrisburg.

Part two: Purchase of a Computer Concepts DCS system for spot storage and playback. (This puppy is pretty fast, considering it's based around a 286 processor.)

Part three: Mass destruction! Hee Hee Heeee!!!

The new AM staff was to include an expanded sales force, requiring new cubicals. Several walls had to go. Never one to miss out on a good aerobic workout (and raise a little hell) I offered to trash the continuity office myself. I received the OK from my CE and the remodelers, and set myself to the task with the base and boom assembly of a surprisingly hardy Atlas mic stand.

After meticulously crafting a new studio from scratch for WLAD(AM) Danbury, Conn., a year ago, I found it refreshingly therapeutic to take out a wall for a change. The

weeks later when it's time to put WNNK(AM) 1400 to bed and debut WTCY(AM). Two hours before the big switch-throwing ceremony by the mayor, the DCS display began to slow down as constant hard drive activity was diverting

Nirvana's Kurt Cobain couldn't have kept up with me that afternoon.

photo (see page 37) shows this very satisfied Bob Vila-wanna-be half way through the carnage.

Nirvana's Kurt Cobain couldn't have kept up with me that afternoon.

With new walls came new carpeting, which meant bye-bye to the old coppery Earth Momma pile, and more fun at Smash Palace.

What's the best way to pull up old carpet glued to the floor? Memories of days past when some moron in the biz burned me.

The few yards I was allotted vanished all too quickly in an adrenaline-soaked frenzy, punctuated by shouts of "Fire me, will you?," "Who says I'm doing your show on Christmas?" and "Turn down my raise, hah?" If I called up two or three more bad memories I'd have torn the concrete slab floor loose.

While the gypsum dust was flying, engineering and operations were at a safe dis-



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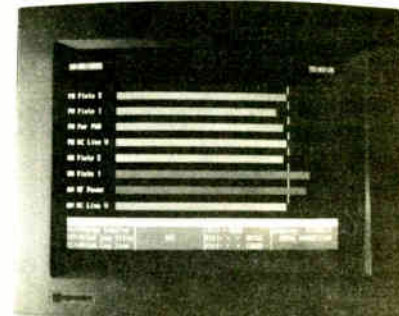
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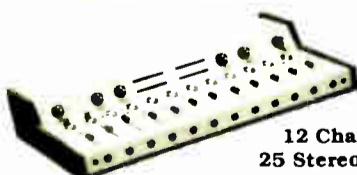
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1-800-336-3045

Five Ads, \$10,000 Fine

► continued from page 34

Isn't it completely backward to say that the "businesses and chamber of commerce" are "not obviously intertwined in the public mind?"

The official line at the FCC is that the lack of a sponsorship ID on the spots was a serious violation of the rules—a violation worth \$10,000. That's right, a big ten grand for five 60-second chamber of commerce spots.

Ouch.

Friendly bureaucrats

As it turns out, the licensee had run the spots by the commission's staff on the telephone before airing them, and the staff didn't mention anything about possible sponsorship ID problems. But according to the FCC (which never feels particularly bound by the advice its staff members hand out anyway), that "informal opinion" was directed to lottery advertising considerations, and not sponsorship ID matters.

What are the take-home messages from all of this?

First, the notion of the FCC as a warm and fuzzy deregulating friend of the broadcaster is probably a dangerous misconception. Think "Cujo," especially when it comes to fines and forfeitures.

Second, while it is sometimes useful to "run things by" the commission's staff beforehand, you should not view that as slam-dunk insurance against any regulatory problems down the line. Even if you specifically focus the staff on a question and get a specific response from them, it's not likely to be much help to you

unless you get it in writing. The staff may change their minds.

The proper procedure is to request a formal "declaratory order" resolving whatever question you might have. The trouble is that the FCC doesn't like to issue such orders, and is not required to do so.

Even if they cut you a break and agree to a declaratory order, the process of actually getting it written and approved can take a long time—much longer than just calling up the staff to "run it past" them.

If you happen to get stuck with a fine, there is probably not much you can do about it. You can appeal or ask for a

reduction in the fine, but the costs of mounting an appeal are likely to make it less than cost-effective, especially if the fine is in the \$10,000-and-under range.

No recourse

This may be part of the FCC's strategy. After all, every fine they collect is money in the bank. The commission has little or no incentive to back off a fine once it is issued, because that would mean admitting to having made a mistake. It is theoretically possible to get some relief at the commission, but more likely that you will have to go to court to have any significant hope of success.

By then you probably will have paid your lawyers what you would have had

to pay the FCC in the first place.

In fairness to the FCC, it is possible that there were other factors floating around in the Cripple Creek case which might make the FCC's action there seem more sensible. But if there were other factors, the FCC should have explained what they were so that we, the great unwashed, could have a complete understanding of the commission's action.

As things stand, the FCC has made it clear that it does not find it intuitively evident that a community's businesses are "obviously intertwined" with its chamber of commerce.

□□□

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

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AM Station Debuts

► continued from page 35

and continues its otherwise quiet duty.

Out of chaos came, not order, but two



Author Al Peterson does for sheet rock what he's already done for broadcasting. (photo by Barb Bolz)

great sounding radio stations in a classy work environment. In other words, the chaos continues.

—Al

□□□

Al Peterson is production director and wrecking expert for WTCY(AM)-WNNK-FM. Send your favorite stress reduction technique to him at 3400 N. 6th St, Harrisburg, PA 17110, and hurry.

USER REPORT

NSM 100-Disc Jukebox Offers Reliability

by Eric Anderson
Program Director/Chief Operator
WBFL(FM)

BELLOWS FALLS, Vt. When I was asked to write an 800-word review of the NSM CD 3101 for RW, I thought to myself, "I only need one word to

describe it—reliable."

At B-107, three NSM 3101 100 disc changers have been the centerpiece of our live-assist studio setup since the beginning of the year. Since then, except for a few small gremlins, we have had flawless playback and virtual no miscues.

The NSM models have several features that make them attractive to a station with a music-intensive format like ours. First, it is incredibly reliable. The only miscues we have had resulted from a poor interface with an upgraded control chip in the CORE 2000 unit—not a result of the NSM itself.

The chip was changed and flawless performance was restored. The machine simply does not cue up the wrong cut. I have heard this is a problem with other multidisc units, and indeed it has been problematic with other disc changers we have used.

The second major feature of the unit is its cuing speed. In our experience, the approximate time from the end of play of one cut to the cuing of the next is 16 seconds. This allows us to play back-to-back cuts from the same machine with a short bumper between them, which is very important in our system.

The NSM machines handle 95 percent of our music, the source for which is two-fold. We use TM Century's GoldDisc library for the majority of our library tracks. In addition, we use regular commercial CDs in the units as well. The NSM handles cuing and EOM information equally well for both.

Easy loading

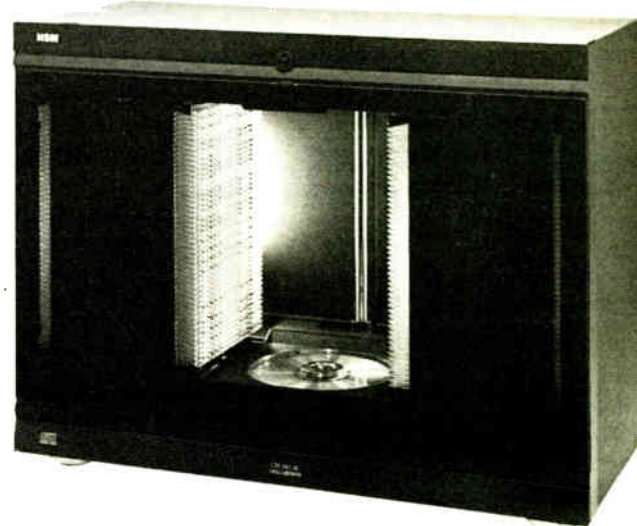
Another positive of the NSM 3101 is its easy loading. The 100 discs are in two 50 disc magazines, which can be easily removed from the machine. Each disc is stored in an easily accessible individual shelf. An entire magazine can be switched if desired, which is great for cycling large blocks of music.

The only modification we have made to our machine is to disable the door alarm. The unit comes with an automatic shut-off if the door is opened. We found this annoying, because we could not add or remove discs from a unit while it played or was about to play. As long as the magazines are in place and you do not stick your hand inside while it changes discs, the alarm is unnecessary.

System integration

We operate a CORE 2000 automation system from Broadcast Electronics with three NSM CD 3101 units, an AudioVAULT digital audio storage system and one Pioneer 18 disc changer. The three NSM units are the real workhorses, handling 95 percent of our music load.

Due to the operation of the CORE 2000 program, occasionally an adjustment at the top of the hour creates a situation where the same NSM is called on in consecutive positions. Normally, this is not possible as each machine has only one platter. To correct this situation, we simply made our top of the hour IDs



The NSM CD 3101 handles almost all of B-107's music library.

30 seconds long. Since the NSM units cue so rapidly, 30 seconds is more than adequate for the NSM to get the next song into place, and to avoid skipping over cuts.

Another of the NSM's features is disc preservation. Once a disc is in the unit, you can count on it never being damaged in any way. It is protected from skips caused by nicks on the surface, finger prints and dust.

A word about dust: earlier generations of the NSM apparently had trouble with dust in the platter mechanism. This is not a problem with the NSM 3101. Our studio was recently re-carpeted, including the walls, which created quite a bit of dust fallout. The filters of other pieces of equipment in the studio were full of dust, but the NSM machines had no trouble whatsoever. I believe the disc loading mechanism is now enclosed so dust cannot get inside of it. I imagine previous generations did not have this feature.

We have found only one fault in the NSM 3101. When the levels of a cut are very low, we noticed a cyclical noise underneath the music. At first we thought we were hearing things, but it turns out we discovered the machine's only flaw. The pin that transmits audio was too close to the pin that transmits digital information, and there was some bleed audible during very soft segments of music. This problem has been corrected with the addition of shielding in the pin connectors between the pin numbers in question. We have just installed these new connectors and they appear to be totally effective in eliminating the noise.

To sum up: the NSM 3101 is a solid, reliable piece of equipment, and I would highly recommend it.

□ □ □

For information on NSM products, contact Jon Taylor in New York at 516-261-7700; fax: 516-261-7751; or circle Reader Service 173.

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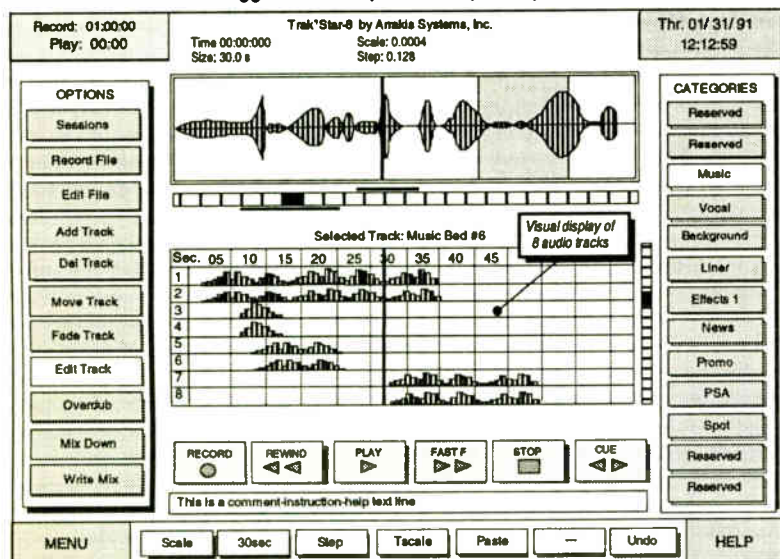
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SPECIAL REPORT

ITC DigiCenter Enhances Canadian Stations

by Laurie Rachkus Uttich
Public Relations Director
International Tapetronics Corp.

BLOOMINGTON, III. Technology means different things to different people. Many broadcasters see technology as an opportunity to make a station easier, better, faster and more cost-effective. But in making the decision to grasp new technology, different people move at different paces. With new technology and new opportunities come new risks, and while some people struggle with making the change, preferring to wait until technology is "proven," others embrace new technology quickly.

Only when change occurs at a broadcaster's own station, however, does he or she begin to realize how great an impact technology can make.

When the Canadian stations CIHI(AM) and CKHJ(FM) were planning to switch some live dayparts to complete automation, they looked for new technology that could assist them in these changes, both now and in the future.

Common needs

The decision for CIHI and CKHJ to switch from analog technology to a digital system was driven by needs common to many broadcasters: They wanted better sound quality and greater cost-effective-

ness. Like most broadcasters analyzing this decision, they saw the new technology as an opportunity, and chose to purchase a digital system that would maximize their opportunities while minimizing their risks.

CIHI and CKHJ are owned by Radio

One Ltd., and broadcast adult contemporary and country music respectively from Fredericton, the capital of New Brunswick, one of Canada's Maritime Provinces. The two made the decision to switch to a digital format because of sound quality. "We had the typical wows and flutters that even the best cart machines generate," said Dick Cleveland, station engineer. Greater cost-effective-

ness also was of concern. "We were looking for ways to cut operational costs," said Bob Coy, station manager. To achieve greater cost-effectiveness, Coy and Cleveland wanted a system that would allow them to run automated during some dayparts, while maintaining



The DigiCenter audio management system impresses Radio One Ltd. Canada.

their live assist programming during others. In addition to automation and sound requirements, both were concerned about secure back-up production and scheduling. They also needed a system that could grow with their future plans. In January, the company plans to completely automate its third station, CJCJ(AM), in Woodstock, New Brunswick, via rebroadcast of CIHI.

After considering many digital systems, Coy selected International Tapetronics Corporation's (ITC) DigiCenter audio management system. "We have a lot of ITC equipment and I have always been impressed with its quality and ITC's service after the sale."

After considering many digital systems, Coy selected International Tapetronics Corporation's (ITC) DigiCenter audio management system. "We have a lot of ITC equipment and I have always been impressed with its quality and ITC's service after the sale."

play), which can be active simultaneously in a single frame, combining mono and stereo cuts and multiple sampling rates. The DigiCenter also can play three simultaneous stereo, un-compressed audio channels in the on-air studio, bringing each channel separately out to the console and allowing for simultaneous playback control from the console logic.

Achieving the goal of cost-effectiveness required more complex and customized planning. With Cleveland's input, Bové designed a digital system with three DigiCenter workstations and three DigiCenter servers, networked together for maximum flexibility and efficiency.

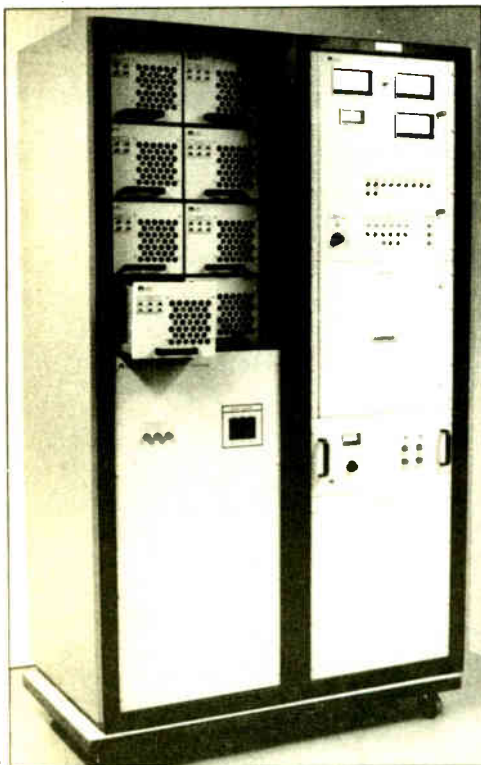
According to Bové, "each station has a workstation and a server that the talent uses for live assist during all the dayparts, except for 10 p.m. to 6 a.m. At that time, the DigiCenter switches the station to complete automation. The third workstation and server is used solely for production and transfers finished spots to the stations. The total capacity of the hard drive community is equivalent to over 20 hours on each server. It's an incredible system that has an enormous capacity for pre-programming and provides reliable back-up of all production."

System that grows

The automation dayparts work so well that the stations are considering making 10 a.m. to 3 p.m. a third automated daypart, achieving even greater cost-effectiveness.

Like any successful broadcaster, Coy wanted a system that could grow with the company. The DigiCenter system is

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The quality improvement Radio One Ltd. wanted was easily accomplished by switching to a digital platform. The ITC DigiCenter integrates external audio sources and compact discs, and hosts 32 Pioneer CD players.

Besides the full, CD-quality audio reproduction, the DigiCenter provides a means of sounding truly live, even in an automated format. Traditionally, this required live talent, and it is only possible to produce this effect by having several reproducers available in the on-air studio.

According to ITC Engineer and Sales Representative Mike Bové, the ITC DigiCenter has six stereo channels available (three playback and three record/

The ITC DigiCenter integrates external audio sources and compact discs.

designed to do just that, and it even has capabilities that Cleveland is looking forward to implementing.

"Right now, we're only using 50 to 60 percent of the functions our ITC DigiCenter is capable of," Cleveland said. In the future, he plans to use the TAMIO (traffic, accounting/billing, music input/output interfaces) and Reconciliation (a program that forwards the day's activities—songs, spots, etc.—to traffic and billing) features.

According to Charlie Bates, operations manager at ITC, the DigiCenter has the capabilities of meeting the stations' continued needs because, "this is an audio library management system—not a cart machine replacement. Through continued customer interface and focus group studies, ITC plans to expand DigiCenter's functionality as radio changes and grows into the digital age. It is an evolving process with much growth planned."

And perhaps this process and planning is why stations like CIHI and CKHJ feel confident grasping technology today—instead of waiting until tomorrow.

□ □ □

For information from ITC, contact Charlie Bates in Illinois at 800-447-0414; fax: 309-828-1386; or circle Reader Service 113.

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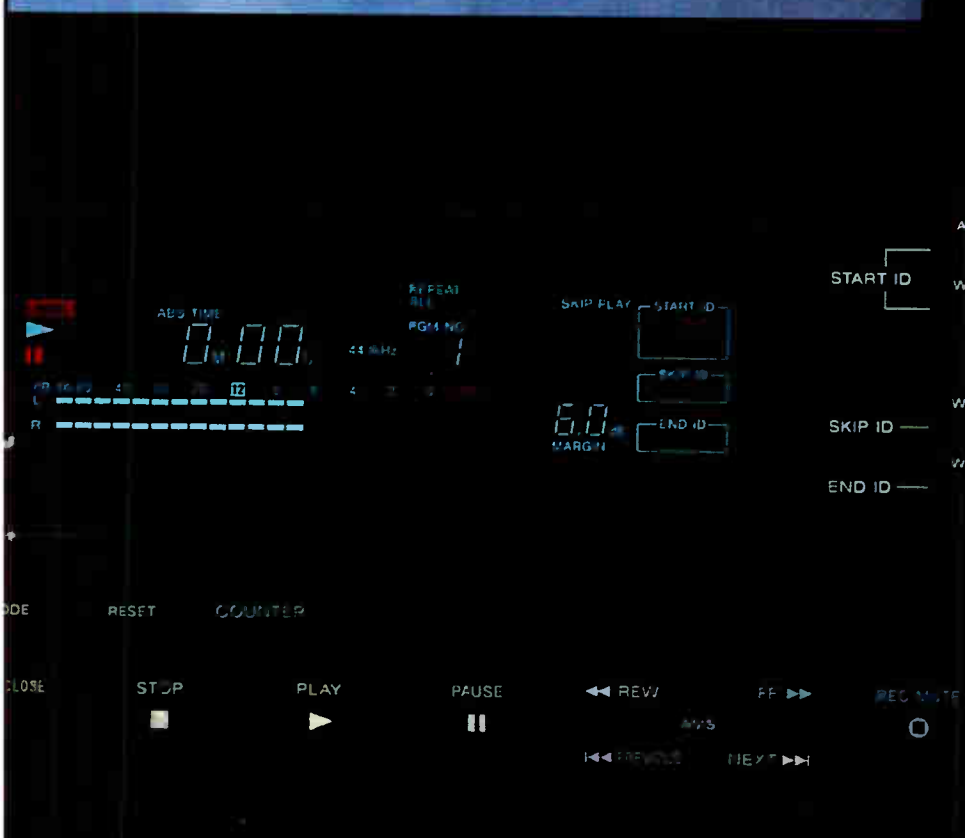
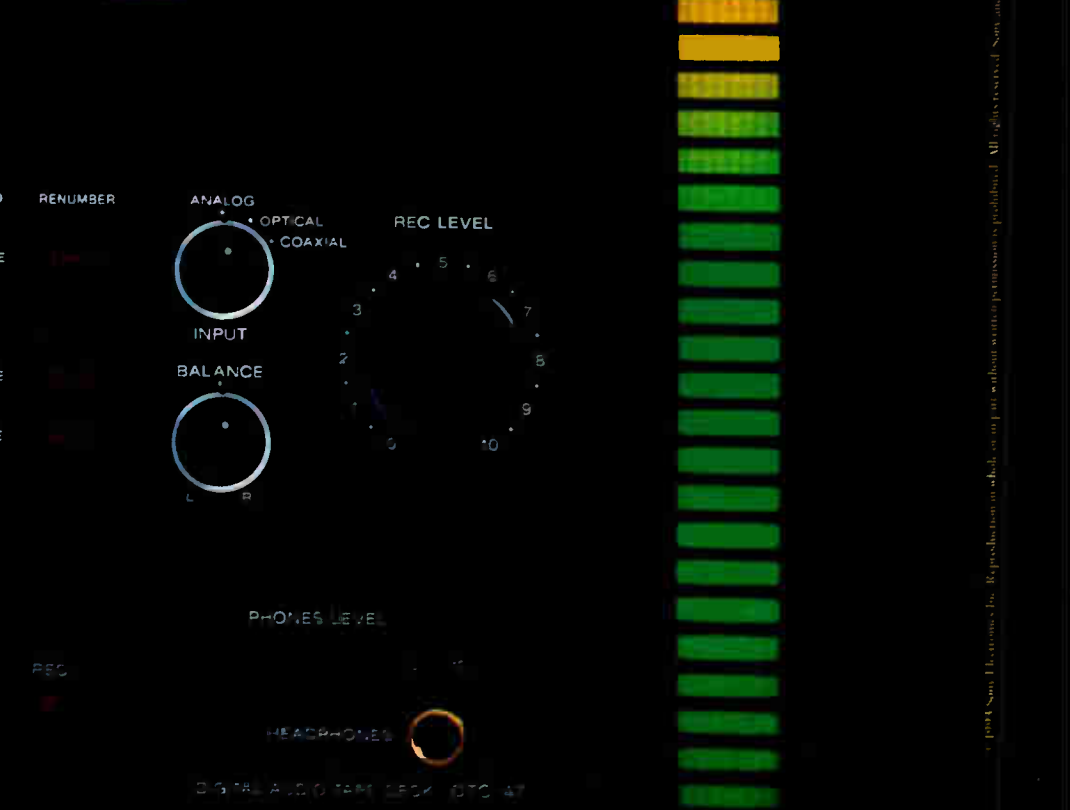
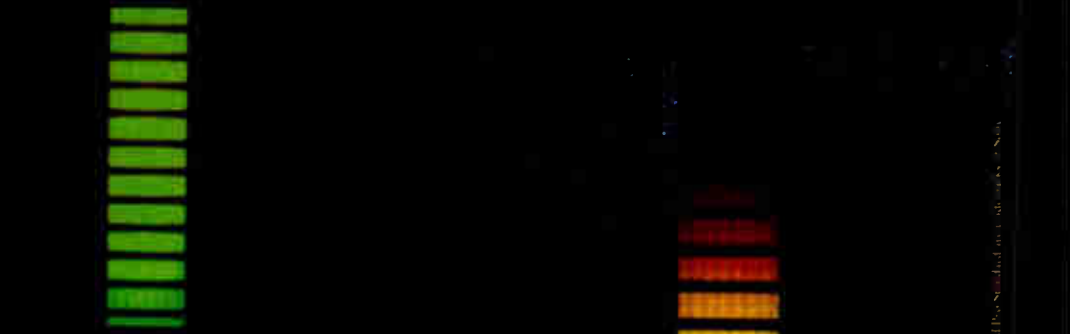
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USER REPORT

JVC R-DAT Machine Hits the Spot

by John D. Klett
 Technical Director
 Clack Sound Studios

NEW YORK Clack Sound Studios is an audio post production facility doing commercials, spots and promos for radio, TV and cable. A large portion of our work is done on digital audio workstations. We use timecode and serial machine control extensively throughout the facility.

When it came time to choose a new R-DAT machine we had to find something that would satisfy a number of requirements. After seeing what was on the market, we selected the JVC DS-DT900NS R-DAT. We have installed one in each of five studios, and plan to purchase three more in the near future for dubbing.

R-DAT is the primary transport format for the elements and mixed spots we make; radio, as well as sync-to-picture, leaves our studios on R-DAT cassette more than any other format. R-DATs have very accurate timebases, and the speed problems commonly associated with 1/4-inch tape are eliminated, along with wow, flutter and azimuth-related phase problems. JVC's timecode DAT machines reference to video house sync speed, assuring us that all the machines run on speed and that the audio locks to picture.

The search is on

Prior to installing the JVC DS-DT900NS, we used a variety of consumer-grade portable machines. But these lacked a number of features we needed.

We began our search for a new R-DAT. Audio quality was high on the list, and while the published specs on all the machines are good, we were surprised to find noticeable differences in subjective quality. The DS-DT900NS rated very well in subjective listening tests.

We needed timecode DAT capability for the lock-to-picture work. Often a video is edited to fit the audio track we make. Other times the completed video master comes back to Clack for a final touch-up and mix. Whatever leaves our studio must have timecode. Prior to installing the JVC R-DAT we often had to send material out on 3/4-inch or 1-inch analog video tape with timecode, and the audio suffered. Most video edit places have timecode DATs now, and ask for audio in that format.

We needed serial machine control for doing conform-to-picture work. Prior to the DS-DT900NS, we stripped the audio from "nth" generation analog video dubs, but now we can accept a timecode DAT that is a clone of the shoot master and do audio conforming using the nine-pin Sony-like serial control port on the DS-DT900NS. The machine control in our workstations only communicates with nine pin serial controllable devices.

The DS-DT900NS is a two-head machine, so there are some things you cannot do. You cannot punch seamlessly right into the middle of program. You cannot insert the audio onto a prestripped or precoded tape. Timecode has to be recorded at the same time as the audio.

We now edit audio in the workstations and dump the mixed and edited audio, along with timecode, into the R-DAT in one step.

Used for dubs

The two-head limitations do not bother us. If we have a number of spots to put on one DAT, we can dump them sequentially without stopping or we can stop the R-DAT while bringing up the various files that need to be transferred. In the first case, the timecode is continuous and in the second there are discontinuities in the timecode. Either way is acceptable,

because R-DATs have program IDs that serve as locate points for the various pieces anyway.

If you need a record deck for editing audio on R-DAT you should look at a four-head machine with flying erase heads and other editing features to be the record deck. The JVC makes a fine source machine in an editing application.

One convenience feature we gave up was the ability to prestripe a DAT tape with timecode and drop our mixes in as inserts. We have done this with video and audio four-track or center-track timecode machines. That comes in handy when we

are cranking out 200 versions for various local markets with countdowns onto a single tape for the client to walk away with. We have worked around that by setting up a "dub deck" with the versions sequenced to timecode in the workstation and dumping that across in one pass.

A couple of the engineers complained about it for a day or two but it takes the same amount of time either way, and the dub deck is saved with the session so it has proven to be a better system anyway. The engineers also liked the new loudspeakers and power amplifiers I bought with the money we saved.

□ □ □

For information on the JVC DS-DT900NS, contact Elin Everson in New Jersey at 201-794-3900; fax: 201-794-1628; or circle Reader Service 58.

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World Radio History

USER REPORT

BE AudioVAULT Eases Station Operations

AudioVAULT 100 is easy to use, flexible and, integrated with other station systems, fits WKXQ(FM)'s needs.

**by Bud Price
Owner/Operator
WKXQ(FM)**

RUSHVILLE, III. One of the luckiest days of my life was when I agreed to beta test the AudioVAULT 100 from

doesn't talk much). Our new BE FM 10B 10 kW transmitter is "Buster the Brute." Our AudioVAULT 100 is named "Audrey," and she is the best addition to our staff that we have made.

When I spoke with Project Engineer Greg Uzelac about the system, he often

our word processor. The AudioVAULT 100 then follows that log precisely. It is as simple as that.

The AudioVAULT automatically shifts network feeds from CNN, INN (Illinois News Net), and RFD (Illinois market news). It does this day in and day out, with out a flaw. I was surprised by how adaptable the system is to various satellite formats.

I also integrated two JVC store-bought CD players and retro-fitted them with the "Ultra-Q" card from Radio Programming Management of Ordhard Lake, Mich. This makes them automatically play their CD library. We were then set for total

strictly voice grade audio, WKXQ uses 11 kHz mono. With 4:1 compression, we can store up to 18 hours of audio with every cut instantly accessible. I can also add up to 12 additional hard drives if my storage needs increase. The sound is super: An A to B comparison with the original CD is virtually indistinguishable.

The AudioVAULT 100 is network-capable for multiworkstation operations. This makes it easy for various depart-

continued on page 47 ▶



Bud and Cathy Price with WKXQ's AudioVAULT 100

Broadcast Electronics (BE). The AudioVAULT 100 is BE's next generation PC-based digital audio storage system. That is the technical definition, but the AudioVAULT 100 is much more.

Here at WKXQ(FM), our staff frequently names the major pieces of equipment. Our dial-up voice synthesized remote controller is "Oscar" (the grouch

said, "Just think of it as a cart machine." Well, the truth is, the AudioVAULT 100 does much more.

Simple as that

It imports information from most traffic and billing systems to create a log. Or, we simply create a general log for each day of the week, and update it daily on

The screens duplicate the familiar operations of a cart machine

automation—the CD players provide the music and commercials, liners and time announcements come directly from the AudioVAULT 100.

Specifications

The AudioVAULT 100 has selectable sampling rates by cut from 22 to 48 kHz with 80 dB separation stereo. Distortion is less than 0.05 percent, and signal-to-noise ratio is greater than 75 dB below MSB. I tested the AudioVAULT on my workbench and found the specifications to be conservative.

The system also has switchable compression ratios by cut using MPEG Layer II standards from 1:1 (uncompressed) to 16:1. We have a minimum of 2.3 hours of 16 kHz bandwidth stereo storage uncompressed on the 1 gigabyte hard drive we installed. Because our library is



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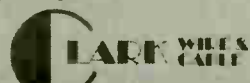
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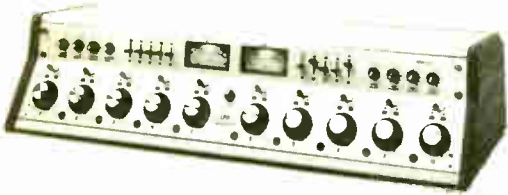


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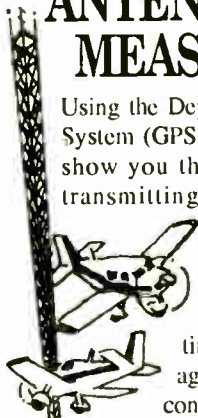
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BE System Suits Station's Needs

► continued from page 45

ments to access the system. The music director works on the playlist at the same time the traffic department does logging and billing and the news director updates breaking stories.

Cost effective

The AudioVAULT 100 is quite cost effective. Before the beta test, I was familiar with BE's high-end four user AudioVAULT 90. The AudioVAULT 100, much to my surprise, offers all of the AudioVAULT 90's features and more at a price that fit my budget. It operates as a total automation product by itself, or with its automation system companions CORE or Format Sentry

from BE. It also can interface with an existing automation system. We use ours for "live" news-talk during the morning drive, live assist at other times and for stand-alone automation during remainder of the day.

At WKXQ, our market size forces us to hire part-time students at minimum wage, and training them is a constant battle. But with the AudioVAULT 100, they simply turn on the mic when the VAULT pauses for local announcer input, and push one button when they are finished. Training is reduced to a minimum.

Previously, I had to hire announcers based not on their voice quality and delivery, but on their perceived manual

dexterity and reaction instincts. It was more important for them to get the right cart on the air at the right time. If they could talk, that was a plus. Now, I hire talented announcers and let the AudioVAULT 100 run the board.

Based on Windows

The Windows-based software make the system easy to use, as the screens duplicate the familiar operations of a cart machine. Instead of a cart slot, there is a window for the program log. To be honest, old veterans like myself must make a commitment to learn to use the AudioVAULT 100, and attitude plays a big part in how quickly a user adapts. Rest assured, however,

once you master the AudioVAULT, you will never want to go back. We rarely turn on a cart machine anymore. And members of the younger generation, who grew up on video games and computers, run it like a pro in no time at all.

WKXQ really is a "Mom and Pop" station. My wife Cathy and I practically run it by ourselves. Recently, when I was hospitalized for a kidney infection, the AudioVAULT really came to our rescue. With the help of friends, relatives and neophyte temporary help, Cathy kept us on the air and in the black. She says it would not have been possible without the AudioVAULT 100.

□ □ □

For information on the AudioVAULT 100, contact Dave Buck in Illinois at 217-224-9600; fax: 217-224-9607; or circle Reader Service 43.

Products & Services Showcase

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

Byte it with



PhoneBYTE
Digital Phone-Bit Recorder

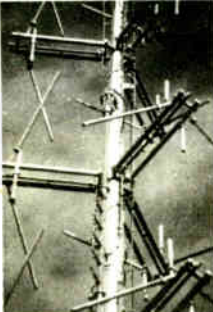
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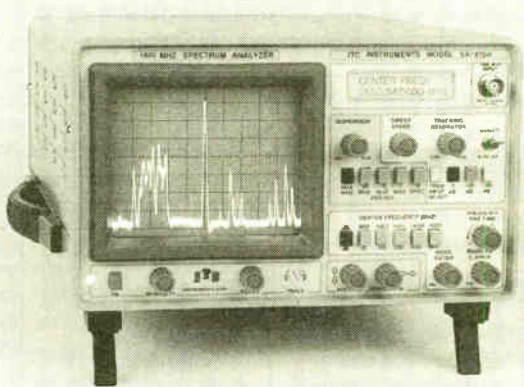
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READER SERVICE NO. 169

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HIGH STABILITY (<1KHz per Hr. after warm up)
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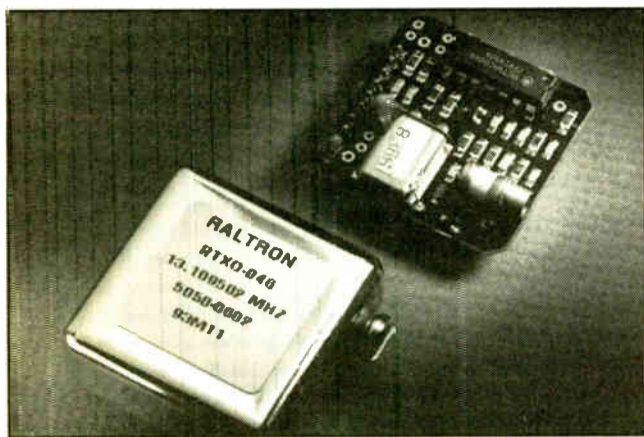


77 Kreiger Lane Glastonbury, CT 06033
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READER SERVICE NO. 40

MARKETPLACE

A compendium of new and recently introduced radio broadcast products



New Families of TCXOs

Raltron Electronics Corp. provides temperature compensating crystal oscillators (TCXOs) for use in products that require affordable, stable frequencies over a wide range of temperatures.

The RTXO family of oscillators provide eight-turn capacitor screwdriver adjustments for aging compensation, and come in two sizes: 1.5 inch square by 0.5 inch high and 0.8 inch square by 0.4 inch high.

The RTVO models offer the same sizes and aging adjustments, but they also include a voltage input for automatic ± 3 ppm aging adjustments. Modulation bandwidth is 10 kHz.

According to Raltron, the TCXOs do not require any warm-up period after power is applied.

For information, contact Sandy Cohen in Florida at 305-593-6033; fax: 305-594-3973; or circle Reader Service 76.

Field Cable Fault Locator

Riser-Bond Instruments manufactures the Model 1205 time domain reflectometer, a compact, multi-purpose cable fault locator, designed for field use.

The meter features an RS-232 serial output port for computer interface.

For information, contact Duff Campbell in Nebraska at 800-688-8377; fax: 402-466-0967; or circle Reader Service 86.



Transmission At Any Data Rate

The D100 Infinity data module can accept information at any data rate. It is compatible with a wide variety of multiplexers, including T1, E1 and variable rate multiplexers.

The D100 Infinity interfaces to V.35 and RS-422/449 and includes a rate justification mechanism that allows the connected equipment to transmit at any data rate.

The data module is useful for standard data transport as well as specialized transmissions such as encrypted data, telemetry and computer-to-computer applications.

For information contact Christine Doyle in Massachusetts at 508-692-9000; fax: 508-692-2200; or circle Reader Service 140.

Alarm Interface Unit

Critical Designs offers the RS-1, an RS-232 alarm interface unit. The RS-1 is designed to recognize alarm codes sent over a modem and to sound an external, user-supplied alarm.

Installed between a modem and a PC/terminal RS-232 serial port, the unit will sound an alarm system that can operate from an open collector drive. Reset is accomplished by pressing a button on the RS-1 unit, or by a contact closure.

For information, contact Ron Jones at 801-561-2685; fax: 801-568-9459; or circle Reader Service 16.

Low Power MPEG Digital Audio Decoder

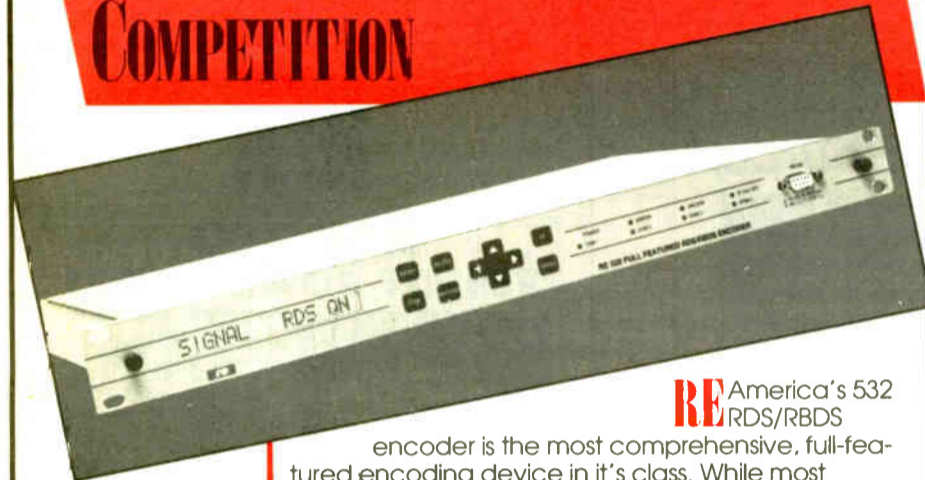
Philips Semiconductors announced a new chip providing MPEG digital audio decoding functions that reduces package size and power requirements.

The SAA2500 MPEG Decoder is fully compatible with MPEG Layer I/II standards for digital audio.

Technical features of the SAA2500 include: de-multiplexing of ancillary data in the input bitstream; automatic digital de-emphasis of the decoded audio signal at 32, 44.1 and 48 kHz sampling rates; two separate switchable bitstream input interfaces; selectable audio output precision in 16, 18, 20 or 22 bit.

For information, contact Sunil Nethisinghe at 408-991-5215; fax: 408-991-2133; or circle Reader Service 48.

THE INDUSTRY'S RDS/RBDS LEADER HAS JUST CRUSHED THE COMPETITION



RE America's 532 RDS/RBDS

encoder is the most comprehensive, full-featured encoding device in its class. While most American RDS/RBDS encoder manufacturers are building their first product, the RE 532 represents RE's third-generation RDS/RBDS encoder. The RE 532 provides five data ports to enable broadcasters to take full advantage of the revenue potential that RDS/RBDS offers.

Ancillary RDS/RBDS data services such as Paging and Differential Global Positioning (DGPS) are now emerging as major revenue sources for broadcasters. The RE 532 will intelligently manage these services as well as maintain the integrity of the stations RDS/RBDS data, such as call signs, format and radio text.

The RE532 comes complete with its own proprietary PC control software which enables the unit to be set up and programmed quickly. Remote data control and phone-line communications can be accomplished with any Hayes compatible modem.

Without a doubt, the RE 532 is the most cost-effective, revenue-generating, piece of equipment your station could ever purchase. Now that a U.S. standard for the Radio Broadcast Data System exists, it promises to provide broadcasters with new and exciting opportunities for increasing the bottom line.

- ▲ Full-featured RDS/RBDS encoder in a compact single rack space
- ▲ Includes Paging and DGPS capability
- ▲ Five data ports for main and ancillary data usage
- ▲ Front panel keypad for easy setup adjustments
- ▲ Backlit LCD displays menu of all parameters
- ▲ Two discrete pilot sync inputs for main and back-up transmitters
- ▲ 16 data records may be programmed and sequenced automatically
- ▲ PC control program is included
- ▲ Operates as a stand-alone RDS/RBDS subcarrier generator plus loop-through mode

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018	040	062	084	106	128	150	172	194	216
019	041	063	085	107	129	151	173	195	217
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Direct-to-Disk Digital Audio

Antex Electronics Corp. offers a digital audio board that allows for real-time, compressed professional studio-quality stereo sound through PCs, PS/2s and compatible computers. The board includes ISO/MPEG/MUSICAM Layer I/II coding and 32, 44.1 and 48 kHz sample rates.

The Series 2 Model SX-23 PC add-on board includes both analog and AES/EBU or S/PDIF digital input and output.

In addition to CD bit rate reduction, the SX-23 offers variable reduction schemes for varying levels of compression.

The SX-23 adds full studio CD-quality digital sound to PC application programs without sacrificing disk space.

For information, contact David Buccola, product manager, at 800-338-4231; fax: 310-532-8509; or circle **Reader Service 127**.

INDUSTRY ROUNDUP

The Race to Replace The NAB Cart is On

By T. Carter Ross

The race to replace the NAB cart continues.

While the long-time standard for music and production source equipment remains in widespread use by broadcasters, a variety of new products and technologies are being offered as the NAB cart's replacement. Listeners can expect to hear music, liners, jingles and advertisements with CD-quality audio coming from digital media.

"We look at source gear, and the NAB cart is the one obvious thing to improve," said Mike Stelts with Denon. "We aim to improve the medium that already exists without losing any of its features, and hopefully adding some more."

"The NAB cart is the one obvious thing to improve."

Since CDs were introduced in the early 1980s, broadcasters have made use of even the simplest consumer-grade players. Newer broadcast-quality players, jukeboxes and CD autochanger systems now offer broadcasters a secure way to rotate large blocks of music efficiently.

CDs, while widely available, still are not recordable—unless broadcasters are willing to pay the price. CD-R, which ranges in price from \$3,500 to more than \$10,000, offers CD quality in a recordable format, but the discs can be recorded on only once.

This lack of versatility has led to the development of several digital re-recordable media.

The mini disc (MD) offers the advantages of the NAB cart—it is re-recordable and transportable—but with CD-quality audio, text display and other features.

"By being universal and removable, the MD has the same fundamental appeal of the NAB cart," Stelts said.

Broadcasters' concerns about compression and cascading algorithms give magneto-optical (MO) technology an advan-

tage. Not only is MO a removable digital medium with both record and playback capabilities, but no compression is used.

"The MO is the first digital re-recordable medium with enough storage capacity (128 MB per disk) to store audio without compression. We can get 10.5 minutes on each disk," said Andy Rector of AIR Corp. Systems. "We are hearing from people that they want non-compressed audio. They are hit from so many directions with compressed audio that they don't need more thrown at them."

Digital Audio Tape (DAT) also has gained inroads as a valuable remote newsgathering tool, while digital open reel offers another alternative to its traditional analog counterpart.

Another option for broadcasters is a hard disk cart replacement system. Not only are these easy to integrate with existing traffic or scheduling programs, they have the advantage of being easily expandable.

"As the needs of the customer grows, modules that add significant power can be added. Our system can go from a straightforward cart player to a CD playback device to a full fledged automation device," said Adrian Charlton of The Management.

Another advantage is that as the information highway develops across the nation, hard disk systems will be able to expand their utility, several manufacturers noted.

Charlton also sees CD-R as poised to take off in the next year. "Now your music library may have 1,000 CDs. CD-R can cut CD inventory to 75 or 100 discs with just the songs you need on them."

Jon Taylor at NSM predicts that CD-ROM will play a big role in the next wave of studio source equipment. "We are beginning to see interest in the CD-ROM environment." While it is uncertain if CD-ROM will be used for music or other source material or for indexing, its density and storage capabilities are definitely ripe for broadcasters to tap.

"When TM Century built its new facility in Dallas, they included an entire CD-ROM mastering facility," Taylor noted.

Waveform Software

The AnyWave™ PC software package from Fluke simplifies the creation and editing of both arbitrary waveforms and signal test envelopes in applications using Fluke test equipment.

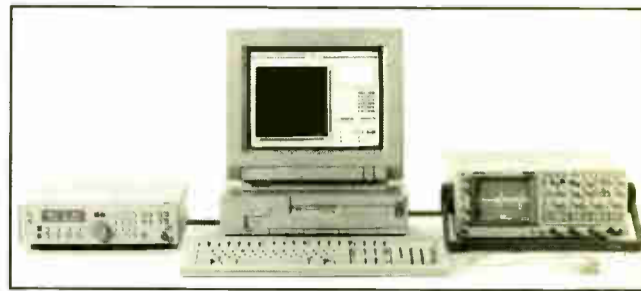
Waveforms can be drawn or edited on a PC screen with a mouse, and then transferred to an arbitrary waveform generator for reproduction as test or simulation signals, or to other instruments supported by AnyWave for automated pass/fail testing.

AnyWave also downloads and edits

signals captured by a digital storage oscilloscope.

The software runs on any standard PC or PS/2 computer.

For information, contact Debby Coyne in Washington state at 206-356-5671; fax: 206-356-6100; or circle **Reader Service 211**.



Match Consumer To Pro Equipment

The IA-1 interface amplifier from Excalibur Electronics matches consumer-type equipment to professional broadcast equipment. It consists of a stereo unbalanced to balanced input stage and a stereo unbalanced to balanced output stage.

The input and output connections are made to a barrier strip, not XLR connectors. This allows gas-tight connections for low noise in permanent installations.

The input stages use a trim pot for

much higher common-mode rejection than can be obtained with fixed resistors. Input and output levels are adjustable to match your equipment.

Distortion is less than 0.006 percent THD and IM. Noise is greater than 90 dB below operating noise level.

The IA-1 is appropriate for use with DAT recorders as well as cassette and reel-to-reel analog recorders.

For information, contact Bill Ashley in Virginia at fax: 703-222-1940; or circle **Reader Service 32**.



Digital Signal Monitor

The AMP-1A/DI from Wohler Technologies provides high-fidelity monitoring of stereo digital audio signals carried in either AES/EBU or SPDIF formats.

The unit's digital input section automatically synchronizes to any sampling frequency between 31 kHz and 48 kHz, and 18-bit low-jitter converters are used for internal D-to-A conversion. A digital output is provided for passive loop-

through of the digital input signal.

The AMP-1A/DI incorporates three PAs and five speakers. Frequency response is 80 Hz to 15 kHz ±7 dB, and output is 98 dB SPL at 0.6 meters (2 feet).

Front panel features include: volume control, balance control and digital input error indication LED.

For information, contact Patrick Hayes in California at 415-589-5676; fax: 415-589-1355; or circle **Reader Service 158**.

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TECHNOLOGY UPDATES

DENON

Denon Mini Disc Recorder And Player Offer Flexible, Re-Recordable Media

PARSIPPANY, N.J. Denon, creator of the broadcast standard CD cart player, is introducing mini disc cart recorders and players.

The compact disc, supported by its universal standard and ease of use, has been a primary source of on-air music playback for nearly a decade. But despite recent strides with recordable CDs, it is

still impossible to erase or re-record a CD. These functions are essential if the CD format is to inherit the tasks currently performed by the ubiquitous NAB cart.

Mini disc (MD) is gaining acceptance rapidly, enhancing and extending the use of optical media. MD provides a universal, removable, digitally-recorded format that addresses the important function of antiquated NAB carts. Erase and re-record capabilities encourage MD's use for commercial/spot production and playback. Also, blank MDs are readily available through a wide range of distribution channels.

Denon's DN-990R MD cart recorder and DN-980F MD cart player are designed specifically for broadcasters, inheriting virtually all the benefits of its CD cart series. As with CD cart, Denon's MD cart machines are made to meet the highest standards of operability, reliability and efficiency for broadcasters.

Features in both units include: ATRAC

data compression, non-contact laser pickup for playback, magneto-optical overwriting recording system, signal-to-noise ratio of 80 dB or more, THD of 0.01 percent or less.

For information, contact Michael Stelts in New Jersey at 201-882-7460; fax: 201-808-1608; or circle Reader Service 61.

360 SYSTEMS

The DigiCart/II Audio Hard Disk Recorder from 360 Systems Can Store Eight Hours of Audio

TARZANA, Calif. The DigiCart/II digital audio hard disk recorder from 360 Systems records 16-bit digital stereo audio. It uses Dolby AC-2 data compression, and can store up to eight hours of audio on hard disk and up to 68 minutes on three sizes of removable media (Bernoulli disk).

Up to 10,000 cuts—with instant access to any one—can be stored in any of 10 directories. The playback of multiple audio cuts is seamless. Playlists can be created readily and played back in linear or rotary fashion. Digital editing is non-destructive and sub-frame accurate.

Two remote control units, new to the second generation DigiCart, enhance and expand DigiCart/II's capabilities with 16 "hot-keys," numeric find functions and

more. A mini keyboard serves as a third remote control with more than 100 hot-keys, and is useful for titling and alphanumeric find functions.

Other features of the DigiCart/II include: storage of up to 48 hours of audio with ancillary HDS storage system; full featured timecode synchronization with video equipment is available as a standard option; the serial port has been upgraded to interface a variety of external devices; and a developers' kit is now available.

DigiCart/II is easy to use—even non-technical people need only a half hour to learn how to use it.

For information, contact Doug Leighton at 360 Systems in California at 818-342-3127; fax: 818-342-4372; or circle Reader Service 120.

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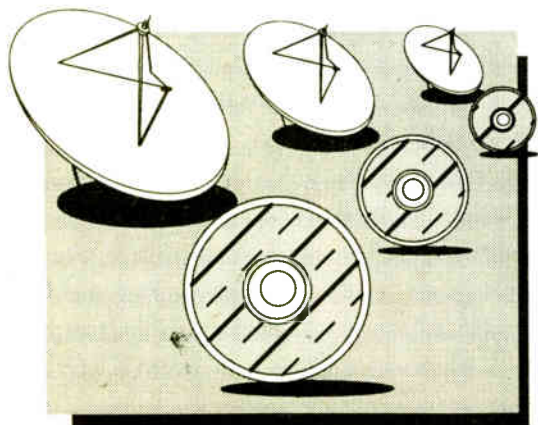
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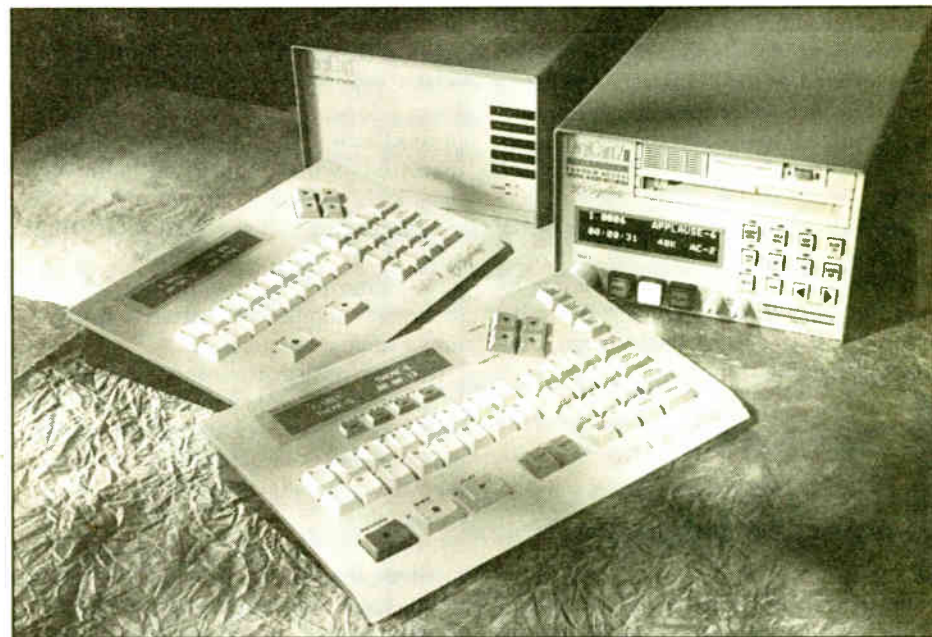
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Circle (67) On Reader Service Card



FIDELIPAC

Dynamax Sampling Rate Converter Switches Audio To Match User's Needs

MOORESTOWN, N.J. The micro-processor controlled Dynamax sampling rate converter (SRC) from Fidelipac receives stereo digital audio signals and outputs them at either a user-programmable sampling rate or synchronized to a second, reference digital audio signal.

The Dynamax SRC accepts signals conforming to AES/EBU, IEC 958, S/PDIF or Optical in professional or consumer mode at any frequency.

The inputs are transformer coupled and have 110 ohm termination. The external reference signal has the same specifications as the audio input signal. The digital audio input can be selected by one of the three front panel switches. LEDs on

the front panel indicate the selected source and the incoming sampling frequency.

The output signal conforms to the AES/EBU standard, switchable between professional and consumer format specifications. It is transformer balanced with a 110 ohm source impedance. The output signal is computed from the selected input with no loss in signal quality for input word lengths up to 20 bits.

The Dynamax SRC also provides a nine pin "D" connector (RS-232 port) for remote programming. This feature allows the user to modify the incoming channel status, user bits, validity and parity bits before they are transmitted.

It is available as a stand-alone or rack-mount unit complete with external power supply and connectors.

For information, contact Scott Martin in New Jersey at 609-235-3900; fax: 609-235-7779; or circle Reader Service 117.

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RDS

The Phantom Offers a Digital Audio Record/Playback System for Both On-Air and Production Situations

PERRY, Ga. The Phantom from Register Data Systems is a completely self-contained digital audio recording and playback system for use with radio station on-air and production operations.

Basic features include: simultaneous record and playback; multiple compression options, including Dolby AC-2, for efficient use of hard disk space; a user-friendly menu-driven interface; and multiple storage capacity options.

In addition, the Phantom includes support for networking and a splice editor for trimming dead air from carts, as well as allowing sections of multiple carts to be combined into a new cart.

In the recording mode, the system has the ability to allow the selection of sample rate, compression mode, and stereo/mono mode on a cart by cart basis.

Advanced features include automatic timer record for recording news or syndicated program feeds from satellite or other sources, as well as a host of other scheduling functions for playback of individual audio pieces.

For information, contact Brad Harrison in Georgia at 800-521-5222; fax: 912-987-7595; or circle Reader Service 165.

ATHAN

Athan Uses High-Grade Gear To Refurbish Tape Machines

SOUTH SAN FRANCISCO Athan Corporation offers various services and parts to assist the radio industry. One of the services we provide is the refurbishing of tape recorder machines. We use Sound Technology 1510A test equipment, a high grade testing tool.

We repair the machines to surpass the specifications the manufacturer requires. One such improvement is our modification of the Otari Corporation's MX5050 audio machines. For this particular machine, we offer five new high speed modifications, which improve the overall performance of the machine.

We also provide rebuilds on capstan and reel motors for all machines from two-track to multitrack. In addition, Athan refurbishes all cart machine motors. For all motor rebuilds we use top grade bearings to reduce flutter. We have a fast turn-around time on motor repairs.

Lastly, we manufacture an array of modified tape recorder parts to enhance the performance of various audio machines from two-track to multitrack.

For information, contact George Athanasiou (tape recorder repair and motor refurbishing) or Diane Athanasiou (parts sales) in California at 415-589-5206; fax: 415-742-9091; or circle Reader Service 7.

STANTON

Stanton Electronics Offers Rugged Dual-Deck CD Player Packed with Useful Features

PLAINVIEW, N.Y. The CD-33 by Stanton Electronics Inc. is a whole new innovation in dual deck CD player design. The unit's "Stick-Shift" control provides search and pitch bend functions with the same fingertip ease to which DJs are normally accustomed. In addition to dual sliding pitch controls and instant cue start, the CD-33 offers memory play of up to ten selections. You can also play 99 selections using the direct access key pad and store up to nine program files into memory for quick and easy recall.

Rugged, double shock isolating disc drive mechanisms and a three spot laser ensure pinpoint tracking accuracy at all times, even under the most adverse con-

DBA

New dB-CART D/O Makes Use of MO Technology

PORTLAND, Ore. Digital Broadcast Associates offers the dB-CART D/O, a full 16-bit linear player/recorder with removable 3 1/2-inch media capable of recording over 10 minutes of 48 kHz sampled stereo per disk, without compression.

The dB-CART D/O employs a magneto-optical (MO) disk drive. MO technology uses a modulated laser to write the digital audio signal instead of the magnetic scheme employed by most disk drives. Modulated laser recording allows the digital data to be written extraordinarily close together. The density is further enhanced by the optical servo track, which allows the disk drive's record/playback head to keep track of where it is and where it needs to go. In a magnetic only environment, this servo track cannot be as precise.

Another advantage of MO technology is its transfer rate during recording. The transfer rate is the speed at which the digital or analog signal can be moved from the audio inputs to the disk in record mode or from the disk to the audio outputs in play mode. The modulated laser recording process the dB-CART uses is faster and more precise than other methods.

MO disks are not subject to magnetic degradation common to audio tapes and floppies or the mechanical wear. MO disks can be used multiple times per hour every day or stored for years on end with no discernable change in the media or the recording.

For information, contact Jeff DeBry in Oregon at 503-639-6341; fax: 503-620-8118; or circle Reader Service 50.



ditions. The CD-33's dual chassis design allows you to install the control unit in the mixer console for quick and easy access while the disc transport unit is stored out of the way in an equipment rack.

Additional features on the CD-33 include: dual pitch control with ± 12 percent speed variation, dual LED and digi-



tal track indicators, 19-inch rack mountable, on-board error diagnostics and can play CD-5 and CD-3 discs. THD is 0.03 percent, signal-to-noise is 93 dB and its dynamic range is 97 dB.

For information, contact Ed Maidel in New York at 516-349-0235; fax: 516-349-0230; or circle Reader Service 13.

PIONEER

CD Autochanger from Pioneer New Media Technologies for Professional Audio Sites

UPPER SADDLE RIVER, N.J. Pioneer New Media Technologies Inc. offers the CAC-V3200 compact disc autochanger for the professional audio market.

The CAC-V3200 stores up to 300 CDs. By simply daisy-chaining up to 32 CAC-V3200 autochangers together via serial interface, an on-line library of up to 9,600 CDs can be developed. The product also features two built-in CD players, each producing its own output, so that the CAC-V3200 is capable of outputting each player individually as well as simultaneously. Another key feature is cue to first audio. The result is seamless playback with fade in and fade out capabilities.

The unit is equipped with both 15 pin RS-232C and nine pin RS-422A serial interface ports for connection to a computer. Pioneer's interface and protocol enable system software designs to promote two-way communication between the controller and the autochanger, as well as direct disc access by track, index, minute, second or frame.

Each player features two analog outputs and one digital output. The AES/EBU digital output utilizes a one bit D/A converter and meets EIAJ specifications. The analog outputs consist of RCA and XLR connections. There is also a mixed analog RCA-type output, common between both players, for crossfade and special effect applications.

Loading time, from the moment a player receives a command to the instant audio is output, is less than 30 seconds. Access time between cuts is under six seconds.

The speed of each player is controllable ± 10 percent, in 1 percent increments, with automatic pitch control. The frequency response is 20 Hz to 20 kHz ± 0.5 dB. Its signal to noise is measured at 100 dB with a channel separation of 92 dB.

For information, contact Lynn Regino in New Jersey at 201-327-6400; fax: 201-327-9379; or circle Reader Service 191.

LPB

User-Friendly ADAM-1 Provides Stations a Variety of Possibilities

FRAZER, Pa. The Advanced Digital Audio Manager (ADAM-1) is a hard disk-based computer system designed to support Travelers Information Systems. LPB developed the system jointly with the Los Angeles-based LocRad Inc.

ADAM-1 records and stores up to three hours of audio messages. The messages can be arranged in a Windows environment into any sequence of play desired. Simplified mouse controlled instructions are clearly identified in the monitor making a very user-friendly system. ADAM-1 contains single input and output programming.

ADAM-2, available in January, adds features such as external switching, simultaneous input and output and multiple program operation. Although originally designed for use with multiple remote site Travelers Information Stations, the attractively priced ADAM system can be fit into any broadcast environment.

For information, contact John Devecka in Pennsylvania at 215-644-1123; fax: 215-644-8651; or circle Reader Service 218.

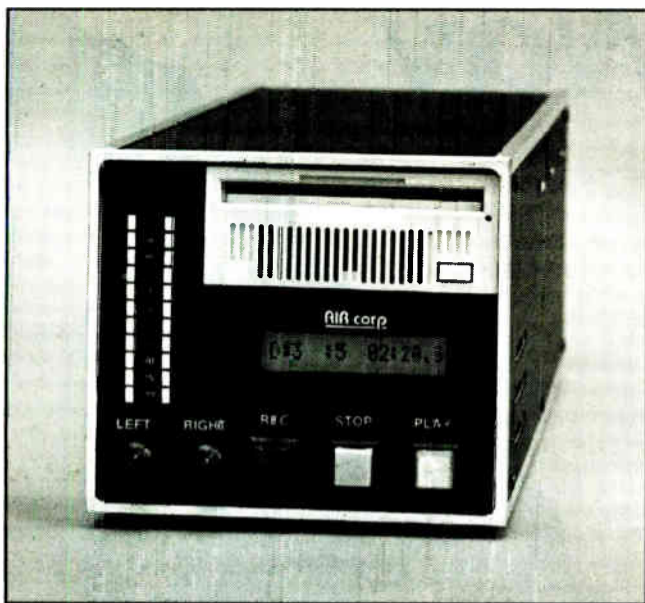
Coming Soon!



Radio World's Annual Directory

All New for 1994!

Watch for it



AIR CORP. SYSTEMS

AIR Corp. AIRcart-MO Ready For Early 1994 Roll-Out Using 128 MB MO Disks

RICHMOND, Ind. The principals of AIR Corp. Systems, Jim Loupas and Andy Rector, know that "homework" is one of their most important jobs. This recently led to an intensive market research effort to learn exactly how broadcasters feel about removable-media recorders and reproducers, and the features that should be included.

Positive reactions were heard everywhere the AIRcart-MO working prototype was shown: Dallas; Los Angeles; Chicago; New York; Chapel Hill, N.C.; Wilmington, Del.; and Madison, Wis. These remarks were very welcome, as were the many suggestions for making the AIRcart-MO more end-user friendly.

AIRcart-MO uses removable 128 MB magneto-optical (MO) disks, which provide 10.5 minutes of non-compressed, stereo, digital audio at a 48 kHz sampling rate. Because there is no mechanical contact between the machine and the disk surface, there is no wear. Disks are guaranteed for life, and provide in excess of one million re-recordings. MO disks will be easily available and reasonably priced.

Feedback from broadcasters during the field research phase, while encouraging, was emphatic regarding the features the industry demands in a digital cart machine. Cuing, controls, logging, RBDS, track selection, mono/stereo, and analog/digital (AES/EBU) inputs and outputs were several of the concerns that will be addressed in production AIRcart-MO machines.

Critics also were relieved they would not be held hostage by additional data reduction (compression) algorithms. During the period of field research, several news stories expressing deep concern on the part of broadcasters about compression stacking surfaced. Since the AIRcart-MO is a non-compressed recording format, there is no need to worry about compression stacking.

When introduced, AIRcart-MO will be a product truly designed by broadcasters for broadcasters. Beta units will be tested on-air during the first quarter of 1994. Production machines will be available for formal introduction at NAB '94.

For information, contact Andy Rector in Illinois at 309-452-9461; fax: 309-452-0893; or circle Reader Service 207.

SCOTT STUDIOS

Digital Audio Player from Scott Studios Provides User-Friendly Screens and Familiar Visual Displays

DALLAS The CompuCart from Scott Studios is a digital audio player that is easy for announcers to use. DJs see six "cart players" on a computer touchscreen and a "cart recorder" in production.

A start button on the touchscreen plays the selected commercial or spot, and DJs can choose to start spots themselves or to sequence them automatically.

The "cart labels" are very user-friendly, showing legible outcues, a digital clock to count down time remaining and a flashing end light. Ten "always ready" buttons start pre-defined recordings, such as jingles, sound effects, music beds, etc. These buttons can be programmed to change as the day progresses.

DJs select spots either by number or from lists on the touchscreen with the "spots" and "jingles" buttons. Logs are transferred automatically from your traffic computer, and the air log shows accounts, rotations, times and discrepancies.

Production can record new spots at the same time any number of air studios are playing. Audio is transferred by local area network (LAN), eliminating the time wasted redubbing spots, retyping labels or walking carts to studios.

CompuCarts come with QIC (quarter-inch cartridges) for digital backup and one year on-site service. The system costs less than analog gear does, and its upkeep is also less expensive.

Optional CompuCart features include: network program capture and delay, larger audio storage and music libraries dubbed to CompuCart hard drives.

For information, contact Dave Scott in Texas at 800-330-3004; fax: 214-620-2707; or circle Reader Service 57.

When looking for a digital audio system for automation of satellite programming or live assist, there would appear to be many choices. But if you're looking for a system which is flexible enough to give you total control without sacrificing your sanity, there is only one choice. The Phantom by RDS.

You will see the difference as soon as you see the Phantom in action. The display provides you with all of the information you need to see in a clean, concise manner, without the crowded look that you'll find in other systems. If you are familiar with the most popular software on the PC, then you may already know how to use the Phantom. The Phantom's pull-down menus guide you through all of the steps involved in setup and daily operation, from creating and scheduling clocks to creating and editing logs.

The PHANTOM Digital Audio Automation

The Phantom ends the confusion of automation by keeping everything organized. The Phantom simplifies your daily operations by keeping information such as input changes, voice changes, and clock changes in their own individual schedules rather than in the log. You can leave those liners and other voice drops out of the log because the Phantom will do them for you. The Phantom allows you to date new schedules to begin weeks, months, or even years in advance. When your satellite network informs you that there will be a voice substitution on Thursday, two weeks from today, you can prepare for it today.

The Phantom can retime spots to fit them cleanly into a satellite break without inserting silence, overlapping, or running late. The Phantom

TIME	CART NO.	DESCRIPTION	Duration	Code
5:27-00p	1001	1 Optional Break	2:00	0
	1001	action Computer Corp.	1:57	01
	1001	action Paper Cuts	1:57	01
	1001	action IC Penders	1:57	01
	1001	Flora FTB/Attention Squ	1:57	01
5:27-00p	1001	4 Mandatory Break	1:20	00
	1001	Forest South Oaks Furniture	30	01
	1001	Forest Hotel &	30	01
	1001	Forest Hotel's Jewellers	30	01
5:43-00p	1001	3 Optional Break	2:00	0

can create reports to keep you informed on a number of topics, from a list of expired spots to an analysis of potential mistakes in your log. The Phantom also maintains a history of system activity.

The Phantom has the features that others would want you to believe are theirs exclusively. The Phantom remains completely functional during recording, sensing relay closures and starting breaks as easily as it does when it is not recording. The Phantom can fill incomplete breaks with spots from a list you specify without ruining product separation.

While other systems tie your hands and limit your flexibility by only offering 3 or 4 inputs, the Phantom gives you 6 stereo inputs, using its AMX-84 solid state switcher, with the option of increasing the number of inputs to 14 or more. If your station is News/Talk, you know how important this can be.

The Phantom allows you to change the sampling rate, digital format, and stereo/mono settings at will to meet your needs for an individual spot. The Phantom offers a number of digital formats, including the new Dolby AC-2 format, as an option.

Call us today to find out how your station can benefit from the advanced technology of the Phantom and the experience of RDS.

1-800-521-5222
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 P. O. Box 980, Perry, GA 30169



There's a Right Way



"I did it right from the start with Computer Concepts' DCS."

I don't sweat when it comes to our spot-heavy morning drive or complicated LMA formats. The reason is simple: First I did my homework. And then I bought a DCS hard disk system from Computer Concepts. In fact, I bought several.

I smile at the thought of multiple program formats and satellite automation, live and live assist. I laugh at complex spot rotations, two-channel crossfades with simultaneous recording and networking to traffic—they're no problem for the DCS.

And Computer Concepts customer support is terrific. Their software experts can even troubleshoot my DCS and upgrade the software remotely, via modem.

No wonder Computer Concepts DCS has turned hundreds of stations into happy customers. I'm glad I'm one of them. Oh, I almost forgot. The price was right, too.



I thought I'd impress HQ by buying the cheapest hard disk system I could find. After all, they all look the same! Their promises sounded good and I wanted to believe.

I found out promises come cheap. But their system wasn't really cheap—not once you added up the little "extras" it took to do the bare minimum. And it still couldn't do all the things our station really needed.

I found out the hard way, at 3 AM when the system we bought crashed. And in morning drive, when missing spots meant dollars down the drain. When I finally reached customer support, they said they were working on software they thought would fix my problem, but they weren't sure when it would be done. Guess what I told them?

Now I know better. We're getting a Computer Concepts DCS. I learned a costly lesson: Get it right the first time. Call Computer Concepts first.



"I should have bought a DCS in the first place."

and a Wrong Way

DCS by Computer Concepts
CORPORATION

Computer Concepts Corporation
8375 Melrose Drive, Lenexa, KS 66214
Phone: (913) 541-0900 Fax: (913) 541-0169

RADIO SYSTEMS

Radio Systems RS-1000 Proves Itself an Industry Workhorse for a Variety of Station Situations

BRIDGEPORT, N.J. Almost five years ago, Sony unveiled its first DAT machine, the DTC-1000. The unit was robustly built and, while intended as a consumer unit, served as the base unit to Sony's first professional unit, the DTC-2500.

Although the unit was never sold to consumers, Radio Systems negotiated the right to import the machine and modify it exclusively for professional use. By adding a lower chassis, complete with large push buttons and a microprocessor to modify the control routines, we converted the Sony DAT machine to a professional unit with cart-like features and functions.

In the early days of DAT, we learned what the unit could and could not do for broadcasters. The RS-1000 proved perfect for automation applications, network delayed broadcast feeds and long pro-

gram playback. We learned the hard way that the DAT was not well suited to fast-paced hard rock programming, which required the ruggedness and super-fast response of a broadcast cart machine.

Still, the RS-1000 has proved to be a work horse for its 500 plus users throughout the United States.

Because the units were never sold com-



mercially, some supply of the Sony base units remain available. Radio Systems still ships the RS-1000 to users in need of especially rugged DAT machines for professional applications. It remains the only unit featuring automatic tape cuing; serial and parallel interface for remote control and automation operation; and end of message relay closures for automatic sequencing.

For information, contact Dan Braverman at Radio Systems at 609-467-8000; fax: 609-467-3044; or circle Reader Service 200.

TAPECASTER

900 Series Cart Machines From TapeCaster Are Rugged, Reliable and Affordable

SOUTHAVEN, Miss. The 900 Series cartridge machines by TapeCaster Inc., are designed to be reliable with good specifications to provide broadcasters the functions they need at a price they can afford.

A 900 Series unit is constructed of rigid steel. Its capstan motor is a direct-drive AC hysteresis synchronous motor. The capstan shaft is non-magnetic stainless steel, precision ground and chrome-plated with precision ball bearings. This provides low flutter, long life and low ambient noise.

The solenoid is air dampened and operates at low current in the holding mode, which helps keep heat generation low.

The 900 Series is available in both stereo and mono models, and record/playback and playback-only models.

All machines have three cue tones standard with the defeat function. The playback amp is muted in the stop and fast forward mode. The fast forward mode is activated manually or by the secondary/tertiary tones.

All inputs are 20k ohm balanced bridging, and outputs are 600 ohm active balanced with +24 dBm max.

The LED level meter on the recorder is selectable for monitoring record only, playback only or automatic.

For information, contact Bob Jones in Mississippi at 601-349-2881; fax: 601-349-2882; or circle Reader Service 82.

STUDER

New Generation of CD Players from Studer Are Stylish and Innovative with New CD-R Features

WOODLAND HILLS, Calif. The D730 (desktop model) and D731 (rack model) CD players from Studer combine ergonomics, styling, attention to detail and much more to create an innovative new generation of CD players. In addition, the D730/D731 include some innovative timing features and several features making them especially valuable to users of CD-Rs.

A board operator relies on an accurate display of the time remaining in a selection. For this reason the D730/D731 remaining time indication always relates to the audio stop point, which does not necessarily coincide with the end of the track.

The player is also able to countdown to

the end of a song's intro. The cue wheel is used to set this point, and during playback, an accurate countdown to start of vocals is displayed. The CD player then continues in play mode, displaying the time remaining in the track. This makes it easy to ensure that the end of an announcement coincides with the end of the intro.

For CD-R users, the player is able to play CD-Rs that do not have a table of contents (TOC). The D730/D731 creates a TOC by scanning the disc, after which it plays like a normal CD.

As soon as the TOC has been written, all skip functions are interpreted correctly. Of course, the CD player can also be programmed to ignore skip functions,

allowing users to make the most of the skip functions of the Studer D740 CD recorder.

Other features include: CD quality indication; user-selected start/stop points; automatic return to last point in case of power failure; and an AES/EBU digital sampling rate converter in the range of 32 to 48 kHz.

For information, contact Thomas Jenny in California at 818-703-1100; fax: 818-703-1179; or circle Reader Service 178.



ENCO

Cart Replacement System From ENCO Includes New Digital Audio Features

ST. LOUIS ENCO Systems Inc. offers an enhanced version of its DAD486x digital audio distribution system software. The DAD486x is an audio cart replacement system with multiple output reproduction, multitasking, production and waveform editing capabilities.

The new version adds powerful non-audio based features that permit external routing and logic control, embedded timing and instructions to be programmed via the system.

DAD486x now serves the complete needs of facilities that split operations between live assist and automate hours.

For information, contact Larry Lamoray in Missouri at 800-362-6797; fax: 314-453-0061; or circle Reader Service 90.

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THE MANAGEMENT

AXS Cart Replacement System from The Management Opens the Studio Door to Hard Disk Recording

FORT WORTH, Texas AXS (ax'sess) is a new product from Electric Works Corp., whose broadcast division, The Management, has developed and marketed broadcast software for more than 15 years. AXS replaces audio cart machines anywhere they are used. Each starter system includes both a production room system for recording the audio cuts and a control

In addition to replacing cart machines in the control room and the cart recorder in the production room, AXS connects directly to traffic and billing systems, eliminating the need for a separate paper log in the control room. AXS uses standard 486 computers, VGA monitors and hard disks. Superb audio reproduction with reasonable use of hard

disk space is assured by the use of apt-X digital audio cards. Balanced audio output and options for overlap and simultaneous record/play make a direct connection into the station audio chain. An audit log is written to disk for every event that is aired. AXS includes options to control several different kinds of multi-disc CD players; cut and

paste and workstation-type digital editors; interfaces to music playlist generators; and long walk away or sweep programming operation. For information, contact Adrian Charlton at 800-334-7823; fax: 817-624-9741; or circle Reader Service 109.



room system for on-air playback. Local area network (LAN) cards and software are also included. All audio is stored on a computer hard disk and played under direct control of the DJ or operator. Additional control and production rooms may be added at any time.

RECORDABLE MEDIA OPTIONS

Table with 5 columns: company, media, life expectancy, # of plays, lengths. Lists options from DIC Digital, Maxell, Sony, and 3M.

AMPEX, Apogee, audiopak, and TDK also produce recordable media products. For more information on those products call them directly.

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Crown DC-150A pwr amp, black face, \$250; Crown DC-300 pwr amp, silver face, \$350. B Wilson, Wilson Studios, 4400 Old Lebanon Rd, Campbellsville KY 42718. 502-789-3683.

Perma-Power S-102 amp w/S1420 batt pack, mobile/portable PA unit, 12 W out, excel cond, \$4100. R Sumner, CAVU Corp, 3322 Applegate Ct, Annandale VA 22003. 703-960-8894.

Stanton 310 pre amp, BO. J Kesler, WOBZ-TV, POB 220, Livingston KY 40445. 606-843-2209.

Audiometrics TP-84 turntable preamps (2), both in excel cond, \$100/ea. H Cotterill, WZAD, POB 978, Wurtsboro NY 12790. 914-888-0077.

Audiometrics PA-1 phono preamp, balanced outputs, BO. B Harris, E&B Services, 2950 S Birch St, Denver CO 80222. 303-756-4843.

New 250 W solid state amp, \$1800. Call for details. Bill Hoffman, 518-583-9490.

Want To Buy

Fisher, McIntosh, Harmon-Kardon tube amplifiers, parts & tubes, any owner/service manuals. R Green, WJGR, 1718 Shannadoah Rd, Wimauma FL 33598. 813-634-1940.

Various WE monitor, PB, pwr line & cutter amps. RQ Studio, Larson Rd #4, N Reading MA 01864. 508-664-0174.

ANTENNAS/TOWERS/CABLES

Want To Sell

4-Bay FMD scale translator antenna on 95.3, gd cond, \$800; Jampro 1-bay FM Class A on 94.3, gd cond, \$800. R Phipps, KERV, 301 Jct Hwy Ste 333, Kerrville TX 78028. 210-896-1230.

300' - 24" face tower, ERI FML-3E antenna, 320' of 1-5/8" coax, Harris xmtr FM 2.5K on freq 99.3. Call 1-800-393-2266.

Tower, 460', 30" face capable of holding 3 bay low pwr antenna, STL & 2 small 2-way antennas 607 guyed, mfg & installed in 1991 by Burkhalter Tower, presently standing, you dismantle & move, \$7500. D Eversoll, WRHQ, Box 1150, Richmond Hill GA 31324. 912-756-3111.

FM - ANTENNAS

Designed and built for your frequency. Choose from 1 to 12 bays and five power levels. Financing available. Call Jimmie Joynt at S.W.R. 214-335-3425

DB Products DB264 base station antenna, tuned to 155.25 MHz, usable over wider range, \$200 + shpg; Motorola 6073A base station fiberglass whip antenna, 150-159 MHz, \$200 + shpg. Al or Wes, KZPX, HCRI Box 286D, Merrifield MN 56465. 218-765-3333.

Gates FMC-3A 3 bay tuned to 103.1 MHz, avail 12/93, BO. P Johnson, KCRV, POB 909, Caruthersville MO 63830. 314-333-1370.

Andrew 7/8" to 1-5/8", gas pass connector, BO. M Friend, STU-Comm, 2011 Lewis Mt Rd, Charlottesville VA 22903. 804-971-4096.

Shively 6813-2R medium power 2-bay w/radomes, tuned to 88.9, excel cond, can be returned or modified for 88.1-89.9, \$1500/BO, pick up only. F Berger, WERS, 126 Beacon St, Boston MA 02116. 617-578-8823.

TOWERS FOR SALE

• 265' very heavy Grasis S.S.M.W. Tower • 8' H.P. dishes & mounts • 100' Rohn 10NH-6N + boom mounts for Quads-CCTV, 500' 1 1/2" Andrews Air Page: 1-800-849-8340

Dura tower, 265', 26" face, 13-20' sections & one 5', needs paint, otherwise in gd cond, w/wires, \$1500. Sue Schmitz, WABT, POB 249, Dundee IL 60118. 708-551-3450.

Jampro JSCP-12 12 bay FM on 100.3 MHz & 340' of 3-1/8" Heliac, gd cond, on tower, \$4000; Dielectric 50,000 motorized coax switch 3-1/8", gd cond, never used, \$2000. T Toenjes, WREN, 201 NW Hwy 24, Topeka KS 66608. 913-437-6549.

Jampro 3 bay circular polarized, tuned to 103.9, needs repair, \$400. Sue Schmitz, WABT, POB 249, Dundee IL 60118. 708-551-3450.

Rohn 45G, overstocked, 231 sections available. Call 806-372-5130.

TOWERS...bought and sold. Call 1-800-393-2266.

Want To Buy

Jampro/ERI 8-bay antenna on 95.9 in gd cond, must do upgrade fast & need bargain on both coax & antenna. D Wrinkle, KBST, POB 1632, Big Spring TX 79721. 915-267-6391.

1-5/8" rigid transmission line, unflanged. Elbows, bullets, couplings. 305-757-9207.

AUDIO PRODUCTION

Want To Sell

Shure M64A stereo preamp, like new, \$25. G Hultman, Hultman Media Svcs, 300 Limp Creek Rd, Grants Pass OR 97527. 503-474-6466.

Studer Dyalx 2+2, 2 hr w/SMPTE sync & DSP opt, demo, warr, \$8850; Sony PCM-2300 DAT, new, \$975. P Engel, 508-745-8522.

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Digidesign Sound Tools digital editing system w/sound accelerator card, DAT I/O digital interface, P/I/O analog interface, Sound Designer II software, JL Cooper CS-1 controller, Sound Tools utilities, manuals, cables, \$2800 plus shpg. D Glasser, Airshow, 7021 Woodland Dr, Springfield VA 22151. 703-642-9035.

Eventide BD-941 bdc delay line w/3, 6, or 12 second delay, \$975. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

SAVE \$300 ON T T 144 POINT PATCH BAYS... audio village 619/320-0728

Gates TA-1; RCA arm-head plus EQ. B Rose, Program Recdgs, 228 E 10th St, NY NY, 10003. 212-674-3060.

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ADC 144 Pt TT patchbays, exc cond, 1 rack space, 3 rows of 48, top 2 rows normal, \$129 (you remove old wiring) or \$199, we totally refurbish w/new front panel, ready to install. TT cords at cost w/purchase! Also 1/4" PB's. Audio Village, POB 2902, Palm Springs CA 92262. 619-320-0728, or Fax 619-320-2454.

Want To Buy

Sony 601ES or another F-1 format PCM w/SPDIF digital in & out. K Baker, Radio Kansas, 815 N Walnut, Hutchinson KS 67501. 316-665-3555.

Straight Wire Audio MTX-2 audio matrix. R Burton, Audio Rents, 7237 Santa Monica Blvd, Hollywood CA 90046. 213-874-1000.

AT-299 audio cards (2) for McCurdy SS-7500 board. Jonas Hunter, 814-238-5085.

Fairchild 600 conax or 602 Conex high freq limiters. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

AUTOMATION EQUIPMENT

Want To Sell

IGM Go-Cart 24 in excel cond, \$750. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Format Sentry FS-12C 48 tray Instacart, (4) ITC R-R, (2) 6' racks, DRS pwr supply, Tandy 1000 SL computer, Tandy DMP 134 printer, Spotmaster cart machine W 2500 tone, 2 yrs old, bought new, will sell for what's owing on equip. A Terry, WODY, POB 545, Bassett VA 24055. 703-647-8493.

Sonomag Mini-Pro w/remote head, (2) RS350 Carousel, RSC-100 random programmer, (4) Revox PR99, will sell separate or together, \$2750. S King, KGFL, Box 33, Clinton AR 72031. 501-745-4474.

IGM Basic A misc parts, Instacart 48 tray stereo, (4) Otari 1000 tape recorders, Wegener 1600 sat rcvr carded for country coast to coast & Microdyne 1100 rec. E Kazmark, KAZZ, POB 1359, Deer Park WA 99006. 509-276-8816.

Harris 9000 automation system w/Micropolis 1055-2 floppy disk drives (not working), (2) IGM Go-Carts, 42 tray, one operational & one for parts; TEC 70X monitor & keyboard, plus misc parts, \$1000/BO. J Huffmann, KMCCQ, 503-298-5116 or 1-800-288-5116.

SMC DP-1 (4) 350 Carousels, (2) dual play LA-246, DP-1 Brain & keyboard, remote (4) SMC R-R & tone sensors, all working; SMC DP-1 20 ch, (6) 352 Carousels, (2) dual play, (2) ITC R-R, DP-1 Brain & keyboard w/remote, LA 246. L Nelson, WAUR, 1 Broadcast Center, Plano IL 60545. 708-552-1000 X150.

Satellite package w/Systemation Superswitch, BE 3000 R/P cart deck, ITC single play cart deck, ITC 3D triple deck, \$2400. G McCoy, KEZH, 500 E. J St, Hastings NE 88902. 402-463-1314.

IGM SC, complete w/16 inputs, relay card plus spare cards, (5) IGM Go-Carts & (3) Otari ARS 1000 stereo PB R-R machines, IGM encoder w/terminal & keyboard. J Lotspeich, KTSM, 801 N Oregon St, El Paso TX 79902. 915-532-5421.

Harris 9002, (4) ITC 770 reel, (5) IGM Go-Cart 24, Delta deck/recorder, dual floppy drive, keyboard & CRT, manuals, BO. G Bamert, WHMS, POB 3939, Champaign IL 61826. 217-351-5300.

Schafer 900 Series 901 control unit, 902 switch mem, (4) R-R PB only w/PBA-1 interface 900 system pwr supply, (3) Scully PB R-R mdl 255, (3) Sound Mag Car mdl 252RS, BO. J Konicsek, KBZZ, 116 Dalton Ave, LaJunta CO 81050. 719-384-5456.

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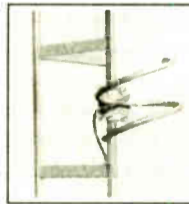
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AKG C460B/CK61ULS cardioid condenser mic, like new, (2) avail, \$350 ea. M Osborne, WKSQ, POB 9494, Ellsworth ME 04605. 207-667-7573.

Audio-Technica AT813 condenser mics (3), gd cond, \$65 ea or \$180/all. H Cotterill, WZAD, POB 978, Wurtsboro NY 12790. 914-888-0077.

Shure SM-81 (2), \$190 ea; (2) Shure SM-57, \$70 ea; (2) Beyer M-201, \$115 ea, all in excellent condition with cases, plus shpg. D Glasser, Airshow, 7021 Woodland Dr, Springfield VA 22151. 703-642-9035.

Neumann KM-53 omni (2), classic tubes with power supply & cables, in excellent condition, \$100/ea. HR Fair, Ealing Rec Ltd, 4906 N Taiman Ave, Chicago IL 60625. 312-784-1558.

Gefell Neumann UM57 tube mics, New capsules for SM2 & many others, New AC701 tubes for Neumann mics, \$275. W Gunn, 619-320-0728.

AKG 414's, \$695, original D12 like the Beatles used, \$295, Sony ECM54, \$150, Beyer M500 lk new, \$300, Demeter 4-ch tube DI rack mt lk new, \$875. W Gunn, 619-320-0728.

Want To Buy

Shure & EV metal mic cases, SM-7 or RE-20 style. R Burton, Audio Rents, 7237 Santa Monica Blvd, Hollywood CA 90046. 213-874-1000.

Neumann U-89 in vgc, will pay up to \$1100. HR Fair, Ealing Rec Ltd, 4906 N Taiman Ave, Chicago IL 60625. 312-784-1558.

RCA, WE, etc, ribbon velocity mics, most models. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

77-DX's, 44-BX's, KU-3A's On-Air lights. Top price paid. Fast response. Bill Bryant Management, 2601 Hillsboro Rd, G12, Nashville TN 37212. 615-269-6131.

RCA 77DX/44BX ribbon, chrome/TV grey, good condition. BO. R Kaufman, Pams Productions, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

MISCELLANEOUS

Want To Sell

Big Radio w/gen & audio amps, speakers & lights, BO. R Plessinger, 1591 Boyle Rd, Hamilton OH 45013. 513-863-0774.

EQUIPMENT FOR SALE DUE TO DUPLICATION. Studio equipment for sale. Studio consolidation has left us with too much equipment. Harris consoles, TNC 99B cart machines, Ampro cart machines, Otari 5050 reel-to-reel machines, Technics turntables w/bases, 3M Scotchcarts & metal cart racks, studio furniture, too much to list. Call for complete list. Also complete (w/racks) SMC automation system w/expanded memory, 5 SMC Carousels, & logging option—ALL OPERATIONAL! Call David Lane, Chief Engineer 716-423-2900

1988 Caterpillar generator set, 125KVA/ 100KW, 3208-V8 diesel w/ water jacket heater 24 V battery charger, 400 amp breaker disconnect, full automatic CAT transfer switch, fully digital control panel, like new cond, \$15,700/firm. A Miller, WKMX, 100 N Main St, Enterprise AL 36330. 205-347-2278.

RCA 220 V heavy duty bulk eraser, \$1100; Audico 751 manual cassette loader, \$500. D Flynn, Continental Recordings, 230 Adams St, Newton MA 02158. 617-630-0007.

FOR SALE: Giant boom box, red in color, \$1750. Audio package, six months old, \$7500. 26 foot tandem axle trailer w/brakes, six months since total refurb/paint, air in control room, great for remotes, fairs, events & high visibility, \$17,500. BE 4100 series console, new from factory, \$2500. Harris SX1A 1990 1kw AM transmitter, you tune & ship, \$9500. Harris BC500H 500 watt AM, as is, \$2500. Potomac AA51 distortion analyzer, new w/book, \$1500. Moseley MRC 1600, 2 studio/1 transmitter unit telco cards & subcarrier cards included, \$2000. Gates dualux, refurb/paint, \$1500. Call Dan Bryan or Chuck Porter at 217-357-3128 or fax 217-357-6610.

Altec 1579A equalized transistor amp for magnetic phono pickup, octal 8 pin base, \$25. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. (no phone # given)

McMartin TBM-2000A, \$100. L Houck, Rollin Recording, 210 Altgelt, San Antonio TX 78201. 210-736-5483.

Tried A-10-J input transformer (2), 150/600 ohm input, 60K ohm output, \$40/pr. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. (no phone # given)

ADC Pro-Patch, 1/4"-19" patchbay, new, \$100; SPX-90 Yamaha reverb, \$350. B Ganslen, Ganslen Audio, 1250 Valencia, Lewisville TX 75067. 214-436-2206.

Want To Buy

45 RPM record library's, all types, hits, promo, etc. D Schmidt, Midatlantic Radio, POB 11502, Wilmington, DE 19850. 302-323-0338.

Tube output transformers by UTC, Triad, Froed, WE, Acrosound, Peerless. L Blackmon, RQ Studio, Larson Rd #4, N Reading MA 01864. 508-664-0174.

Pioneer control switch assembly, RSG-025-0 or control board RWG-047-0, good condition & complete, will consider used Pioneer R/P RT-1011L. M Hoffman, KNCK, 913-743-1414.

Ampex tube recorders and mixers. W Gunn, 619-320-0728.

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

Radio transformers by Chicago, UTC, Triad, Peerless, Froed, Sola, send list. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

Wanted: Old, tubes, speakers, amps, turntables, etc. By Western Electric, McIntosh, Altec, Langevin, Marantz, Dynaco, RCA, Jensen, JBL, EV, Tannoy, Fairchild, Telefunken, G.E., Thorens, EMT, Fisher. Call 713-728-4343 or FAX: 713-723-1301.

MONITORS

Want To Sell

Peerless 4580116-20 input transformers, 600 ohm input, 60 K ohm output (8), 8 pin octal base, \$15 ea. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. (no phone # given)

Want To Buy

TFT mod monitor for FM. D Wrinkle, KBST, POB 1632, Big Spring TX 79721. 915-267-6391.

McMartin (buy & sell) any model. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886 or fax 402-493-6821.

RECEIVERS & TRANSCEIVERS

Want To Sell

Ceivwe Miniplexer 6 cavity mobile duplexer & circulator tuned to 462.675, covers 450-470 MHz, \$100. P Russell, Bowdoin College, Sillis Hall, Brunswick ME 04011. 207-725-3066.

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Regency Micro Comm 401R UHF 2 way repeater w/combiner, all in rack, BO. M Aldridge, RSE, POB 616, Dellewah TN 37363. 615-855-1624.

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McKay Dymek AM-3 solid state AM tuner wide or narrow band, nice cond, \$250; McKay Dymek AM loop antenna w/RFB amp, tunable w/RFB gain control. L Snyder, Madera Bldg, Box 182, Floral Park NY 11001. 718-347-2940.

Want To Buy

Marantz, Karg, REL, Scott, Fisher & McIntosh FM monitors. L Blackmon, RQ Studio, Larson Rd #4, N Reading MA 01864. 508-664-0174.

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McMartin TBM-1100R VHF rcvr, \$100 plus shpg. L Nelson, WAUR, 1 Broadcast Center, Plano IL 60545. 708-552-1000 X150.

TFT 9200 STL system, pair of 9200/9205 tuned to 944.875 & 945.125, new in factory sealed cartons, \$5600. G Levites, WEVD, 770 Broadway NYNY 10003. 212-777-7900.

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Moseley MRC-1600 xmtr/studio units, both wire modem 7 SCA cards incl 2 manuals, spare parts kit, excel cond, \$1000. J Norris, WMUU, 920 Wade Hampton Blvd, Greenville SC 29609. 803-242-6240.

Moseley 6020 composite rcvr only, excel cond, \$2300. G Faltus, 10 Executive Dr, Farmington CT 06032. 203-677-6700.

Moseley MCR 1600 remote control, \$1400. G McCoy, KEZH, 500 E. J St, Hastings NE 68902. 402-463-1314.

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Martl STL-10 mono w/(2) 4' dishes, mounting hardware & 200' or 3/8" coax, like new, \$3000. C Ratliff, Long Pine Bldg, Rt 2, Box 178, Wadesboro NC 28170. 704-694-5040.

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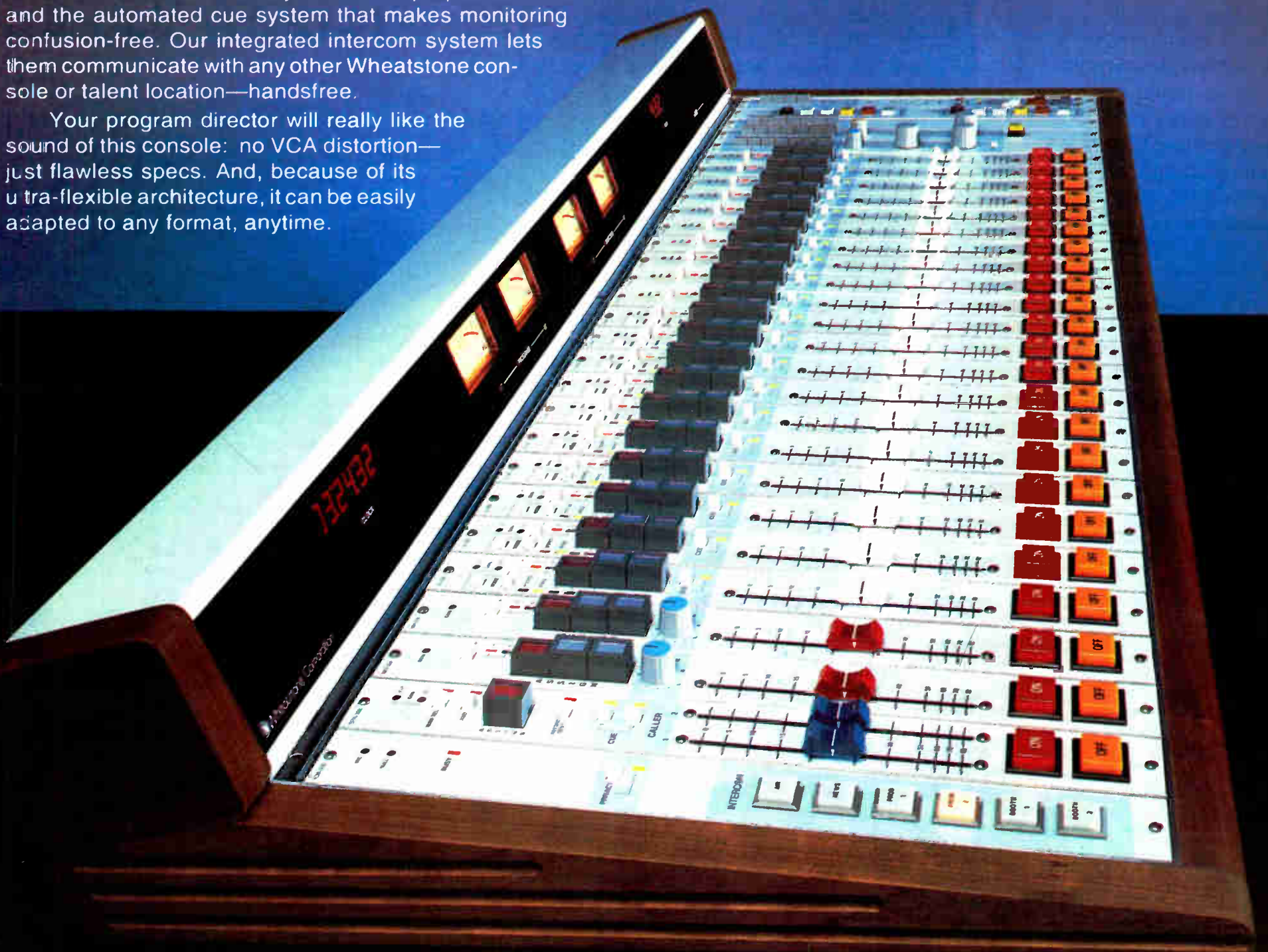
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