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**SPECIAL YEAR-END ISSUE!**  
 With the Top Ten News Stories of 1991

# Radio World®

Vol 15, No 24

Radio's Best Read Newspaper

December 25, 1991

## New York Parties with WKDM

by Frank Beacham

**NEW YORK** The holiday party tradition hit New York City broadcasting with a bang this year—especially during an 11-hour marathon remote featuring 22 live bands, more than a thousand exuberant revelers, six whole pigs, dozens of roasted chickens and gallons of party spirits.

The occasion was "Adelanto Navideno," a pre-Christmas party tradition imported from Puerto Rico to New York City by United Broadcasting's WKDM-AM (1380), Manhattan affiliate of the CBS Hispanic Radio Network.

The 11-hour live radio party, held Nov. 16, was so big and complex it originated from BMG Studios, the former RCA complex on West 44th Street and one of the city's largest recording facilities. Two performance stages were constructed in 75'x50'x30' Studio C, which allowed one band to play on the air while another set-up.

### Eat, drink and be merry

A crowd of more than 1,000 guests ate, drank, danced and cheered to dozens of popular Latino performers, many of whom sang Spanish Christmas carols or "aguinaldos," folk music and

contemporary hits. Musicians—lugging instruments and equipment cases—maneuvered through their fans, attempting to reach a studio stage in time for their scheduled performance.



Sound engineers worked as a team to air the music of such bands as La Gran Manzana (inset) during WKDM's 11-hour holiday remote.

Working behind a Sony MXP-3000 console attached to 36 vintage Neumann, Shure and Electro-Voice microphones in the studio, veteran BMG mixer Dennis Ferrante plowed through the chaotic, non-stop live broadcast with alternating moments of exuber-

ance and frustration. "I'm just winging it as I go along. I work best under pressure," Ferrante said.

Since there was no way to set levels in advance of each band's appearance, Ferrante, with the assistance of representatives for the various performers, had to fly blind with each act as they went on the air. Each start-up was a moment of high tension with a committee of engineers often arguing the merits of a given mix.

At the end of the console in the studio control room was Dave Bialik, WKDM's chief engineer. He processed the mono feed from the Sony console through a Shure M267 mixer and Aphex Compellor compressor/leveler before connection to an 8 kHz telco line to the station's Carlstadt, N.J. studio.

Because the program was monaural, phase cancellation and other live stereo problems were avoided. "If this was stereo I would not be this calm. I'd be crazy now," said Ferrante, whose clients have included John Lennon, Linda Ronstadt, Kiss, Harry Connick Jr. and Wynton Marsalis.

### Miking live radio

Bialik picked a vintage microphone from BMG's collection for his on-air talent. "Since this is live radio, we wanted some tradition and I decided to use the RCA 77DX, which I happen

(continued on page 7)

## FBI Captures Kautz

**WASHINGTON** FBI agents and local police arrested Jerry Kautz on Nov. 26 in St. Charles, a town in the suburbs of St. Louis, Mo. Kautz was the owner of Imperial Transmitters, and had been pursued by the FBI on fraud charges.

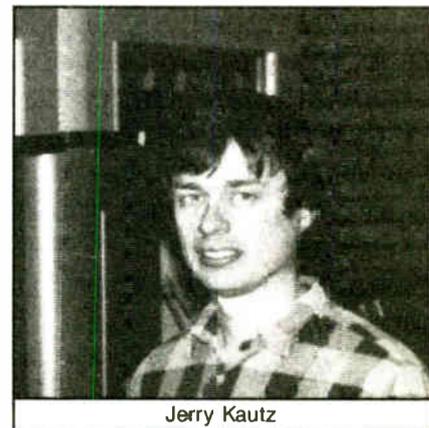
Kautz was indicted in November by the Federal Grand Jury for the U.S. District Court of the District of Nebraska on eight counts of mail fraud, according to Jim Lovelace, supervisory special agent for the FBI's Omaha field office.

Through his company Imperial Transmitters, Kautz accepted payment from broadcasters for a vast assortment of professional equipment that reportedly never was delivered. He billed his customers 50 percent down, with the remaining 50 percent on delivery.

Kautz, according to his customers, promised that an Imperial Transmitters truck would deliver equipment to the stations to save on shipping charges, provided the remaining 50 percent was sent prior to delivery. He disappeared from Imperial's Nebraska headquarters just as customers began to suspect they had

been defrauded.

According to the indictment, 34 persons were victimized by Kautz, and a total of \$212,635 was obtain-



Jerry Kautz

ed by him. Since his arrest, he has been returned by authorities to Lincoln, Neb., where he has been held in custody, Lovelace said.

On Dec. 4, Kautz was arraigned in Lincoln. He entered a plea of not guilty.

At press time, a trial date had not yet been determined. Lovelace estimated that a date might be set within 60-90 days.

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# DAB's Saga Gains Momentum



Although digital audio broadcasting (DAB) was introduced in 1990, 1991 can be considered the year that brought DAB from a question mark to a much discussed subject.

NAB jumped into the DAB arena early in the year. It stunned broadcasters when its Radio Board endorsed the European-developed Eureka 147 system at the annual January board meet-

ing. A DAB task force also was established.

Opposition to the NAB's Eureka support was immediate. NAB, however, turned aside accusations of "conflict of interest" and vowed to "manage and control" the development of DAB, specifically to stop satellite DAB.

Based on a commissioned spectrum study, the NAB targeted L-band (1500 MHz) to accommodate existing FM and AM licensees in a DAB scheme. The spectrum was the same as that targeted by satellite

DAB interests.

Engineers looked at past L-band studies and predicted higher power costs as building and foliage attenuation increased at the higher frequency. NAB countered by saying that Eureka's 147 design might actually increase the performance at L-band.

#### L-band was the rage

The DAB Task Force said it would schedule L-band tests later in the year, and Canada said it would perform its own tests

during the summer.

Meanwhile, U.S. in-band DAB systems began to surface from companies including Kintel, Gannett, American Digital Radio, Mercury Digital, LinCom and Synetcom.

Gannett, joined by CBS and Group W, announced the Project Acorn in-band DAB system developed with Stanford Research Institute. The technology could put a digital signal "under" both AM and FM signals and extract it for reception using U.S. military technology. The system,

## THE TOP TEN

named USA Digital Radio, debuted at the NAB spring show.

Ted Schober of Radiotechniques announced a DAB system that would be phased in via a tiered allocation system where stations would convert to digital, eventually relinquishing their analog licenses.

Another company, Strother Communications Inc. (SCI), was granted permission to test DAB on UHF channels, but initially it had no systems to test. Strother filed for test authority in several other frequencies and planned an independent test center to test DAB systems in Washington, D.C. SCI also was granted a pioneer preference by the FCC.

Eventually, Eureka researchers began to suggest that their system could be adapted to narrower bandwidths than L-band. The NAB began licensing talks with Eureka researchers around mid-year, but a crucial letter of intent was extended several times and finally stretched to the end of 1991.

#### L-band doubts

L-band, however, then ran into another stumbling block. The Dept. of Defense and the National Telecommunications and Information Administration opposed release of the spectrum because it is considered vital for military research.

In light of opposition to L-band, the FCC indicated it would ask for some L-band and some S-band (2300 MHz) for DAB in preparation for 1992's World Administrative Radio Conference (WARC).

Letters opposing both the NAB's push for L-band and its endorsement of Eureka poured into the FCC. The L-band opposition was based on anti-satellite DAB sentiment and from those who wanted an

(continued on next page)

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**Look for the rest of RW's second-of-month columnists in our Jan. 22 issue.**

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World Radio History

# AM Rules Cause Some Concern



The FCC's long-awaited decision on AM improvement, unanimously accepted on September 26, was somewhat less than unanimously welcomed by the industry.

The decision on Docket 87-267, which was slated for publication in the Federal Register in early December, increased first and second adjacent channel protection ratios, refined methodology for calculating nighttime coverage and interference and required a station to make a 10 percent interference reduction when voluntarily modifying its facility.

The FCC identified "technical standards," "migration" to the expanded band and "consolidation" as the target areas in its plan to reduce congestion and interference in the AM band. The technical standards included those items listed above.

Regarding migration, stations causing the most interference in the existing band were given first claim to the expanded 1605 kHz to 1705 kHz band, with an added preference for AM stereo stations.

Dual ownership and operation of existing and expanded band stations for a five-year period, with a waiver of duopoly and national ownership rules during that period, also was approved.

Regarding consolidation, the FCC approved issuing tax certificates to licensees who voluntarily stop operating marginal stations. The FCC also would relax multiple ownership rules for stations proposing changes to facilities that would reduce adjacent or co-channel interference.

With the adoption of the new rules, the FCC will drop the current AM application freeze, pending Office of Management and Budget approval of the effective date of the new rules.

Finally, the FCC said that it might need to consider some restrictions on AM-FM simulcasting, but said that it would revisit that issue after three years to determine whether such restrictions actually are

necessary.

Preliminary response to the AM docket suggested that the new rules may actually offer disincentives to AM improvement, because interfering stations are given first consideration for the expanded band. Also, the so-called "ratchet" provision would require stations to back off in power if they enter into voluntary modifications.

At day-long meetings in mid-November, the NAB's AM Improvement Committee met to pore over the text of the docket. A committee member said the group planned to file comments on

the docket once it was published in the Federal Register, primarily to have some procedural points clarified.

## THE TOP TEN

Even the FCC acknowledged that some of the ideas in the docket are rather rigorous. Commissioner Ervin Duggan pointed out that some pain and sacrifice must be endured by AM stations for the greater good of the band, an opinion with which Chairman Al Sikes agreed.

"By any sane analysis, AM is a very sick service," Sikes said.

## EBS Attacked for Ineffectiveness



After fining a Missouri radio station \$25,000 for misusing EBS attention signal tones in a fictional skit, the FCC staff is now trying to decide whether WCBS-AM—one of America's largest stations—should be penalized for misusing the EBS tones in a real life emergency.

The way the FCC deals with the WCBS issue may set a precedent about how seriously many broadcasters take the Emergency Broadcasting System as it tries to redefine itself as an emergency warning service in the 1990s.

The FCC, seeking to give EBS "a higher profile," made an example of KSHE-FM, an Emmis Broadcasting station that serves the St. Louis area, after a disc jockey used EBS tones in a dramatization of a fake nuclear attack. The commission issued a warning saying EBS encoder tones were not to be altered and noted that use of prerecorded tones is not in compliance with Sections 73.940 or 73.906 of the rules.

In August, Hurricane Bob hit the shores of Long Island. After failing to relay emergency information concerning the storm to other stations in an EBS chain, WCBS-AM and FM in Manhattan—both CPCS-1 stations—drew fire from Long Island broadcasters dependent on them for emergency information.

After an initial denial, WCBS-AM finally admitted using pre-recorded tones, which failed to trigger EBS receivers. WCBS-FM chose not to participate in EBS (which is voluntary), but it did not inform stations in the chain that had depended on it for EBS warnings.

The FCC requested reports from both CBS stations and is expected to decide soon whether to take action against WCBS-AM for airing the pre-recorded tones in violation of rules.

In 1991, EBS officials also were engaged in efforts to educate broadcasters about emergency procedures and to investigate advances in technology that might enhance the system.

EBS Chief William Browning said six

major regional workshops are being conducted throughout the U.S. in 1991 and 1992 to help state officials and broadcasters bring their emergency plans up to date. After the workshops are completed, he said, state plans are to be tested four to six times during 1993. In 1994, a national test of the EBS system is planned, he said.

A Notice of Inquiry (NOI) into technical upgrades to the EBS system was issued in 1991.

## DAB Gains Momentum

(continued from previous page)  
in-band solution.

Although the NAB encouraged the U.S. to support L-band for DAB at the 1992 WARC and continued licensing talks with Eureka, it also began to soften on in-band. By mid-summer, the DAB Task Force announced it would consider in-band systems along with L-band.

Before the NAB's Radio '91 show in September, the association stunned the industry by asking Eureka to develop an in-band or narrow-band DAB system for U.S. broadcasters, which put Eureka in firm competition with U.S. in-band developers.

SCI became a system proponent again. The group formed a research alliance with several industry firms (DATA) and began underwriting tests for LinCom and Syncom's DAB systems.

In October, SCI and LinCom demonstrated LinCom's system to government agencies and the NAB's DAB Task Force. The LinCom system would put a digital signal on each FM's first adjacent channel, with enough capacity for every existing AM and FM licensee and additional licensees.

Eureka developers began urging a consortium of developers to accomplish an in-band DAB solution. U.S. in-band system

developers, however, have shown no enthusiasm for such a partnership.

### Other developments

Several other DAB developments paralleled the L-band and in-band debate by the fall. Satellite CD Radio, which had begun the entire process with its petition to begin satellite DAB service in 1990, modified its plan a number of times.

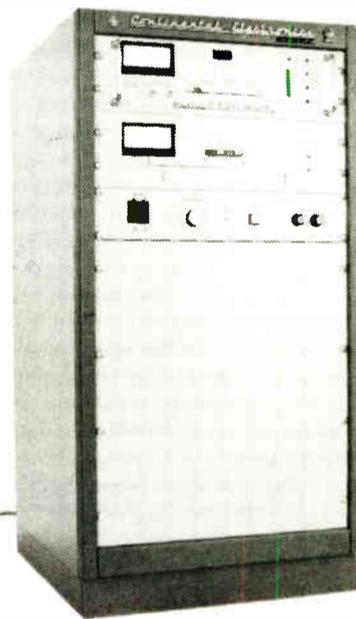
Canada completed the first L-band tests in early fall and showed that the pessimism over signal propagation at L-band may be unwarranted. NAB, however, postponed its scheduled L-band tests.

L-band became a moot point anyway as the Executive Branch and the FCC decided by November that the U.S. would ask for S-band.

U.S. DAB development is now focused on in-band. But NAB talks with Eureka continue, and the possibility of an in-band fight between Eureka and U.S. system developers looms.

Late 1991 developments included the Electronic Industries Association (EIA) establishment of a standards-setting committee to recommend a DAB system. DAB also got a hearing in Congress, at which the NAB was grilled about its alliance with the foreign owned Eureka project.

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# Continuing a Holiday Tradition

by Alex Zavistovich

**WASHINGTON** When I look back on winter holidays I spent as a little boy, my strongest memory is of one thing: cleaning.

Somehow, my folks ended up being the ones who had to host the Family Dinners. From Thanksgiving through Christmas, my mother was a blur of small kitchen and household appliances—after all, you can't have company over if the basement rug hasn't been vacuumed.

That childhood memory still affects me, because I notice a real zeal to reorganize and catch up on things whenever the weather turns chilly.

So, this installment of *Pilot Tone* will be a grab bag of items that have crossed my desk, tidbits I've seen and heard, and whatever else I've turned up while going through my in-box.

But before I start on that, I'd like to introduce everyone to *RW's* latest addition: Lucia Cobo, who comes to us from Broadcasting magazine's New York office, where she was radio editor for the East Coast. Lucia is *RW's* new managing editor, and she brings a perspective on radio management to our pages. We're glad to have her on our team.

Now on with the show.

★★★

The group that met at Radio '91 in San Francisco to discuss a broadcast-specific digital interface standard is still considering a final location for its next meeting. At press time, the group was leaning toward the Winter Consumer Electronics Show in Las Vegas, Jan. 9-12. Bob Weirather of Harris-Allied is coordinating the meeting.

I've learned that the NAB has officially revised the dates of its '92 national convention in Las Vegas. The convention will begin on April 12th and end on April 16th (Sunday through Thursday). The NAB says the change was made to accommodate the Broadcast Engineering Conference, which for radio folks will begin at 1:30 p.m. on April 12th. The ex-

hibits will run Monday through Thursday, as previously noted.

The Radio Advertising Bureau (RAB) is readying itself for the RAB Managing Sales Conference, slated to run Jan. 30 to Feb. 2 at the Opryland Hotel in Nashville, Tenn. Look for a special preview of the event in the Jan. 22 issue of *RW*.



Meanwhile, the Armed Forces Broadcasters Association (AFBA) is collecting memorabilia from Armed Forces Radio and Television Service (AFRTS) stations, for a "golden yearbook" commemorating the service's 50th anniversary. Send your submissions to: AFBA Alamo Chapter, PO Box 37381, San Antonio, TX 78237-0381.

★★★

Congratulations to KYW, Newsradio 1060 in Philadelphia. Employees of the Group W station were recognized at an awards banquet of the Pennsylvania Association of Broadcasters.

KYW reporters Bob Kotowski, Roca Duffus and Paul Kurtz won in the Documentary category for a series called "Childhood: Rated PG." Editorial Director Charles Thomson was honored for the station editorial "So Much in Common."

Group W, by the way, has joined with other top broadcasting groups, Radio Advertising Bureau members, the Radio Network Association and The Interep Radio Store in a partnership called The Radio Creative Fund. They are launching the "Mercury Awards" for creative excellence in radio advertising. First prize is \$100,000 to the creative team that comes up with the best radio ad of the year.

There are no categories in the Mercury Awards. The competition is judged by creativity, no matter what the campaign. The deadline for entries is January 27, 1992, so you station production rats had better get on the stick. Request entry forms by writing: The Radio Creative Fund, c/o Group W Radio, 888 Seventh Ave, New York NY 10106. The award date is slated May 11, 1992 in New York City.

At Bonneville Broadcasting System, a division of Bonneville International, Jack Adamson has taken over as Chief Operating Officer. Bonneville Broadcasting is a syndicator providing AC and Easy Listening programming to stations here and internationally.

Jack's been at the post about three weeks now, coming to the company by way of the Bonneville Major Market Radio Group, where he was president.

In other Bonneville news, I was saddened to learn of the passing last month of William D. Loveless, VP of Engineering for Bonneville International Corp. Bill died November 2nd at Cottonwood Hospital in Salt Lake City, after a tough fight against cancer. He was 56.

Bill Loveless joined Bonneville in 1952 as a part-time technician at KSL in Salt Lake City. By 1980, he earned the position of BIC VP, completing an M.S. degree in electrical engineering along the way. *RW's* condolences go out to his family.

★★★

You know, Eastern Europe is really gung-ho on Western radio, and the Soviet Union (or whatever it's called in these post-coup days) seems the most interested of all. Western-style stations are starting to spring up in its larger cities, and the programming is definitely *not* polkas, folk songs and marches.

For example, on December 8th, the Dallas-based Satellite Music Network brought its Z-Rock 50 show to Europa Plus radio in Moscow and St. Petersburg, the city formerly called Leningrad. Z-Rock 50, a hard rock countdown hosted by Madd Maxx Hammer, will air bimonthly in English and Russian, and

is sponsored by Rock Power magazine.

Europa Plus, by the way, is one of a number of stations in Eastern Europe started by outside interests. Ever since the Soviets took the FM spectrum back from the military and opened it up to commercial ventures, entrepreneurs around the world have tried to wrangle their own spot on the dial.

The U.S. radio brokerage Star Media Group has been working on an agreement with the city of St. Petersburg to start up a station in that city. The project is still in its very early stages, however.

Somewhat further along is Radio 7, the Moscow-based commercial FM project of Gillette, Wyo., entrepreneur Ben Doud. That station is expected to go on the air January 7, 1992.

★★★

The number "7" has been lucky for Ben Doud all along. For one thing, Radio 7 was awarded the seventh commercial license for an FM facility in the Soviet Union. And the January 7th sign-on date is either a wild fluke of luck or a tremendous marketing effort on Doud's part.

Why? Because it's Christmas, that's why.

Hey, hold on there, you say: Christmas falls on Dec. 25. Well, it's Dec. 25 if you use the *Gregorian* calendar, named after Pope Gregory, who is believed to have "perfected" it. Followers of Russian Orthodoxy, however, go by the *Julian* calendar, named after Julius Caesar.

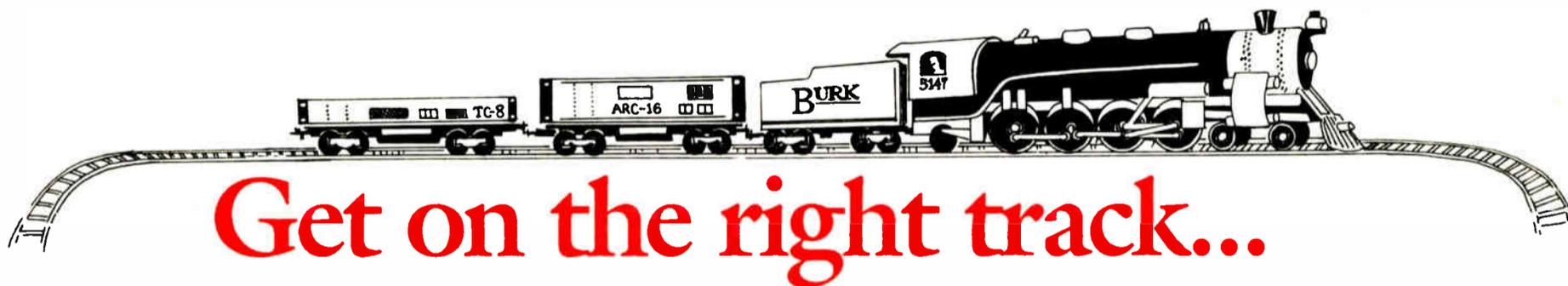
The principle difference between the two calendars is that the Julian is two weeks behind the Gregorian. Therefore, Christmas according to Russian Orthodoxy is celebrated not on Dec. 25, but—you guessed it—on Jan. 7.

What great timing for a station kickoff: "Happy holidays from Radio 7, the sound of young Moscow. Now back to more Madonna."

And season's greetings from *RW*. By the way, has anyone seen the vacuum?

Tune in next time,

Alex

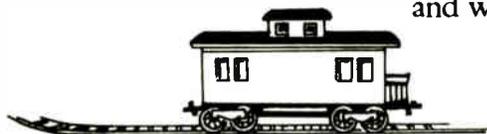


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World Radio History

## READERS FORUM

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### Wire turns and tower tuning

*Editor's note: The following letter was addressed to RW columnist John Shepler. The letter, and John's response, are printed here to clarify a point raised in a recent installment of John's Q-Tips feature.*

Dear John,

Let me preface this letter by saying that I normally enjoy reading your articles in *RW*, and agree with most of your statements. However, I take serious exception to your latest article in the Oct. 9 issue, where you say "put a couple of big turns in your AM feed wire before it connects to the tower. This forms an inductor that won't upset your tuning."

Placing an inductor such as you describe will seriously upset the tuning of a tower, whether it is a non-directional or part of an array.

Let's look at a typical tower operating a 1000 kHz, exhibiting an impedance of  $38+j25$  ohms. Assume if you will, that the matching network is designed for  $-60$  degree phase lag. For a perfect match at 50 ohms, the input leg would be 21.46 ohms, the shunt would be  $-50.33$  and the output

leg 3.39 ohms.

Now let's add the two turns you suggest. Typically, they would be 20 inches in diameter, and stretched out to about eight inches. This would result in 2.4 micro-henries of inductance, or 14.8 ohms at the carrier frequency.

Now let's look at what happens to the perfectly matched 60 degree network. Without going into the math involved, the input would be  $64.4-j16.8$ , a serious mismatch; however, the worst part is that the delay across the network would now be  $-79.4$  degrees. The obvious solution is to add a corresponding  $-14.8$  ohms to the output leg of the network. I say obvious, but as you know, it would only be obvious to someone who is familiar with AM antenna systems.

Please print a correction in the next issue, before all the third-ticket holders make the consultants rich.

Please don't feel that I am trying to trouble-shoot your work, this is not my intent. My intent is to try to stop people in the field from making a serious mistake.

Fred W. Greaves, Asst. DE  
Susquehanna Radio Corp.  
York, Pa.

John Shepler replies:

Thank you for your insightful comments. I value your input as someone who obviously has spent much time understanding the technicalities of antenna network design.

Fred, I never really intended to suggest that third ticket holders or even qualified broadcast engineers rush out willy-nilly to modify their antenna systems. My intent was simply to describe some of the industry-tested practices that properly-designed antenna systems incorporate to attenuate the effects of lightning strikes to the tower.

I believe you are quite correct in stating that adding inductance to an already tuned antenna will upset the established impedances. The impression I hoped to leave the readers of the column with is that the small, but significant, impedance of the looped feed line is enough to discourage high frequency lightning transients from entering the tuning house, but can be accommodated by the tuning design for the antenna feed.

This is in contrast to the much higher impedance of the static drain choke which tries to look like an open circuit at AM carrier frequencies.

The antennas I am familiar with all have loops in the feed line (and static drain chokes) that were incorporated when the systems were first put into service. As a broadcast engineer, I would be suspicious of any system that omitted this feature.

I agree with you wholeheartedly on one point: Making changes to broadcast antennas to incorporate new features is a job for experts only.

My personal practice and advice to fellow broadcasters has always been to hire competent consulting help for any AM or

It's been an action-packed year for news. From stories as far-reaching as Operation Desert Storm and the Soviet coup to those as specific to the industry as the future of the Emergency Broadcast System (EBS), radio has been on the front lines, serving the public interest.

Looking back over the year, a number of stories stand out as significant indicators of where the industry is headed. *RW* compiled these items for this special year-end issue, in a feature called, "The Top Ten News Stories of 1991."

Certainly no single topic garnered as much attention in 1991 as digital audio broadcasting (DAB). The European Eureka technology was embraced by the NAB, which attempted to have the system adopted in the L-band spectrum for U.S. broadcasters.

U.S. engineers, however, were largely opposed to the wideband technology, and began work on in-band DAB solutions. The FCC's recent recommendation only

of S-band DAB allocations for the World Administrative Radio Conference (WARC) this coming February has made in-band research all the more important as 1991 draws to a close.

Still, opponents of L-band technology were surprised this year to discover that Canadian tests of signal propagation and permeability at that frequency indicate reception of DAB at L-band could be comparable to FM or UHF reception at comparable ERP. The Canadians are

taking L-band to WARC as their DAB recommendation.

A more immediately accepted technology this year, however, was the Radio Data System (RDS). By dint of its acceptance in Europe, RDS was placed on the fast track for development in the U.S. RDS encoders and receivers are already being developed, and the system is even being touted by one firm as a possible replacement for EBS.

As for EBS, the FCC launched a notice of inquiry this year into whether the system should be refined, updated or replaced. That, coupled by the furor that erupted when WCBS-AM/FM failed to broadcast the two-tone warning during the onslaught of Hurricane Bob, made the issue among the hottest topics of the year.

That's just a quick look at some of the stories that made *RW*'s Top Ten. For a more in-depth analysis, read the special section in this issue. And hold on for 1992—it's already looking like it'll be more than interesting.

—RW

## Tallying the Top Ten

*FM antenna issues. In fact, I think I'll devote a future column explaining why this is money well spent in even tight budget times.*

*Once again, thanks for taking the time to send in this well thought out discussion. I welcome any other suggestions you may have to clarify topics in the column or recommendations for subjects that would be important to cover.*

### Weighing the costs of SBE

Dear RW,

A recent letter to the editor (*RW*, Sept. 25, 1991) commented on the subject of moving the SBE annual convention around the U.S. The first question we should ask is, "Why have a national convention—why not several smaller regional gatherings?" The second question should be, "Who pays?" The third question, "Who benefits?"

Costs! The cost of attending a convention—either national or regional—vary mainly with travel distances involved. The time away from the normal job site does not change much except for those who reside in the immediate area of the convention.

Who really pays the basic costs of a convention and who benefits? The exhibitors pay the majority of the costs. The individual registration fees are not the major source of money. If you feel otherwise, examine the cost for attending a training seminar given by, for example, Sencore (usually about \$75 for four or five hours of training) or Bruel & Kjaer Instruments, Inc. (\$75 for about five hours of training). These companies are only attempting to break even on the associated costs.

So, a local attendee pays very little for transportation and perhaps commutes from home. The rest of us have the same basic housing and food expenses, leaving only the travel

costs as a variable. Each of us will block off two days for travel. By taking advantage of the normal convention travel plans and discounts, we can minimize even this part of our overall expenses.

I wonder just how many of us really base our final decision only on the cost of travel. Is the final decision much more like a fish looking at a baited hook? Does the perceived reward outweigh the risk of being caught? Will we get a good exchange of educational benefits for our money?

Agreed, there are some marginal potential attendees who will base attendance only on travel time and cost. Are there more or fewer of us who would or would not attend if we had to pay for the lack of exhibitor participation?

I feel the costs of a convention are much lower where there are more exhibitors participating. To me, the real factor is how much I can get from the educational—that is, technical session—portion of the affair.

Let your chapter and national officers know what your feelings are, and ask them for realistic cost analysis if the commercial exhibitors pull out and we, the attendees, pay the full freight.

George Riggins  
Long Beach, Calif.

### Clarification

The Nov. 20, 1991 issue of *RW* inadvertently omitted Television Technology Corporation (TTC) from the *Buyers Guide*. TTC produces a complete line of solid state FET FM transmitters from 1 W to 8,000 W, and energy efficient tube type transmitters from 10,000 to 25,000 W.

For more information on TTC FM transmitters, contact Russ Erickson at 303-665-8000, or circle Reader Service 78.

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Managing Editor, Lucia Cobo  
International Editor, Alan Carter  
Associate Editor, Charles Taylor  
News Editor, John Gatski  
Contributors: Judith Gross,  
Frank Beacham/N.Y.  
Technical Editor, John Bisset  
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Julianne Stone, Lisa Roach, Lisa Stafford  
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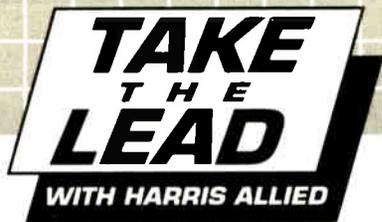
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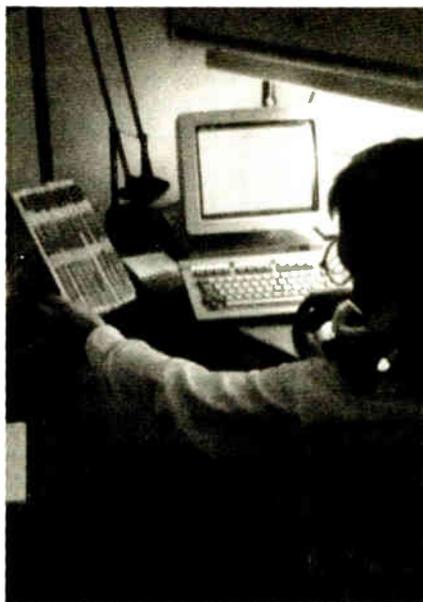
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# FAA, FCC Squabble Over Control of EMI



The ongoing dispute between the FCC and the Federal Aviation Administration (FAA) over electromagnetic regulations was a rollercoaster ride this year as negotiations started off on a sour note, improved slightly, and ended in a stalemate.

The FAA caused a stir last January when it announced that it was seeking to gain more control over broadcast station and tower construction, including any improvements that would result in ERP increases.

The FCC immediately brought the matter to Transportation Secretary Samuel B. Skinner, whose branch oversees the FAA.

This move led to a series of meetings between FAA and FCC officials. While the FAA never officially rejected the proposed rules, there has been no move to implement them yet.

The episode stirred up a number of contentious issues between broadcasters and aviators regarding the interference dispute. Chief among them was the FAA's computer model, used to determine potential magnetic interference to aviation communications and directional equipment (avionics).

Broadcasters argued that the FAA was unjustly denying numerous broadcast applications because of possible

electromagnetic interference (EMI). The model, broadcasters argued, assumed aviators used avionics gear that did not have modern interference filters. Few aircraft are outfitted with such low quality gear, broadcasters charged.

The FAA countered that direction-finders could still be hampered by broadcast signals and argued that air safety takes precedence over broadcasting.

By the summer, the FAA had agreed to ease the restrictions on AM radio, cellular phones and fixed microwave services.

FM restrictions were originally left in force, but the FAA later decided to alter its computer model to provide a "more reasonable" assessment of interference potential.

Meanwhile, a radio consulting firm in Texas petitioned the FCC to draw up specifications for avionics receivers, a request that appears to have been shelved pending the outcome of discussions with the FAA.

According to Barry Umansky, the NAB's deputy general counsel, FCC/FAA negotiations are going nowhere.

"We are in a stalemate again," Umansky said "The FAA promised to form a special subcommittee to examine the EMI issue. That has not happened yet. And frequent meetings have been held on how to improve the (EMI) model, but there has been no progress."

Umansky said the issue appears to be hinging on an Orlando, Fla., case in which the city is suing the FAA for approving a broadcast license under its relaxed restrictions.

## THE TOP TEN

# N.Y. Party

(continued from page 1)

to feel is one of the best microphones ever made," Bialik said.

A veteran of about three music remotes each week, Bialik is also an enthusiastic proponent of the Aphex Compellor for remotes. "When you are doing live radio, you tend to get a little hollow sound. The Compellor adds a very subtle flavoring to the sound. I'm trying to give it a richness . . . I'm filling in that hollowness."

But Bialik stops short of discussing his other processing tricks. "No way am I talking processing," he snapped with the reaction of a chef being asked to reveal a guarded recipe. "We are a Spanish Top 40 station in a highly competitive market. Other stations may consider themselves in a loudness war. I'm in a clarity war. I want to make my station the clearest in town."

"I process my station for the lousy radios because I figure there are more lousy radios out there than good radios," he continued. "If I sound good on a lousy radio, I'm probably going to sound very good on a good radio."

This is the second holiday season WKDM has brought a live broadcast version of "Adelanto Navideno" to its New York audience. "We want to share the warmth of the holidays, memories of our homeland and the importance of Christmas with our listeners through this day," WKDM Promotions Director Marta Collazo said.

# QSound Improved



After receiving criticism from radio broadcasters that two major recordings using its 3-D sound imaging process were not mono-broadcast compatible, QSound redesigned its software in 1991 to help mixing engineers guard against potential mono problems.

QSound, one of several new three-dimensional psychoacoustic imaging processes designed to enhance stereo sound recordings, has been used by artists including Madonna, Wilson Phillips, Sting, Luther Vandross, Janet Jackson and others.

The early problems, which appeared in releases by Madonna and Wilson Phillips, occurred when mixing engineers used the process without carefully checking the mono mix, the company said.

QSound, owned by Archer Communications of Calgary, Alberta, is applied to individual tracks of a recording in the mixing phase of record production. It is a real-time software-driven device that allows the mixer to place instruments or other sounds at specific positions in space. The effect is a sense of the sound coming from beyond the loudspeakers. The technology is based on an auditory model of how the human brain localizes sounds.

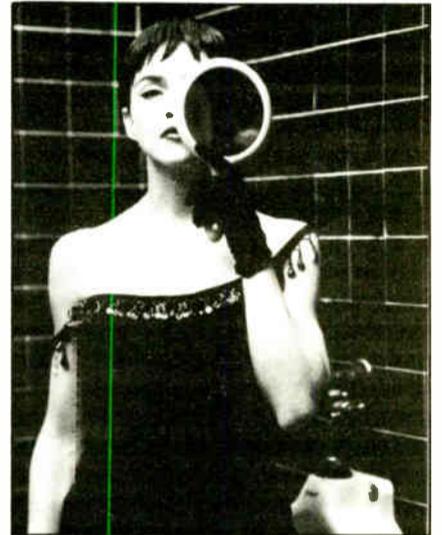
New QSound software allows dynamic motion control of eight channels and the ability to bring sounds closer or further away from the listener. The original software treated the entire mix and allowed sounds to be extended only from right to left.

The new software also has placed some limits on the mix which help the engineer avoid mono compatibility problems. If the new QSound system senses a potential mono problem, a flag icon is displayed on the computer screen to warn the mixing engineer to listen to that channel.

"Mono is very subjective. It's very difficult to look at sound electrically and tell whether it's going to be good or bad in mono," QSound inventor Dan Lowe said. "We still recommend the engineer sum and listen. We have solo features that allow them to do that."

Mono compatibility, which is important to radio broadcasters, is not an issue to other QSound users, Lowe said. For example, QSound systems for the home videocassette mixing market will have all mono limitations removed because "they want the extreme" in wide stereo.

"We deal with this mono thing on a country to country basis," Lowe said. "We mention mono in Japan and they couldn't care less about it."



Madonna's Immaculate Collection suffered mono compatibility problems from QSound encoding.

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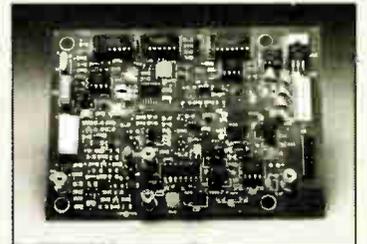
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# U.S. RDS Standard on Fast Track



Since its debut demonstration in the U.S. nearly three years ago, RDS (Radio Data System) has been riding a fast track toward becoming a domestic standard.

In 1991, the industry moved quickly to adopt a U.S. standard for FM broadcasting. It is likely that a U.S. standard will be adopted by the NRSC (National Radio Systems Committee) by April 1992.

The U.S. RDS standard (renamed RBDS, or Radio Broadcast Data System, domestically), was worked out through the NRSC's RDS subgroup, which will send the standard to the full NRSC in January 1991.

RDS's rapid trip through the standards process is due to the technology itself, already well developed in Europe. RDS is transmitted on a 57 kHz subcarrier and broadcast on a station's main FM carrier.

It can provide a variety of functions, including text display, text scrolling,

automatically locking onto a music format when traveling from area to area, and switching between a station's translators. RDS also has been proposed as a replacement for the EBS system.

U.S. broadcasters have expressed particular interest in the RDS text function: the capability to transmit call letters and frequency to car listeners. More advanced RDS units will be able to display the name of a song playing and the artist from CDs or digital tapes that have such information contained in the digital subcodes.

NAB Manager of Technical Regulatory Affairs John Marino said U.S. broadcasters support RDS, but want to make sure the industry is not totally driven by the receiver industry. In November, a NAB RDS task force was formed to define the broadcasters' position on RDS.

If receiver manufacturers offer the same RDS radios sold in Europe, including the text function and the ability to switch from one translator to another, broadcasters will be satisfied, Marino said.

RDS's potential as an EBS technol-

ogy replacement has been pushed strongly by the technology's proponents as well.

By July 1992, broadcasters in the Jefferson County, Texas, area will have completed testing and most will have switched to the RDS emergency alerting system.

The county, which is dominated by the petrochemical industry, decided to go with the RDS system because it is much more automatic and has fewer links that can fail. Other communities also have expressed interest in using RDS for emergency

## THE TOP TEN

alerting.

The RDS subcommittee has run into a few obstacles in pursuit of a standard—mainly, a perceived compatibility problem with Cue Paging, a paging subcarrier that also operates at 57 kHz. It is located on more than 270 radio stations.

Cue Paging originally caused problems with RDS receivers, including lengthy delays in text display, receiver makers claimed. However, Cue Paging has made some software changes to its systems, and tests in California showed that the two systems could be compatible.



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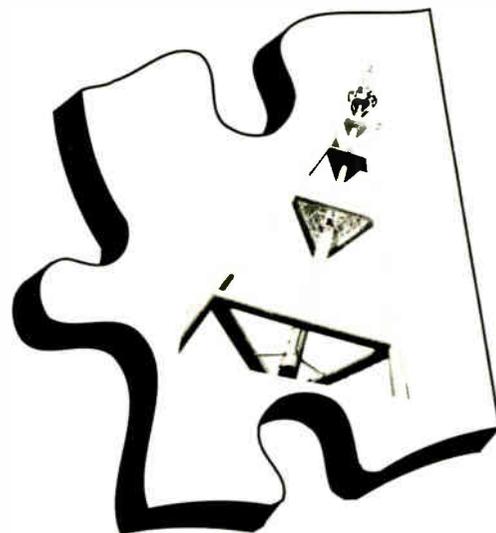
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## Canada Tests L-Band



In 1991, digital audio broadcasting (DAB) was the one of the hottest topics in the industry, and L-band was a big part of it. L-band delivery of DAB was considered by some to be unworkable because, they believed, transmission would require a large amount of power or would be subject to signal loss from obstructions.

At the Society of Broadcast Engineers (SBE) convention in Houston, however, findings of Canadian L-band analog signal propagation tests indicated that digital radio reception at that frequency actually may be similar to FM and UHF signal reception at comparable ERP.

The test findings also indicated that L-band signal permeability is better than had been speculated, and does not suffer appreciably from obstructions such as tree foliage.

Actual coverage area of the L-band signal was close to the predicted coverage area. In some cases, there were no coverage gaps in places where such gaps had been predicted.

L-band propagation was also found to be similar to a predicted coverage area for FM. The coverage

range was 45 to 60 km, based on an ERP of 8 kW, from an antenna height of 260 m. Service gaps found at L-band were similar to those found for FM service, and no worse.

Indoor reception or permeability tests in houses and office buildings showed that, with the exception of basement floors, there was no location where field strength was not at least 10 dB above the receiver threshold. Rooms with windows boasted 15 dB to 20 dB higher than rooms without windows.

The Canadian test findings indicated that at L-band, the reception of digital radio would be superior to that of UHF and comparable to—or possibly better than—FM reception.

While the news was considered surprising by some engineers, the point was soon rendered moot for the U.S.

In November, the FCC stated its formal recommendation for the U.S. position at the World Administrative Radio Conference, which specified an S-band allocation instead of L-band.

Canada's WARC recommendation will be an L-band allocation, a position shared by Mexico, Brazil and Australia.

## Consultants Question FCC's Fine Schedule



The FCC implemented its new fine and forfeiture schedule in 1991, and not to everyone's satisfaction.

On Aug. 1, the FCC issued a referendum intending to clarify its often-vague, ill-defined schedule of fines and forfeitures for stations violating its rules.

Policy Statement 91-217, which established standard fines for specific violations, is not foolproof, but it at least gave broadcasters an idea of which violations the Commission most fretted over.

While the new schedule went into effect Aug. 8, the NAB and others have requested that the FCC rescind the policy and issue it only after requesting comments. But even if the FCC accepts this request, the priority of the various violations will likely remain the same.

In the past, there was no effective way for the Commission to dole out violation fines. At best, a station could obtain listings of various fines the FCC had charged and the violations for which they were assessed, but that would give only a general range of potential fines.

The most substantial base fine—mind you, these are "per day" fines—is \$20,000, for misrepresentation/lack of candor; failure to mark and light towers as required; unauthorized construction; unauthorized substantial transfer of control; and violation of rules relating to distress and safety frequencies.

A fine of \$18,750 was mandated for failure to permit inspection—stations are to be available for inspection any time they are operating; \$17,500 for malicious interference and failure to respond to FCC communications; and \$15,000 for exceeding authorized antenna height.

Exceeding power limits and unauthorized emissions draw a \$12,500 fine, as well as unauthorized frequency; transmission of indecent material; and violations of political broadcast rules.

Though current EBS guidelines are under reexamination by the FCC, as of late 1991, the old rules stand, with a fine of \$12,500.

Frequent EBS violations include non-operational generators, receivers or decoders; missing log entries regarding EBS test transmission and reception; use of an unauthorized EBS generator; and inability to fulfill EBS obligations from an off-premises control point.

## Acquisitions Brisk in 1991



This year was a fairly busy one for the acquisition of companies and sales of stock. The first deal of the year was completed Jan. 1, when Sennheiser acquired the Berlin-based microphone manufacturer Neumann GmbH. The purchase was part of an ongoing effort at Sennheiser to diversify and expand in the international market.

Another deal completed in January was Fidelipac Corp.'s purchase of Rancho Cordova, Ca.-based Broadcast Audio Corp. The company has been operating as the Broadcast Audio Division of Fidelipac.

Fidelipac also purchased the rights to sell a floppy disk-based digital recorder from the British firm ASC. Renamed the DCR1000 by Fidelipac, the recorder is still marketed in the U.K. under the ASC DART name.

Florida-based Harris Corp. acquired the assets of the systems and the radio frequency divisions of Midwest Communications Corp. for \$3 million. Midwest's radio frequency division designs and manufacture UHF and VHF television transmitters. Its systems division is responsible for radio and television turnkey projects covering satellite uplink, electronic newsgathering and studios. It also includes the company's overseas distribution arm, Midwest International.

Moseley Associates was repurchased by company founder Jack Moseley and a group of investors, including senior management officials. The company was acquired from General Research Corp. (GRC) International.

Audi-Cord Corp. was purchased from Carl Martin by Andrew Rector. Martin, who founded Audi-Cord in 1976, will continue with the company. Rector, one of the original founders of International Tapetronics Corp., has had a long relationship with the broadcast tape cartridge industry.

Russco Electronics Manufacturing Inc. was sold by Russell Friend earlier this year. Throughout its 27-year history, the company has researched and designed radio broadcasting equipment. Under its new ownership, and the direction of Chief Engineer Ronald Reyes, Russco will expand to the consumer marketplace.

Finally, Gentner Communications Corp. raised over \$3.2 million in cash in a secondary stock offering this year, and changed its name from Gentner Electronics Corp. The company said it would use the capital to fund future growth. The company put out 1.25 million units, consisting of 3.75 million shares of common stock and 2.5 million redeemable common stock purchase warrants. The offering was available only by means of a prospectus. Gentner trades on the NASDAQ exchange.

# THE TOP TEN



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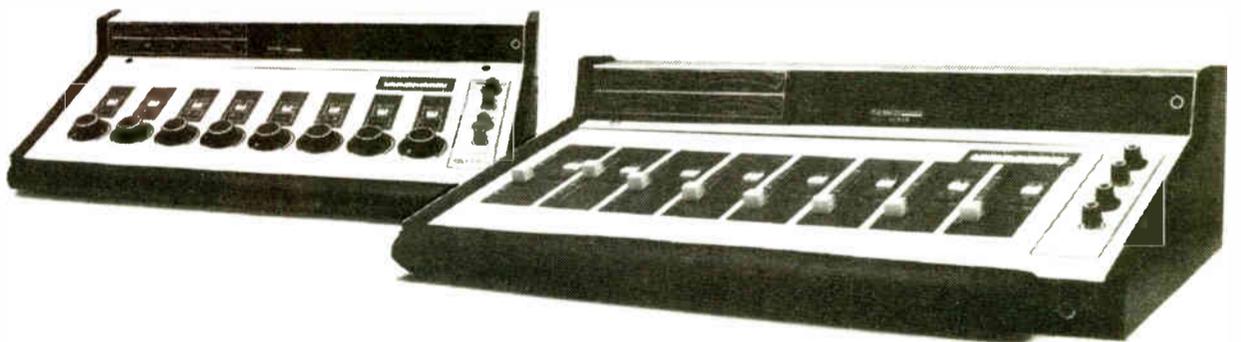
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xL12/2S	12 mixer, dual channel	4,358
RS4	2 mixer, 4 machine start/stop	263
RS8	4 mixer, 8 machine start/stop	325
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MMB 1/9	9 input mix/minus buss, bal. out	184
SLF	Super long life linear faders(per mixer)	79

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World Radio History

# FCC Eyes Mod Rules



The FCC Mass Media staff has recommended that the Commission undertake a Notice of Inquiry (NOI) into possible changes of the modulation rules, a heated subject during much of 1991.

The Mass Media staff's action was the result of pressure from broadcasters and modulation monitor companies that believe ambiguities in the rules have led to differing interpretations of what is legal modulation.

FCC Assistant Mass Media Chief Bill Hassinger said the Commission wants to eliminate "grey areas" and close loopholes in the modulation rules that were loosened during deregulation in 1983.

The often-criticized deregulation included elimination of modulation monitor type acceptance standards. The Commission also has been criticized for not elaborating on how it measures modulation during station monitoring and what is considered overmodulation.

Controversy intensified in 1989 when

Modulation Sciences introduced the ModMinder, a modulation monitor that ignored very brief peaks, which according to the company allowed a few more dB of legal modulation.

Other modulation monitor companies said such a monitor could allow overmodulation, adding that the FCC deregulation has caused confusion about modulation standards.

As a result the FCC declared at the 1991 NAB convention that it would take some type of action.

If the full Commission approves the NOI process, it could then undertake a Notice of Proposed Rulemaking (NPRM) for any rule changes. Any changes are likely to include increased specificity of measurement procedures so there will not be any room for misinterpretation, Hassinger noted.

Hassinger said the FCC is not likely to resurrect type acceptance standards for monitors, re-emphasizing an FCC public notice released earlier this year that said all commercial monitors appear to measure accurately.

## LMAs: Pros and Cons

by Harry Cole

**WASHINGTON** For those of you who thought you might have found salvation—or at least survival—by entering into an "LMA" (local management agreement) and brokering off all your station's time to some guy down the block, watch out. In the on-going push and pull between Congress and the Commission, the Congress has thrown up a yellow caution flag about LMAs.

LMAs are a way of dealing with the overly competitive environment brought on by the deregulatory excesses of the 1980s, which have forced too many stations to grab for too few listeners and even fewer advertising dollars. The solution? Lease off your facilities to another broadcaster so that he or she can take advantage of economies of scale, reduced competition, etc., and make a go of it.

Of course, that approach flies in the face of traditional "public interest" notions of broadcast licensing. But the Commission smiled on it in a number of decisions at the beginning of this year. Those decisions require that LMAs comply with certain conditions—be sure to consult with counsel before considering an LMA.

### Rent a station

Since then, LMAs have become a trendy way of weathering tough economic times without having to sell your station at a loss. Instead, you just rent it out for a while, and possibly sell it to your renter at the end of the agreement. You get regular rent and a lot fewer headaches, the renter test-drives the station for a couple of years to see how it works, the public gets service, life is great. Right?

As you may know, some members of Congress don't think so. At least one harsh letter of inquiry about the FCC's LMA policy landed on Chairman Sikes' desk last winter.

Now, however, a bill has been introduced that would require the Commission to set pretty dramatic limits on LMAs. For example, the bill would pro-

hibit you from brokering more than 10 percent of your station's time to any one party, or from brokering more than 25 percent of it in total. Also, you couldn't do an LMA (or, in the bill's language, a "bulk time sale agreement") with anyone

## COLE'S LAW

who is seeking to buy the station. Where's the fun in that?

Under the bill, LMAs would have to be filed with the FCC, they would have to include assurances that the licensee could preempt programming or even terminate the agreement, should the licensee think the public interest so warranted. LMAs could not be used to rent stations to parties otherwise not qualified to hold broadcast licenses.

The bill does contain some safety valve language which would permit a licensee to avoid the limits of the bill, but at a pretty hefty price. To get around those limits, you would have to (1) show that without some such exemption, the station could not continue to broadcast; (2) let the public comment on the proposed LMA; and (3) forego any renewal expectancy at your next renewal time.

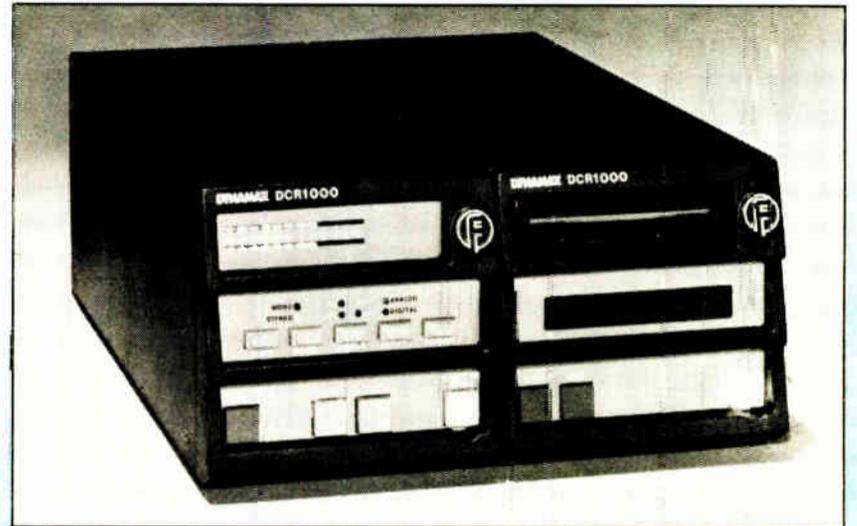
### Just politicking

But don't panic yet. This is just a bill. It hasn't been considered by any committees or subcommittees, and it's a long way from being enacted into law. In fact, it is likely that the bill is just a way for some congressmen—Messrs. Markey and Dingell, in this case—to communicate their views on the subject to the Commission.

What the FCC's next step will be is not clear. The Commission could take Congress' cue, initiate a rulemaking proceeding looking toward adoption of some LMA limits, although not necessarily those proposed in the bill, and let things sit for a while.

(continued on page 20)

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DCR1040 Record Amp \$2,600 List

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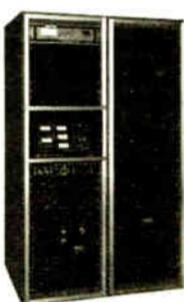


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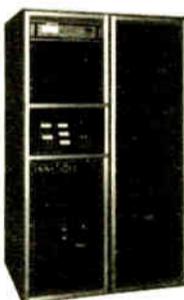


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# Understanding Primary And Secondary Cells

This is the fifth in a 10-part series called DC Fundamentals. Northern Virginia Community College will offer 1.2 CEUs (Continuing Education Units) to registered students who successfully complete the course and an examination mailed at its conclusion.

To register, contact the Director of Continuing Education, Annandale Campus, 8333 Little River Turnpike, Annandale, Va. 22003, or call 703-323-3159. The fee for the course is \$30.

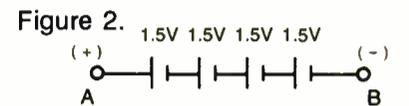
by Ed Montgomery

### Part V

ANNANDALE, Va. If a conductor is connected between a material that contains an excess of electrons (negative ter-

is a paste. This is illustrated in Figure 1.

There are two classifications of batteries: primary and secondary cells. The primary cell contains a chemical reaction that is irreversible; this cell cannot be recharged.



Secondary cells have a reversible chemical reaction, permitting the cell to discharge and be recharged numerous times.

A cell consists of a positive and a negative cell and produces a voltage potential of one to two volts, depending on the material used to create the voltage. Greater

voltage and current is obtained by connecting them in various configurations.

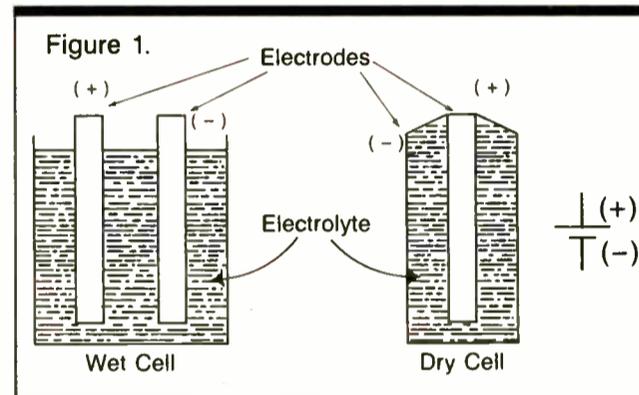
Figure 2 is an illustration of cells connected in series. In this example, each cell is given a potential of 1.5 volts. When cells are connected in series, the total voltage produced is equal to the sum of the individual cells.

In this example, the total voltage output at points "A" and "B" is six volts. Notice how the cells are connected: positive to negative to positive to negative. This permits maximum positive charges to build up at point "A" and maximum negative charges to build up at point "B."

Figure 3 illustrates cells connected in parallel. Notice that all of the positive and negative cells are connected together in this arrangement. When cells are connected in parallel, their total voltage will remain the voltage of each cell.

In the example, 1.5 volts will be produced. However, the amount of current produced is equal to the sum of the currents from each cell. If each cell had the

(continued on page 20)



minal) and a deficiency of electrons (positive terminal) then current (a flow of electrons) will occur. The development of the positive and negative terminals is electromotive force—voltage.

Direct current potential is developed in numerous ways. The most familiar source of DC is the battery. Batteries have positive and negative terminals created through chemical reactions.

### Creating electron imbalance

The electrode terminals are immersed in an electrolyte and create the electron imbalance. The positive electrode loses electrons while the negative electrode acquires electrons. In wet cell batteries, the electrolyte is a liquid, but in dry cell batteries it

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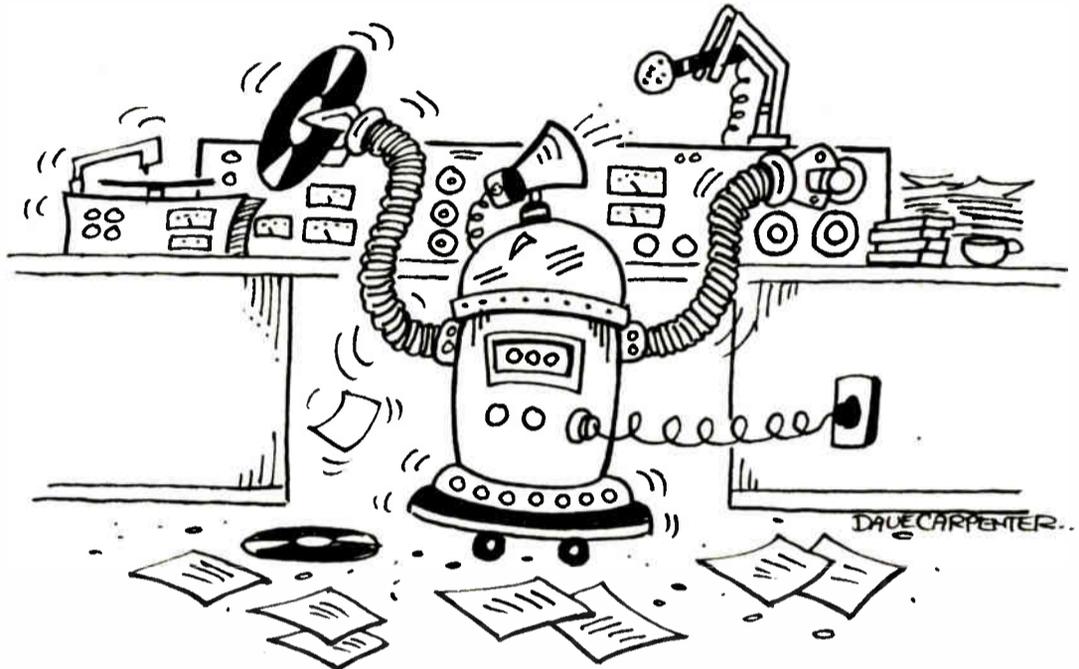
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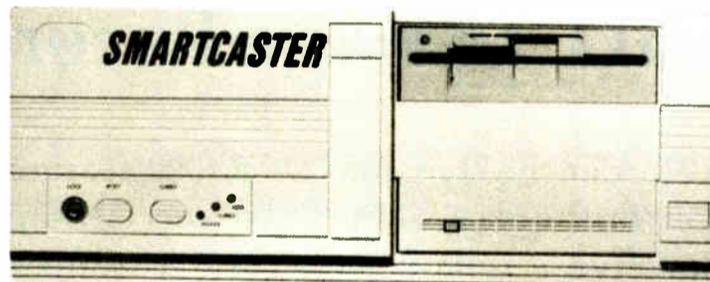
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- 006 028 050 072 094 116 138
- 007 029 051 073 095 117 139
- 008 030 052 074 096 118 140
- 009 031 053 075 097 119 141
- 010 032 054 076 098 120 142
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- 012 034 056 078 100 122 144
- 013 035 057 079 101 123 145
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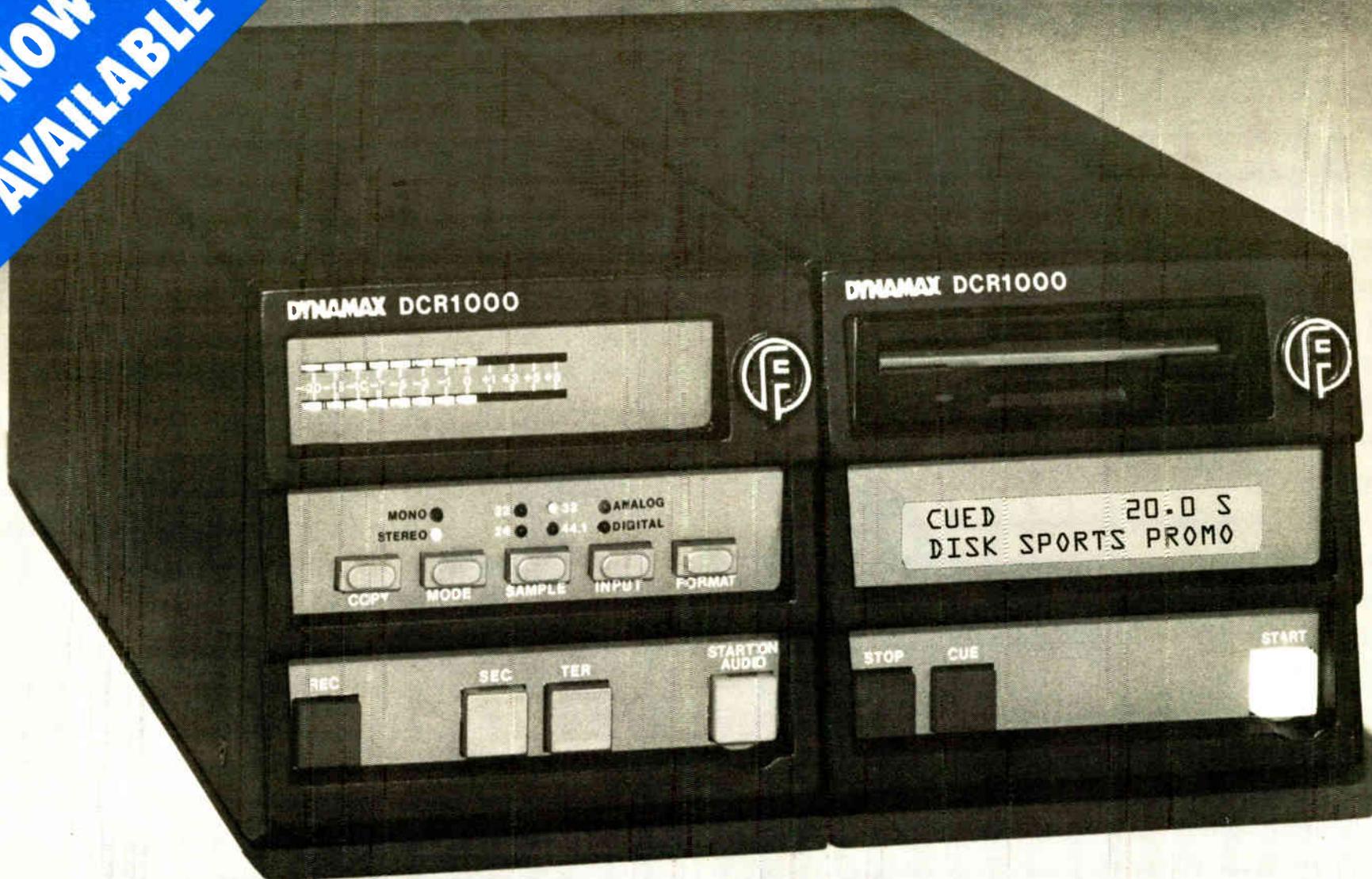
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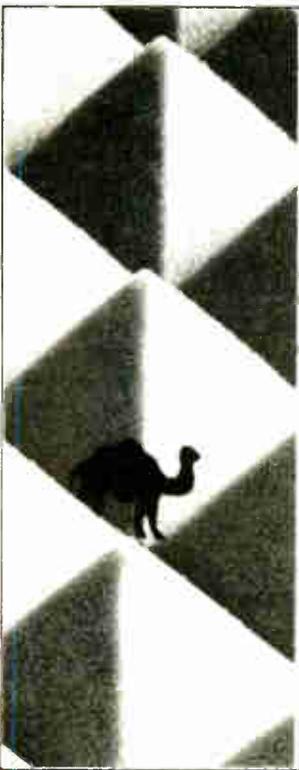
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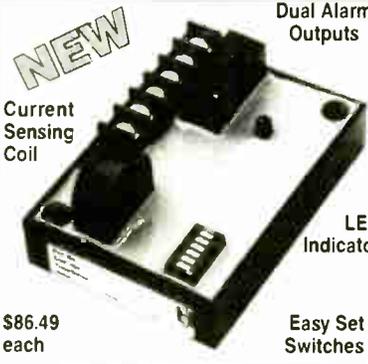
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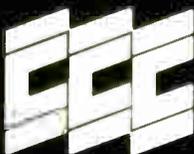
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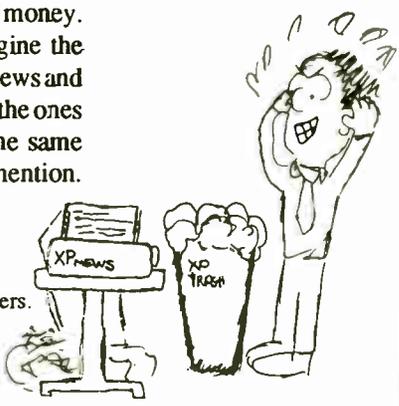
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# WORKBENCH

## A Year-End Wrap-Up

by John Bisset

**FALLS CHURCH, Va.** If you are responsible for keeping cables organized, such as those associated with remotes, consider the benefits of RIP-TIE™ Velcro™ cable wraps. Shown in Figure 2, these color-coded ties affix quickly to a cable, and the Velcro offers quick release. RIP-TIEs are made to endure—they've been tested to perform 10,000 closures with no loss of holding power, and they can be custom-printed with station calls or logos.

For more information, circle Reader

Service 14. RIP-TIEs™ are manufactured by Seam Tech in San Francisco.

★★★

Getting modules back into the older Audiotronics consoles can be very trying. Rather than drill and tap holes for the module mounting screws, the company used small nuts that slide along a channel. The problem is the nuts always seem to slide out of alignment with the mounting hole as you insert the bolt. A solution that involves pulling all the modules, but which will save you plenty of future headaches, uses Elmer's Glue™.

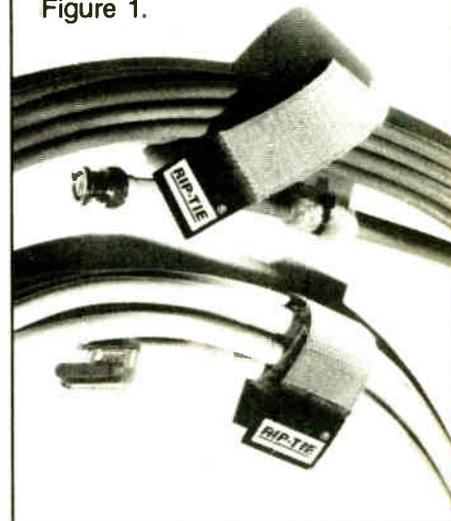
If you pull modules on a quarterly or even annual basis to blow out the dust, before re-seating the modules, carefully align the nuts and dab a tiny bit of glue where the nut meets the aluminum channel. Be careful not to get glue in the nut itself.

A long cotton swab does a good job applying just the right amount of glue, and a heat shrink gun dries the glue quickly. By using white glue, like Elmer's™ brand, if the nuts need to be moved, or realigned for other modules, the bond can be easily broken.

◆◆◆

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

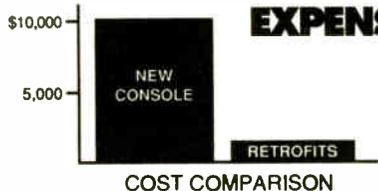
Figure 1.



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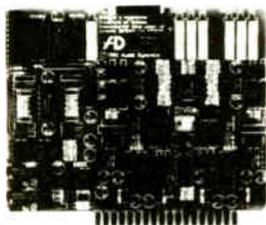
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World Radio History

# Primary and Secondary Cells

(continued from page 14)

ability to produce .25 ampere, then the total current from this arrangement would be one ampere.

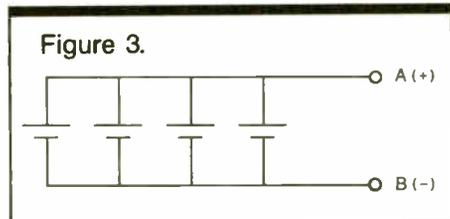
Besides batteries, there are other sources of electric potential. Solar cells convert light energy into electricity. Fuel cells use hydrogen and oxygen to convert electricity and water as a by-product. This method has been used in the space program.

### Electrons and magnetism

As an electron rotates around a nucleus, a magnetic field is created. This magnetic field contains invisible lines of force perpendicular to the movement of the electron (illustrated

in Figure 4).

When electrons flow through a conductor, the magnetic field associated with the electron movement is present along the entire length of the conductor. (Further discussion of magnetism will



take place in a future course addressing alternating current.)

The production of this magnetic field is extremely important because it is the force that permits wireless communications and motor action. When current flows through a conductor, an electro-

magnetic field is present.

When a positive and negative charge are

present but no conductor exists between the two, an electrostatic field is created. Electrostatic fields are present during electrical storms. When the positive and negative potential limits are exceeded, a bolt of lightning is produced, jumping the gap.

Static electricity is used in various controlled conditions, including keyboard controls of computers, control of paint flow in spray painting and as chimney "scrubbers" in heavy-industry smoke control. Electrostatic fields are also present in cathode-ray tube displays on TVs and computers.

Answers to last lesson's problems are

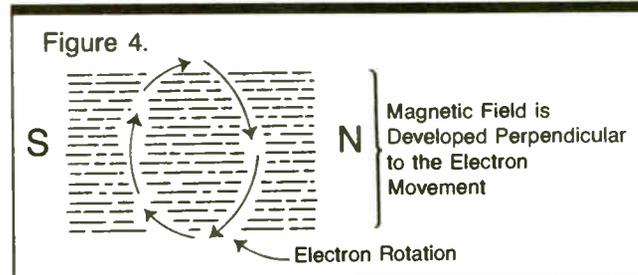
as follows:

$$(4 \text{ Amperes})(600 \text{ Volts})=2,400 \text{ watts or } 2.4 \text{ kW.}$$

$$(.5 \text{ Amperes})^2(1,000 \text{ Ohms})=250 \text{ W}$$

$$(16 \text{ Volts})/(4,000 \text{ Ohms})=0.064 \text{ W or } 64 \text{ mW}$$

$$(0.002 \text{ Ampere})^2(335 \text{ Ohms})=0.00134 \text{ W}$$



or 1.34 mW

Ed Montgomery is a communications teacher at Thomas Jefferson High School for Science and Technology. He has taught broadcast engineering at Northern Virginia Community College and worked as a broadcast engineer for several radio stations. He can be reached at 703-750-5090.

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## A Guide to Pros and Cons of LMAs

(continued from page 13)

Such an approach would ideally satisfy Congress (at least for a while) and would permit the FCC to continue to allow LMAs in the meantime. Indeed, at the end of the rulemaking, the FCC might just conclude that unrestricted LMAs are permissible.

Alternatively, the Commission could cave in to Congress by issuing a statement retracting everything nice it's ever said

about LMAs. This is probably unlikely—the FCC does seem favorably disposed to LMAs, and it would be premature to do an about-face just because of a single bill.

As a third approach, the FCC could issue an announcement criticizing the bill and defending the LMA policy. This also is unlikely—there is no point in antagonizing Congress unnecessarily.

Yet another approach would be for the

FCC just to do nothing, to continue its course of *ad hoc* approval of LMAs as it has done all year. This might accelerate congressional action on the bill, but there would still be plenty of time before possible enactment of the bill for the FCC to start its own rulemaking proceeding, if that proved necessary.

### Safe for now

What the FCC will do is anybody's guess. Where does this leave LMAs? For the time being, they are still all right. The Commission has not said or done anything to reverse its several previously approved LMAs; they are thus under no threat—yet.

If you are involved in an LMA, or are thinking about getting involved in one, you should be sure to consult with your communications counsel.

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

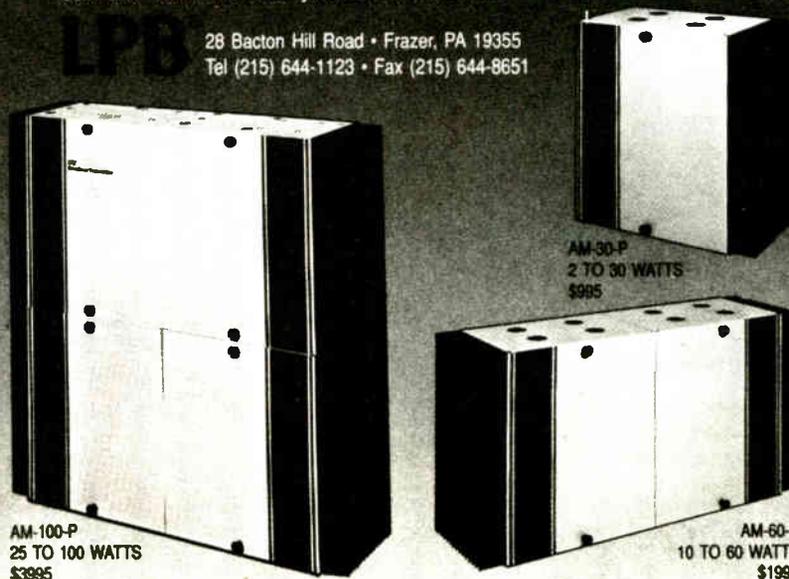
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## AMPLIFIERS

### Want to Sell

**Russco DA-2418** dist amp; Bogen C-20A mono 20 W amp; (2) McMartin B-200B TT preamps; call for info & pricing. M Cooney, Radio 1, 610 N Kwanis, Sioux Falls SD 57104. 605-336-2706.

**Soundcraftsman 5002** (2), 750 W, excel cond, \$500 ea. A St John, WLKI FM, POB 999, Angola IN 46703. 219-665-9554.

**Crown D-150** amp (2), \$250 ea. Mark Jerry, Ligosa Sound Studios, 700 W Pete Rose Way 5th Fl, Cincinnati OH 45203. 513-621-5111.

**Ramko 1x6** mono DA on rack panel, c/n & wrkng, \$75; Magnecord CM6K tube mon amp, 10 W, rack mount, rebuilt, \$35. E Davison, 125 N Illinois, Springfield IL 62702. 217-787-0800.

**Davtronics RFA-5** AM monitor RF amp, \$750. J Goode, WCIT/WLSR, 419-228-9248.

**DB KA500 & KA2500** 500 W, 2500 FM RF amp, new, single phase 220 V, (1) uses 36X800 tubes, (1) uses 3CX3000 tubes, under \$5000 & \$10,000. Allen, Allen Audio, 2407 Woodridge Dr, Decatur GA 30033.

**C-own DC200A** 300 W power amp, perfect, \$300; Crown D75 75 W power amp, perfect, \$250. B Watson, KSAK, 714-946-6249.

**Hafner preamp**, excel cond, \$135. J Deering, 615-264-2886 after 7 PM EST.

**McMartin TBM-25000B/RF** amp; (4) Sparta TT preamps. KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

**McIntosh MC2500**, black, factory sealed, \$3975; (2) MC240, \$1175 ea; (3) MC40, (2) MC-225, \$575 ea; (2) Krell Altair w/outboard pwr supply, \$3150 ea; Spectral DMA100 Mk III, \$2975; Sony Esprit TAN900, \$750 ea/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

**Audiotronics 1100DAGLC** dist amp (20), in (2) Audiotronics 1100MF 10-input mainframes, w/Audiotronics PS60 RM external pwr supply, used 6 mths, \$1300/all. B Lord, Lord Brdcstg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

**Dynakit PASII** pre-amp, new & used cable w/Canons 3 prong; manuals for Ampex 351/350/601 & mixer MX-35; Pultec EQP1A; Univox headsets, new, stereo or mono guitar; monitor panel for 8 trk recorder through speakers to stepdown to 2 trk, or whatever. Mr. Oliver, 212-874-7660.

**RCA BA-21A** mic tube pre amps (9) w/connectors & racks; (2) RCA BX-21A tube pwr supply's w/connectors & racks; (6) RCA tube program amp BA-23A; (2) RCA tube pwr amp SA-354; (3) RCA tube pwr amp SA-751; Altec A-326; (6) Altec 1564A; (3) Altec 1567A; (8) Altec 1561A; Altec lone pre amp 1562A; Altec 1520A; Dynaco stereo 70, mint. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

### Want to Buy

**Tube amps & remote mixers**, incl RCA OP-6, OP-7, WE 22-D & RCA T3A series. B Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

**Gates Criterion** stereo record amp, will trade mono amp & cash. D Hofmann, KGHP, 14105 Purdy Dr NW, Gig Harbor WA 98332. 206-857-3513.

**Altec 287-F/287-W**, any cond; also, WE amps, Marantz & Ampro vacuum tube audio amps, Westrex cutter amps. D deForrest, 7441 Wayne Ave #10-D, Miami Beach FL 33141. 305-866-5401.

**Used power amps & X-overs**, QSC preferred, cash paid for working/not working. Todd, 202-547-7008.

**NAD 2150** power amp, cheap. T Hill, WJBC, 2901 Liberty Hts Ave, Baltimore MD 21215. 301-396-0404.

**McIntosh tube amps**, preamps, tuners, tubes, manuals, etc, any cond, cash paid. R Glenn, WJGR, 1718 Shanadoh, Wimauma FL 33598. 813/634-1940.

**Denon POA8000** (2); Sansui B2301, BA5000, C2301; Marantz 1-10; Crown DL2 phono module; Burwen TNE7000; Hartfields; Sony CDPRI, DASR1. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

## ANTENNAS & TOWERS

### Want to Sell

**Andrew RG-322/HJ8-50B** 3" Helix coax cable, 40'; BO, D Quinlan, KCHQ, 1415 Laverne Ave, Klamath Falls OR 97603. 503-884-3257.

**Jampro JHPC** 4-bay tuned to 102.5, wrkng when removed, \$4500. D Miller, KYTE FM, 906 SW Alder, Newport OR 97365. 503-265-2266.

**Liberty tower**, 900', 20" face, on grd in 6 pieces, \$10/foot; (6) Gates & (6) Collins antenna tuning units; (1) Gates & (1) Collins 6-tower phasing cabinet; BO. F Weinberg, KTRT, 11330 E 21st St, Tulsa OK 74129. 918-234-1270.

**Rohn Tower 80**, 492' w/beacons & guys, standing, BO. O Eatmon, WAHD FM, 19 W Hargett St, Raleigh NC 27601. 919-833-6259.

**Phelps-Dodge 20 kW** 3-1/8" 5-port directional coupler, \$350/BO; Shively 5826D-E 1-5/8" 10 kW 4-port directional coupler, \$200/BO. J Robillard, WYLD AM/FM, 2228 Gravier St, New Orleans LA 70119.

**Transmitting plant**, complete 3-tower 1 kW, w/phasing towers, (2) Gates xmtrs, processing, remote, 11 yrs old, will sell all/part. J Randolph, WHIR/WMG, Box 1230, Danville KY 40422. 606-236-2711.

**Phelps-Dodge CO-LP** 1-bay antenna, tuned to 92.7, \$900; 197' Andrews 1-5/8" coax, \$1100. J Sokolosky, KKBS-FM, 3125 Norcrest, Oklahoma City OK 73121. 405-427-6869.

**CSP 5 kW** 4-tower phaser. V Baker, WKG, POB 889, Blacksburg VA 24063. 703-552-4252.

**Cablewave 1/2"** foam, 130'; \$130; Andrew FHJ4-50B 170' 1/2" foam, \$170; 60' 1/8" foam w/(1) female 75AN, \$150; 7/8" Andrew foam, 50', no fittings, \$100. L Bawinkel, WWJQ/WJOK, 5658 143rd Ave, Holland MI 49423. 616-394-1260.

**Galvanized tower**, 500'; 30" face w/tubular side rails, chnl horizontals & bar diagonals, complete w/base insulator, set for 7 levels for guy wire, reasonable. B Gibson, Seacomma Comm, POB 5086, Kent WA 98064. 206-228-4393.

**ERI G4-CPH-10** 10-bay circ pol high power FM antenna, tuned to 96.1 MHz, w/500 W functioning Deicers & mounting brackets, makes 100,000 W ERP H&V, w/20 kW xmtr; Dielectric 4-1/16" rigid sections w/spring hangers; 4-1/16" field flanges; some 3" rigid spring hangers. C Murray, Eugene OR, 503-484-9400.

**Rohn 45G** tower, 300'; w/lighting kit, photo control, EQ plates, guys, excel cond, \$7500. R Wright, WWLX, 1208 N Locust, Lawrenceburg TN 38464. 615-762-2916.

**ERI/Harris FMXL-3E** 3-bay FM antenna, rototiller style, on air at 93.5, w/15588 pwr gain, 1-5/8" end input, you ship, \$3700/BO. S Mattingly, WWWVO, 5216 Bradburn Dr, Muncie IN 47304. 317-289-9500.

**Gates/ERI FMA-8B** 8-bay horiz only on 94.5 MHz, complete, gd shape, BO. F Hollon, WAHI-FM, Box 195, Augusta IL 62311.

**Andrew 7/8"** dielectric line, 170'; \$4/ft; approx 300' Andrew 1/2" foam dielectric line, \$1.25/ft. E Histed, WWCC/WDNH, POB 1104, Honesdale PA 18431. 717-253-1616.

**Andrew HJ8-50B** 300' 3-1/8" Helix, BO; new Andrew splice kit for 3-1/8" coax, \$300; Andrew EIA connectors, BO. S King, KATP, 7700 I-40 W, Amarillo TX 79160. 806-335-1951.

**KH 300 mm** beacon, w/red filters, excel cond, BO. G Peterson, KIMM, POB 8205, Rapid City SD 57709. 605-348-1100.

**Cablewave 1-5/8"** air dielectric xmission line, 290'; gd cond, w/1-5/8" EIA flange connectors & hangers, 5 yrs old, on spool ready to ship, \$1600/BO. Dan/Paul, KRDI, Decorah IA 52101. 319-382-4251.

**Phelps-Dodge 6-1/8"**, 75 Ω xmission line, (37) 20' sections, EIA flanges, w/(84) hangers, on tower, you remove, \$5500. M Burnham, WWSB, 5725 Lawton Dr, Sarasota FL 34233. 813-923-8840.

**Elec Research EH05** antenna heater, 150 W/110 V, brand new, still in crate, \$1080. K Conner, KAMQ, 2001 W Walnut, Rogers AR 72756. 501-636-4611.

**Miter elbow**, 3", flanged, new, \$280+shipping & COD. R Kroh, KMUS, 1513 Carey, Cheyenne WY 82001. 307-484-2704.

**Gray Research** antenna heater control. KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

**Set of guy wires** (8), approx 1/4" diameter including insulators, can be used for AM/FM 300s tower, like new, \$500. R Chambers, 916-257-2121.

**Interconnector bullets** w/teflon disc (2), 3-1/8", new; (2) 90° 1-5/8" elbows; (2) 1-5/8" to 7/8" taper reducers. R Plummer, CTC-TV, 10071 Bayhaven, Fairhope AL 36532. 205-928-5770.

**Radio Systems CP-15** coupler (12), for use in carrier current brdct applications, wired w/6' 3-phase cable & 3-phase disconnect plug, excel cond, \$100 ea. R Rossman Jr, 814-885-9568.

### Want to Buy

**Grid dishes**, 8' & 10'; for 950 MHz STL system; (6) pieces 7/8 Helix, 300' long, w/connectors, priced right. K Austin, Austin Brdcstng, 1101 Hwy 81 N, Marlow OK 73055. 405-658-9292.

**Cablewave HFM-LP-4** antenna, 4 bay horiz only, on/near 95.9 MHz; also, Cablewave HP-1000-4 antenna, 4 bay horiz only, on/near 95.9 MHz. T English, WEZN, 10 Middle St, Bridgeport CT 06604. 203-366-9321.

**Coax flanges**, 1-5/8". V Baker, WKG, POB 889, Blacksburg VA 24063. 703-552-4252.

**Any Class A** antenna, horiz/circ, 2/more bays, on/near 96.1 MHz, ie Phelps-Dodge, RCA, Shively, Collins, etc, reasonable. T English, WEZN, 10 Middle St, Bridgeport CT 06604. 203-366-9321.

**Twelve-bay tuneable 107.1**, 20-25 kW xmtr, 3" line, 900-1000' tower; also, 10-bay tuneable 98.3, 20 kW xmtr, 2" line, 400-500' tower. Bob, 303-330-1342.

**Rohn 80**equiv 20' section, need (4), will pick up & pay cash w/in 200 miles. Z Smith, Airwaves, 4801 Lamar, Paris TX 75460. 903-785-8881.

## AUDIO PRODUCTION

### Want to Sell

**Orban 536A** dynamic silibance controller, BO. J Miller, KGNQ, 908 Frontview, Dodge City KS 67801. 316-227-4444.

**Eventide 1745-M** w/3DDL & pitch ratio, excel cond, BO. F Virtue, Virtue Rcrdng, 1618 N Broad St, Philadelphia PA 19121. 215-763-2825.

**Valley 610** dual chnl compressor/expander, like new; ART Multiverb digital effects processor, 4 effects at once, stereo I/O, like new. C Lulitz, 1373 Oakridge Dr, Bucyrus OH. 419-562-2118 after 7 PM.

**ATI emphaziser**, vgc, \$550. C Crouse, Beech Tree Brdcstng, 48 Cedar St, Dedham MA 02026. 617-461-2699.

**CRL SEP400** 4-band spectral energy processor, BO/trade for test equip. R Kerban, WTNJ FM, 609 Main, Mt Hope WV 25880. 304-877-5592.

**Cornell on-air** lights (4), for standard duplex outlet box, \$20 ea; Shure Audiomaster M63 EQ, \$75; (2) Technics SL-1200 TT w/bases, \$150 ea; (2) Ramko MA14 spkr amps, \$25 ea; several Ramko TT preamps, \$25 ea. S Sands/Ludwig, 815-459-7000.

**Burwen DNF 1201A** dynamic noise filter, new cond, \$200. D Bailey, Rockshoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

**Audio Digital TC4** 6.8 sec delay unit (2), 15 kHz, w/stereo couple & catch-up options, \$800 ea/\$1500 pair; CRL AM-4S stereo syst w/SPP-800, (2) SEP-400A, SMP-900, updated to NRSC specs by CRL, avail 1/92, \$3175. J Goode, WCIT/WLSR, 419-228-9248.

**Eventide BD955** 3.5 second digital delay, \$1700; Gentner SPH-4 telephone system, \$450; both used 1 yr, excel cond. J Carl, KCOB/KLVN, 611 1st Ave E, Newton IA 50208.

**Studio Sound S305** vintage passive filter sets, matched pair, consec #, rack mount, rare, \$275 ea. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

**Howe 2100** Phase Chaser w/all connectors & manual, \$500. S Schweiger, WXLO FM/AM, 146 Worcester Ctr, Worcester MA 01608. 508-752-1045.

### Want to Buy

**Yamaha SPX-90** Series II audio effects processor, must be vgc. M Carta, KM Prod, Austin TX. 512-218-1610.

**CRL DX2/Symetrix 511A** NR, excel cond; also, (2) Symetrix SX201 parametric EQ, excel cond. B Tidwell, WAFT, POB 338, Valdosta GA 31603. 912-244-5180.

**Yamaha SPX-90** effects processor; also, phone interface. A Neri, WGTK, Box 590, Middlebury VT 06753. 802-388-4101.

**dbx K9-22** cards for Dolby 361 NR, India Navigation, 177 Franklin St, NY NY 10013. 212-219-3670.

**Burwen TNE7000**; Yamaha REV-5 & REV-7. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

**Ham radio operators** looking for surplus audio processors, mixers & mics, as well as other inexpensive gear that could help hdt engrs play radio at home among enthusiasts for vintage AM. Please write w/offerings. WA3VJB, Box 73, West Friendship MD 21794-0073.

## AUTOMATION EQUIP

### Want to Sell

**Beehive Micro B2** terminal, white screen, works, \$125/BO/trade for gd mic. J Hutson, 3220 72nd Ave Cl W, Tacoma WA 98466. 206-566-8489.

**Mark Persons** Programmer 3A controller; (4) Revon AR77 R-R; BO. J Miller, KGNQ, 908 Frontview, Dodge City KS 67801. 316-227-4444.

**SMC DS-20** switcher, as-is w/manual, \$150; SMC PDC3 clock, RP1000 programmer w/pwr supply & manuals, as-is, \$300. E Stanley, KBIT, Box 12, Bottineau ND 58318. 901-228-2483.

**IGM 48-tray** stereo Instacarts (2), boxed & ready to ship, incl all cables, \$4200 ea/\$7500 both. T Hansen, KWSP, 805-438-3221.

**BE 16-C**, excel cond, newest software, (3) Scully R-R's, (3) BE single plays mono, 1-3 deck BE PB mono, 1-48 tray Go-Cart, \$15,000/BO. E DeLaHunt, KPRM, POB 49, Park Rapids MN 56470. 218-732-3306.

**IGM EC** w/computer, 48-tray Instacart, (2) SMC 250 stereo Carousels, BE 3300PS stereo cart, mon, (2) racks, manuals, set up for satellite, \$10,000. G Terrell, KCXY, POB 956, Camden AR 71701. 501-836-9567.

**SMC 2-Carousel** system, in use w/Unistar format, w/ABC decoder, \$3000. J Salov, WHGR/WUPS, 517-740-1165.

**IGM EC** controller, (3) 250 Carousels, (4) Audicord PB, mint cond, \$5000. B Huggins, KOOI/KERE, 402 S Ragsdale, Jacksonville TX 75766. 586-2527.

**Harris 9002**: (6) R-R, (2) IGM stereo Instacarts, (2) Go-carts, ITC premium net recorder, (2) terminals, gd for satellite, BO. R Watts, WCKO/WRAG, POB 71, Carrollton AL 35497. 205-367-8136.

**Harris 9000** w/CRT keyboard, Extel AH-11R printer & (8) cases of paper; (2) IGM 42-tray Go-Carts; (2) IGM 48-tray stereo Instacarts; (4) ITC 750 P reel decks; (2) Harris 25 Hz tone gen; \$14,000 all, will separate. D Greer, WZZZ/WDFD, 1830 Genesee Towers, Flint MI 48504. 313-238-7300.

**BE Control 16** incl (4) Scully 255 decks, (2) 42-tray Go-Carts, 24-tray Go-Cart, (2) sngl P carts, ITC 3D, full logging all stereo, satellite interface, (4) racks, many spares, \$17,500; also, SMC 3060 controller w/remote, IGM rack, (4) Scully 255 PB w/cue detectors, \$4000. D Roberts, KOLT FM, 301 S Wolcott, Casper WY 82601. 307-265-1984.

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**IGM 400 series** w/(2) Revox PR99, 48-tray Instacart, 24-cart Carousel & Conex 25 Hz tone gen, works perfectly, must sell. D Schroeder, WSWL, 904-433-1141.

**BE 16** complete satellite interface w/new cards & software, Instacart, (3) sngl P carts, 3 deck, Carousel, (3) Skully PB, excel cond, \$15,000/BO; also, SMC DP1 w/(4) Carousels, remote, time announce controller, desk mounted, not modified, excel cond, must sell, BO. E Dehanhant, KPRM, Hwy 34 E, Park Ridge MN 56470.

**SMC MSP-1** automation for satellite/tape/CD, 6 yrs old, must sell, less than \$3000. D Doeitzsch, WDDD, 1 Brdcst Cir, Mario IL 62959. 618-997-8123.

**Format Sentry** controller, new, \$4000. E Histed, WWCC/WDNH, POB 1104, Honesdale PA 18431. 717-253-1616.

**SMC 452** w/(2) Carousels, Stereo Plus MEI Satmaster programmer, cables & manuals, \$2500+shipping. R Kerban, WTNJ FM, 609 Main, Mt Hope WV 25880. 304-877-5592.

**SMC MSP-15**: (5) Carousels, (5) R-Rs, RMT control, (3) video mons, logger, (4) racks, 3 yrs old, \$10,000. D Gill, WHON, POB 1647, Richmond IN 47374.

**BE 16** complete system for tape/satellite, 3000 events software, pwr supply, audio processor, main processor, remote, CRT, printer, customer interface, satellite interface, (10) audio cards, (6) interface cables, 78-tray IGM Go Cart II, (2) 42-tray Go Carts, much more, gd wrkng order, BO. D Brown, KVLE-FM, POB 832, Gunnison CO 81230. 602-645-8181.

**Sentry Format FS-12B**: 12-chnl switcher, Op-to card, brdct auto control w/3 operating modes, 50,000 event walk away memory w/360K diskette, traffic software integration, special music rotation, interface for 12 stereo random access sources, (4) SMC mono Carousels, bi-directional, SMC dual P cart machines, Otari R-R, racks, etc, BO. G Gilbert, CSRG Inc, Box 50539, Denton TX 76206. 817-380-0229.

**Microprobe Electronics** 24 station/8 source automation controller, needs repair/gd for spare parts, w/remote control switch pad, \$300. R Chambers, 916-257-2121.

**IGM Instacart** (2), stereo w/Maxtra heads, gd cond, \$6000 both. D Swatman, WMGF/WPRD, 2001 N Mercy Dr, Orlando FL 32608. 407-298-5510.

**BE 16** w/newest software, (3) BE sngl P Carousel, 48-tray Instacart, 42-tray Go Cart which needs work, (3) Scully R-R PB, vry clean, satellite interface, \$15,000/BO; also, So-no Mag DP-1, complete remotely controlled desk unit, vry chn, not modified, well cared for, BO. E DeLaHunt, KPRM, Hwy 34 E, Park Rapids MN 56470. 218-732-3306.

**IBM EC**, complete system less SAT receiver, config'd for Unistar, w/custom switcher to allow 4-jock walkaway & (3) Instacarts, BO. 601-693-2661.

**Conex CS25A** dual 25 Hz tone sensor (2), \$200 ea. J Bremer, KARZ, POB 492890, Redding CA 96049. 916-243-2222.

**AUTOMATION . . . WTB**

Harris 90-9000 series auto interface to Instacart; Harris PC board #992-4574-001. J Aey, WHOI, 4040 Simon Rd, Youngstown OH 44512. 216-783-1000.

**BUSINESS OPPORTUNITIES**

**Want to Sell**

Radio vet, 23 yrs, seeks co-signer for \$110,000 note for sm mkt AM in S GA, 40% for signature. B Rachels, 912-228-1204.

Seeking joint venture w/person or company that is familiar w/promoting radio music formats, goal is to deliver via satellite. J Gelo, 813-642-6899.

**CAMERAS (VIDEO)**

**Want to Sell**

Ikegami HL-79E (2), no lens/pwr supply, w/manuals, plates, cases, & Anton Bauer battery mount, hw hrs, vry clean, mint, \$18,500/ea; (4) Ikegami TA-79E/E HL-79E Triax adaptors, mint cond, \$1600 ea/trade for camera unit. D Eitzroth, Ritz AV, 6620 Virginia Manor Rd, Beltsville MD 20705. 800-543-0582.

Panasonic AK-30 (2), w/brcdst grade Plumbicon tubes, lw hrs, BO. D Brennan, Brennan Entprns, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

CEI 287 studio (2), new 1" Plumbicons, all cables, CCU, (2) lrg VF outfits, (2) Verogon lens 10/1, \$750 both. C Potorti, Potorti Video, 10005 Lacy Ave, Morrisville PA 19067. 215-945-3996.

Norelco PC-70 (2), 3-tube Plumbicon studio camera systems w/10:1 zoom lens, cables, racks & spares, \$500/both. J Krepol, RNDL, 7 Dustin Dr, Claymont DE 19703. 302-798-4076.

Hitachi FP 15 color camera (2), 3-tube Saticon, 1.5" & 4.5" VFs, rear servo zoom & manual focus, remote control unit w/camera cable, external pwr supply, case, manual & extenders, 10:1 Hitachi lens, \$4000+shipping; JVC KY1900 3-tube Saticon, pwr supply, 10:1 Tamron lens, case, \$500+shipping. D Hurd, Harding U, 805 Park St, Searcy AR 72143. 501-279-4658.

**Want to Buy**

Broadcast museum wants Ampex, Norelco, GE, Marconi, Harris, Visual & Dumont, H Henson, American Brcdst Museum, 4549 Havensrest Rd, Winston-Salem NC 27106. 919-924-0621.

**CART MACHINES**

**Want to Sell**

Mono cart deck w/reproduce & record capabilities, 3-slot, for sale by sealed bid due 1/92, call for more info. F Urtuzastegui, Purch Office, Maricopa County Comm College, 602-731-8524.

BE 5302 mono 3-deck, '82; (2) Audi-Cord TDS-1 mono P only carts; Audi-Cord E21 R/P w/tones; Tapecaster 770 R/P snlgl cart; Tapecaster 700 R/P snlgl cart; Spotmaster 5000 R/P; Gates R/P; Audiolab TD-1B cart eraser; call for info & pricing. M Cooney, Radio 1, 610 N Kiwanis, Sioux Falls SD 57104. 605-336-2706.

ITC SP mono snlgl P cart (3); (3) ITC trpl-deck mono 1 w/rcrd amp; ITC mono snlgl R/P w/tones; (2) ITC ESL-IV splice finder/eraser; Dynamax CTR-33 mono trpl-deck w/rcrd, '89; BE 5304-B mono 3-deck w/5310 record unit, '83; call for info & pricing. M Cooney, Radio 1, 610 N Kiwanis, Sioux Falls SD 57104. 605-336-2706.

Gates Criterion 80 mono R/P, gd cond, \$245. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Audi-Cord series E R/P mono cart machine, never used, new in '86, w/manual, guaranteed, \$1200. IKE-Houston, 713-479-1614.

Sparta BP-22B portable AC/DC cart P machine, w/amp & spkr, works OK, needs to be mounted in briefcase, \$50. D Bailey, Rockshoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Audicord A-series R/P & P-only decks, in desk-top cabinet, 3 cues, mono, \$750/both. J Goode, WCIT/WLSR, 419-228-9248.

ITC 3D series mono trpl-P cart machine (2), excel cond, (1) w/rcrd amp, \$2000. J Sakov, WHGR/WUPS, 517-740-1165.

ITC SP (2), w/3 tones, 99B style head block & improved cart hold down, recently recapped w/new electrolytics, \$775 ea. P Hess, 134 Derwent Dr, Pittsburgh PA 15237. 412-366-1249.

Spotmaster 2000 R/PB, grt cond, in operation, \$325. J Deering, 615-264-2886 after 7 PM CST.

Collin Twintape 642-E-1 stereo PB, BO. J Socolof, KUII, Dallas. 214-526-2580.

Collins stereo Twintape w/rcrd amp, (2) decks in 7" high rack-mounted unit, gd cond, \$500. B Watson, KSAK, 714-946-6249.

BE (2), look & act new, low use, \$1300 ea/\$2200 both. A Neri, WGTN, Box 590, Middlebury VT 05753. 802-388-4101.

WE KS19522 L1 recorder/coupler, auto answer interface between cart machine & phone line, new, \$50; Sony TC228 8-trk R/P w/(16) blank carts, cln & wrng, \$50. E Davison, 125 N Illinois, Springfield IL 62702. 217-787-0800.

IGM 48PBM Instacart, 48-deck mono cart machine in excel cond, w/cabinet, will handle export & shipment for US buyer, BO. G Darling, CKRW-AM, 203-4103 4th Ave, Whitehorse Yukon CN Y1A 1H6. 403-668-6100.

Audicord DL-PS stereo (3), in operation, excel cond, \$600 ea. C Madrazo, TIJ, APDO Postal 453, Tijuana BC Mexico 22000. 66-81-9677.

Latest model BE stereo PB (3), excel cond, \$1000 ea; Fideipac stereo R/P cart machine, \$1300; matching ESL machine, \$350; (2) BE 3000 stereo PB decks, \$500 ea; (3) Harris stereo PB & (1) Harris stereo RP, \$250 all. S Sands/Ludwig, 815-459-7000.

IGM 99B stereo cart rcrdr w/ELSA, \$3000; Delta stereo P, \$1000. G Terrell, KCXY, POB 956, Camden AR 71701. 501-836-9567.

ITC Premium stereo R/P, gd cond, \$950/BO. J Phillips, WZOM-FM, 408 Clinton, Defiance OH 43512. 419-784-1059.

Dynamax 4450 stereophonic level controller, \$500; Sparta R/P, \$250; Harris P only; Sparta PB only. KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

Audi-Cord DL series stereo cart R/P, \$700; Audi-Cord E series stereo PB, \$500; BE 3-stack stereo PB, \$800; all equip in service. M Huffman, KYRX-FM, Cape Girardeau MO, 800-455-9105.

SMC T90 R/P, \$200; Telex Magnecord R/P, \$250; (2) Revox B77, need some knobs, \$250 ea/\$450 both. E Moody, KESE, 216 E Main, Bentonville AR 72712. 501-273-9030.

**CASSETTE & REEL-TO-REEL RECORDERS**

**Want to Sell**

Ampex 600 series recorders (6). V Baker, WKGM, POB 889, Blacksburg VA 24063. 703-552-4252.

Revox A77 stereo R-R w/built-in Dolby NR, some spare parts, w/manual, excel cond, vry clean, \$400+shipping. C Wagoner, Vision West, 12410 12th Ave S, Seattle WA 98168. 206-242-2042.

MCI JH110B 2-trk R-R, mounted, excel cond, several avail. B Massey, WKHX, 360 Interstate N, Atlanta GA 30339. 404-955-0101.

Ampex 601 1/4" 1/2-trk mono R-R in Samsonite suitcase, dual input, needs new tubes, heads OK, \$600/BO. T Heathwood, Heritage Radio Classics, POB 16, Boston MA 02167. 617-969-9966.

Otari 50/50 2-trk, 1/4" tape machine, \$1600/BO; Sony TCD-10 PRO portable DAT player, \$1800; both studio use only. Jerry/Phil, Ligosa Sound, 513-621-5111.

Ampex SP3000 instrumentation recorder in portable case (2), (1) for 1/4" 4-trk & (1) for 1/2" 7-trk, need documentation, \$600 ea; Scully 280-1 FT PB only plug-in head assembly, 14" tape, like new, \$95. K deGruchy, WYVW FOX-TV, 205 E 6th St, NY NY 10021. 201-641-3997.

Scully 280 4-trk in console, excel cond, BO. F Virtue, Virtue Rcrding, 1618 N Broad St, Philadelphia PA 19121. 215-783-2825.

Teac A-1200; AKAI 280-D; Pioneer RT-1020L; all recently used & in wrng cond. D Morris, WKUN, 204 W Spring St, Monroe GA 30655. 404-267-6558/404-267-2035.

Teac auto reverse w/dbx Dolby B&C, excel cond; Hitachi 3-head R/PB, excel cond; \$300/both. J Deering, 615-264-2886 after 7 PM EST.

Studer-Revox B77 2-trk, vgc, \$800. N Hammond, PAS, 320 Eithan Allen Ave, Takoma Park MD 20912. 301-891-3567.

Tape Athon R-R (3), bi-directional, 3.65 ips 1/2-trk, auto reverse, (2) portable 7" & 10.5", (1) rack mount 10.5", all working, w/spare parts, \$50/ea. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Ampex ATR-102 1/4", metal heads, 2 speed, gd cond, \$2400. M Linett, Yr Place or Mine, 1600 Las Flores Dr, Glendale CA 91207. 818-244-1909.

Tascam 48 8-trk w/(2) dbx DX-40 NR, excel cond, \$6000. J Maples, WMYU 102, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

Otari MX5050 QXD 4-trk, mint cond, heads perfect, w/dbx NR (sep unit), \$1800. B Hanson, Reeltrax, 209 E El Cortez, Columbia MO 65203. 314-449-2433.

Scully 284B-8 8-trk 1" deck, 3.75-30 ips, vry clean, less than 100 hrs, w/all manuals, \$5500. T Sherry, 415-969-3030.

Revox A-77, 7.5/3.75 ips, 10-1/2" reels, work-horse, gd cond; also, AKAL 4-chnl, 10-1/2" reels, 7.5/3.75 ips, gd cond; \$650/both. J Deering, 615-264-2886 after 7 PM EST.

MCI JH-110B 2-trk in Ruslang roll-around cabinet, gd cond, \$1500/BO; Sony APR-5000 2-trk on roll-around stand, SMPTE ready, vgc, 2 yrs old, \$3000/BO. T Price, DOCSI Corp, 1140 N LaBrea, Los Angeles CA 90038. 213-462-4966.

Crown SS700 PB, 10-1/2", 15.75/3.75 ips, many features not found on newer machines, gd cond, \$175; Teac Dolby B processor, works grt, \$50. J Deering, 615-264-2886 after 7 PM EST.

Concertone reel hold-downs, pair, excel cond, \$15+shipping. D Dintenfass, Transcription Specialist, 7549-27th Ave NW, Seattle WA 98117. 206-784-4803.

Ampex 3200 series R-R duplicator, (3) slaves, brand new cond, BO; Scully 280 8-trk rcrdr, working cond, BO. Jane/Dan, WBSR, POB 8057, Pensacola FL 32505. 904-438-4982.

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Technics RS-1500 2-trk, vgc, \$700. B Watson, KSAK, 714-946-6249.

Ampex ATR 700 R-R; (2) Correctone R-R; Revox R-R. KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

ITC 850 FT, 3.75/7.5, split gate, works well, \$500; Ampex 602 FT, 7.5, gd cond, \$200. D Ibel, Valley Sound, RR 1, Spencer IA 51031. 712-262-6231.

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Otari ARS 1000, new. J Phillips, WZOM-FM, 408 1/2 Clinton St, Defiance OH 43512. 419-784-1059.

Technics RS1500 2-trk deck; also, Sony/MCI JH110C on roll-around metal cabinet; both excel cond. J Gelo, 813-642-6899.

Recortec ACD automatic audio cassette dup system, w/bi-directional master R-R reproducer & cassette slave recorder/loader, incl parts, supplies & manual, lw use & well maintained. C Wagoner, Vision West, 12410 12th Ave S, Seattle WA 98168. 206-242-2042.

Dictaphone 40-trk 1" loggers, dual decks, mounted in rack w/plexiglass door, gd cond, \$1950; optional time/date gen/reader, \$375; tapes avail. G Wachter, KFYI, 602-258-6161.

Nakamichi 1000 2XL w/NR100, 19" rack w/wood case, \$650/BO; Crown SX824 R-R 1/2-trk, 2-trk R, 4-trk P, w/case, \$500. R English, DJ Entertainment, 882 Old Seneca Tpk, Skaneateles NY 13152. 315-685-3814.

Gates ATC rcrdr, vgc, BO; (3) Gates ATC tape decks, vgc, BO. L Popp, 814-467-7894.

Ampex ATR-102 1/4", gd cond, \$2500; 440 capstan servo w/ps, \$500. M Linett, Yr Place or Mine, 1600 Las Flores, Glendale CA 91207. 818-244-1909.

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Tascam 40-4 1/4" 4-trk, gd cond, BO. S Winthrop, Winthrop Prod, 156 W 94th St, NY NY 10025. 212-662-8685.

Ampex 350 1/2-trk mono 14" reel transport & Lang SS R/P electronics, \$295+freight. N Mishaan, POB 335, Lynbrook NY 11563-0335. 516-582-1338.

MCI JH-110 stereo tape deck (2), in floor consoles, \$1500 ea; (2) MCI JH-110B stereo tape decks in floor consoles, (1) w/timer controller & mon panel, \$1500 ea; various Ampex 440s w/outh cabinets, BO; Ampex 350 tape deck, no amp, BO; Multisync MDA1B R-R speed controller, BO. J Socolof, KUII, Dallas. 214-526-2580.

Alkai GX-4000D 1/4-trk 7" R-R, sound on sound capability, tapes, all manuals, new cond, must sell, \$175. B Lecato, WKRE, POB 220, Exmore VA 23350. 804-442-5000.

Ampex 350 mono audio tape rcrdr (2), in floor cabinet, gd cond, \$725. P Friedberger, Assoc Recording, 71 S Parker Dr, Monsey NY 10952. 914-354-3192.

**POSITIONS WANTED**

Combo eng/anncr, exper in AM/FM/SAT, 20+ yrs exper, General Class License, prefer TX area. P McKaig, 512-664-1106.

Announcer w/5 yrs exper seeks FT pos in N CA area, all formats, prod exper, any shift. Clint, 318-847-4635.

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Chief engineer top 100 mkrts/20 yr vet, you will get high integrity routine audio & xmtr maintenance, exper in all phases, high pwr AM directional & high pwr FM, plus super audio. 516-265-5372.

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Exper friendly adult communicator w/grt prod skills seeks stable opportunity, solid air work, team player, AC/oldies or country. Dave, 712-262-7954.

Veteran station manager, 20+ yrs, ops mgmt, PD, acct exec, air personality, w/talk show, computer & limited elec exper, avail immediately, prefer SE. Bob, 803/536-1491.

Broadcast eng, young, energetic, resourceful, BSEE, exper in radio, TV, studio & film, FTcontract, will relocate. Todd, 1250 C St NE, Washington DC 20002. 202-547-7008.

Thirteen yrs radio exper, PD, prod, news, sports, promo, DJ-live, automation & satellite, computer skills, billing, programming, problem solving, pay & benefits important. John, 502-932-5420.

Sales/mgt support for you, seek station needing revitalization, mature respected community man, ownership opportunity preferred rather than salary, possible \$\$ avail, extensive media exper. 912-681-6378.

I do sports best, looking for sports only pos. exciting & enthusiastic, w/14 yrs exper in all phases of brdcstng. Tim, 507/932-3094.

News/sports vet w/7 yrs in radio, hard working, reliable & team player, some grt P-B-P. Tim, 319/334-2549 days.

Can I do play by play? You bet. Sports P-P pos sought in Midwest. Tim, 402-475-3411.

Exper station manager & former station owner desires GM/partner relationship in LA/MS/AL/AR sm markets, no calls please. Airwaves Co. 510 W 2nd St, Rayville LA 71269.

For sale: late model morning train, lw mileage, runs strong, AOR/CR/CHR, serious inq only. Jeff, 813-624-2922.

DJ, 18 yrs exper, seeks adult contemporary, will also consider country/oldies. Mike, 904-255-6950.

DJ/trainee DJ, all formats, 5 yrs exper, some prod & Ham exper, seek pos in CO, AZ, CA or AL. 3923 E Thunder Bird Rd, Box 139, Phoenix AZ 85032. 602-942-1514.

Finally an antidote for Rush! Intuitive talk show host w/keen mind & quick wit will travel anywhere, exper in all size markets. 216-677-9113.

Broadcast grad w/some on-air & prod exper seeks work anywhere in US, any format, FT only. Charles, 912-567-4715.

Blues/jazz radio DJ, producer, in-depth knowledge plus music library, PT OK, San Francisco/N Bay areas. 707-528-4055.

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CHIEF ENGINEER—Midwestern 5 kW AM/100 kW FM seeks experienced with strong maintenance skills, IBM-PC literate, FCC License. Send letter and resume to: Jon Jenkins, KWMT, POB 578, Ft Dodge IA 50501.

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**Ampex AG440** 1" 8-trk rcrdr, 10 hrs on 40/40 heads, excel cond, \$3000; Fostex 4030/4035 synchronizer system, version 3.2 software, w/manuals & cables, \$900; Fostex 4010 SMPTE reader/generator, excel cond, \$425. B Seifried, Eclair Eng, 101 Prospect St, Northampton MA 01060. 413-584-6767.

**Revox A-77** 1/4-trk in walnut case, excel cond, original wired remote control incl, \$600. B Harwell, Compact Disc Jockey, 1861 Brown Blvd #630, Arlington TX 76006. 817-649-3535.

**Magnecord 1021 7"** R/P reel deck, \$75. E Moody, KESE, 216 E Main, Bentonville AR 72712. 501-273-9030.

**Studer/Revox HS77 Mk IV FT mono**, 10 hrs use, as new, \$875/BO/trade; portable case for A77 w/mom spkrs & pwr amps, excel cond, \$375. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

**Ampex AG-440C stereo (2)**, PB only, excel cond, \$1500 ea. D Swatman, WMGF/WPRD, 2001 N Mercy Dr, Orlando FL 32808. 407-298-5510.

**Otari ARS 1000 DC R-R**, 2-chnl reproducer, 1/4" 1/2-trk w/25 Hz tone sensor & cuneone relays w/adjustable delay, excel cond, \$1700 ea. R Chambers, 916-257-2121.

**Revox C-278** current 1/2" 8-trk, vry hw hrs, excel cond, w/manual & parallel adapter, \$3500. J Rose, Digital Attic, 20 Marion St, Brookline MA 02146. 617-277-0041.

**MCI 110B 1/4"** stereo, up to 14" reels, roll-around cabinet, many spare parts & cards, excel cond, \$1250. M Shea, Precision, POB 723, NY NY 10276. 212-989-2684.

**Revox A-77** wood portable case, tech manual included, \$350 plus freight & COD. R Krob, 303-484-2704.

**Want to Buy**

**MCI/Ampex 1/2"** 4-trk rcrdr, vgc; also, remote PK & dbx; other 4-trks considered. M Carta, KM Prod, Austin TX. 512-218-1610.

**Ampex 601/602 mono FT or 1/2-trk**, up to \$75. E Lightman, WEDL, 550 Merchant St, Ambridge PA 15003.

**Revox B-77**, must be 1/2-trk. R Deen, Deen Adv, POB 508, Adel GA 31620.

**Ampex MR-70**, gd cond. D deForrest, 7441 Wayne Ave #10-D, Miami Beach FL 33141. 305-866-5401.

**Ampex AG355/440 P** only electronics, stereo/mono, prefer w/optional VU meters. D Dintenfuss, Transcription Specialist, 7549-27th Ave NW, Seattle WA 98117. 206-784-4803.

**Ampex 351** for parts. D Ibel, Valley Sound, RR 1, Spencer IA 51031. 712-262-6231.

**Ampex 300** 8-trk recorder. B Seifried, Eclair Eng, 101 Prospect St, Northampton MA 01060. 413-584-6767.

**Scully '100'** recorders, record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 1131 Virginia Ave, Campbell CA 95008. 408-866-8434.

**MCI/Sony capstan & reel motors**, any cond., recd gds, most mfgs, machines, new, used. Relapped then sold. Amp Services, 224 Datura St No 614, W Palm Beach FL 33401. 800-826-0601, in FL 305-659-4805.

**Ampex ATR100** taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

**CD's**

**Want to Sell**

**Denon 950FA** CD cartridge player, working when removed, \$700/BO. R Rogers, KSKG-FM, 1217 S Santa Fe, Saina KS 67401. 913-825-4631.

**Technics SL1200 (2)**, wall orig hardware, manuals & packaging, excel cond, \$1500/both. J Deering, 615-264-2886 after 7 PM EST.

**Want to Buy**

**Radio programs/segments** or other misc type material produced on CD format, for brdcstr collection. R Strawn, 1900 SW 1st, Fruitland ID 83619. 208-452-3190.

**COMPUTERS**

**Want to Sell**

**Wang CPU**, (2) terminals, modem, etc. ran Computer Concepts Business System, BO. A McCarthy, KUIJ, 600 E Main, Vacaville CA 95688. 707-446-0200.

**Digital Voice Mail** software, use for sales communication, station comment line & much more, barter basis. 800-275-7997 X3000.

**Tandy 1000 EX** computer & CGA mon, 5-1/4" drive, 256K memory, joystick, new cond, have software to share, \$500. Tim, 315-488-1269/315-673-1624.

**Extel 15 cps** news printer, BO. F Anderson, 3801 5 Ave S, Great Falls MT 59405. 406-452-2810.

**CONSOLES**

**Want to Sell**

**LPB M-85-03**, '85; Shure M63 mixer; Shure M64A stereo mixer; Shure M675 prod mixer; call for info & pricing. M Cooney, Radio 1, 610 N Kiwanis, Sioux Falls SD 57104. 605-336-2706.

**McCurdy SS8500** custom 10 mixer/dual stereo brdcstr console, excel cond, \$4250. D Vernier, KUNL, Univ NIA, Cedar Falls IA 50614. 319-273-6400.

**Shure M67 & M675** mic mixer & prod master, excel cond, \$300/BO. M Saady, 1st City Rec, 141-60 84 Rd 3E, Briarwood NY 11435. 718-846-2062.

**McMartin B-501** 5-chnl mono mixer, gd cond, \$325. G Wichter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

**Howe Prod 12-chnl stereo console**, needs 2 input modules to make almost new, VCA control for dln & noiseless audio, vry reliable, excel cond, \$1500. Tim, 315-488-1269/315-673-1624.

**Cetec 2000** 8-chnl stereo, wrkng cond, grt for parts. BO. B Sommer, KTEQ, 501 E St. Joa, Rapid City SD 57701. 605-394-2231.

**McMartin B-501**, needs work, \$150. E Histed, WWCC/WDNH, POB 1104, Honesdale PA 18431. 717-253-1616.

**Quantum Lab QM12-B** 12 chnl, stereo mon, 8-chnl tape returns, talk back w/mic, excel cond, \$2000. R Glenn, WJGR, 1718 Shanadah, Wimauma FL 33598. 813/634-1940.

**Audio Technica AT4462** stereo field prod mixer, vgc, w/manual, \$600. C Crouse, Beech Tree Brdcstrg, 48 Cedar St, Dedham MA 02026. 617-461-2699.

**Radio Systems S-18**, mint cond, very little use, extras w/unit, must sell asap, \$5500/BO. E DeLaHunt, KPRM, POB 49, Park Rapids MN 56470. 218-732-3306.

**Collins 212 F1** console, mint cond, w/manual, \$350; Collins stand alone TT remote system w/PA amp, \$350; Harris circa '75 10-input stereo console w/program, audition & mono busses, full monitoring & manual, cln board, \$600. S Sands/S Ludwig, 815-459-7000.

**McCurdy 10-chnl stereo console** in desk w/all wiring & termination, BO; McCurdy 6-chnl mono console, BO; CCA Elec Ultimate 10-chnl stereo console, BO; RCA BC-14B 4-chnl stereo mixer, not working, BO. J Socokof, KUUI, Dallas. 214-526-2580.

**BE 4 pot mixer**, \$650/BO. J Phillips, WZOM-FM, 408 Clinton, Defiance OH 43512. 419-784-1059.

**Gates 10 pot board**, completely rebuilt, also gd for parts. BO. L Popp, 814-467-7894.

**Pacific Records BMX 22**, 12 yrs old in gd cond, will incl furniture, \$4800+shipping. K Rider, Unistar Radio Network, 1675 Broadway, NY NY 10019. 212-373-4947.

**Custom 16 x 16** vacuum tube recording console, whewishers, Westrex line amps, Pultec Type EQ, up & running, \$5000/BO. W Sear, Sear Sound, 353 W 48 St, NY NY 10036. 212-582-5380.

**CCA-QRK Futura 6** stereo, gd cond, slide pots, \$300+shipping. G Erway, KRRU, 6208 Momouth Ave, Goleta CA 93117.

**Harris Stereo 80 (2)**, now in service, \$1000 ea. M Huffman, KYRX-FM, Cape Girardeau MO. 800-455-9105.

**Gates MO3388** 4-chnl mixer console, as-is, \$300. K Hill, WONG, POB 1151, Madison MS 39110. 859-8218.

**Fender 4208** 8-chnl mixer, phantom pwr, (2) mon sends/chnl, effects bus, 9-band EQ on ea chnl, excel cond, cln sound, custom travel case avail, \$850. D Deuth, Audio Prod, 1801 Commerce Blvd, Mound MN 55364. 612-472-1619.

**Radio Systems R-S18**, mint/new cond, used in studio only, \$5500/BO. E Delahunt, KPRM, Hwy 34 E, Park Rapid MN 56470. 218-732-3306.

**Mono console**, 4-chnl, w/pwr supply, KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

**Hellos 24/16/24**, classic British circ 70s, many updates/models, w/documentation, discrete mic preamps, (9) sep pieces, w/wood rack cab, mahogany desk, \$9500/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

**BI-Amp 1229 Mixing Console**, ASI power amp, Akai GX77 R-R plus much, much more. Call for details. 308-882-4696.

**Want to Buy**

**Howe 10,000 parts**, any/all, please no 10K series. A McCarthy, KUIJ, 600 E Main, Vacaville CA 95688. 707-446-0200.

**Pacific Records BMX series** mic modules, need (2) in wrkng order. B Larson, WUSN, 875 N Michigan Ave, Chicago IL 60611. 312-649-0099.

**Tascam/Teac/Yamaha** 8-12 chnl stereo console. T Crockett, Hot Tracks, Box 10501, Blacksburg VA 24060. 703-953-0222.

**Gatesway-II spare modules**. Bob, 303-330-1342.

**Gates Studioette** 4-chnl mixer, '61 model, up to \$100. E Lightman, WEDL, 550 Merchant St, Ambridge PA 15003.

**On-air stereo console**, 5-10 chnls. HV Madera, WNZN, Carr Vieja del Vigia #83, Ponce PR 00731. FAX 809-840-1588.

**Harris stereo console** for parts. D Ibel, Valley Sound, RR 1, Spencer IA 51031. 712-262-6231.

**Used control board** for production room of 5000 W station, slide/rotary dial. R Lightsey, KPBA AM, Pine Bluff AR. 501-536-0052.

**Langevin AM4A** w/documents. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

**DISCO & SOUND EQUIPMENT**

**Want to Sell**

**Audio Arts Eng 4200** parametric EQ/preamp, like new, \$225+shipping. C Wagoner, Vision West, 12410 12th Ave S, Seattle WA 98168. 206-242-2042.

**JBL 4320R** control monitor (2), w/JBL 2235 15" woofer, JBL 15" passive radiator, JBL 2426 1" driver, L91 horn & lens, (2) 2405 slot tweeters, \$1250/pair; also, Ashley XR 2000 24 dB/octave stereo 3-way crossover, \$400. Mark/Jerry, Ligosa Sound Studios, 700 W Pete Rose Way 5th Fl, Cincinnati OH 45203. 513-621-5111.

**Emulator II+** sampling keyboard, (2) disk drives, writes SMPTE, built-in sequencer, w/sml library of sounds, used in studio only, vgc, \$900+shipping. B Seifried, Eclair Eng, 101 Prospect St, Northampton MA 01060. 413-584-6767.

**AAL Super Jock** spkrs; Peavey stereo booster amp. 130 Wchnl; Alus SM502 DJ mixer, new; BO. D Miller, KOOL, 1340 Richmond Rd, Detroit Lakes MN 56501. 218-847-5624.

**Master Room X2-121** reverb & Kernwood Basic C-2 stereo preamp, \$100 ea/BO; Ashley SC-88 4-way stereo crossover, \$300. B Wilson, 212 Southside Ave, Cville KY 42718. 502-789-1505.

**Orban 111B** spring reverb w/limiter & parametric EQ, \$75. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

**EMT 140ST** stereo tube plate reverb, \$3000; Eventide H3000, \$1700; Lexicon 200 digital reverb, \$1700; Orban 536A de-esser, \$200; Rane GE14 stereo graphic EQ, \$185; Eventide Instant Phaser, \$150; (2) KEPEX gates (modules), \$175/both. B Seifried, Eclair Eng, 101 Prospect St, Northampton MA 01060. 413-584-6767.

**Bullfrog** 3-way stage monitors, pair, parallel jacks, hi freq control, excel cond, \$450/pair; Sunn SA-21 pwr amp. 300 Wchnl or 600 W bridged mono, floor display, rack mount, like new, \$395. D Deuth, Audio Prod, 1801 Commerce Blvd, Mound MN 55364. 612-472-1619.

**dbx NX-40 (2)**, tape NR encoder/decoder, \$100 ea. B Harwell, Compact Disc Jockey, 1861 Brown Blvd #630, Arlington TX 76006. 817-649-3535.

**Snake** 16 phantom-pwr inputs w/ext pwr sup, 250' Belden 19-pair cable w/mil connectors & stlss-steel strain reliefs, 10' Neumann XLR snake mates w/box or Belden snake, excel cond, \$750/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

**Altec N-501-8A** 2-way crossover network (2), in orig boxes, new, \$70/pair. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

**Community Long Throw** mid-range cabinet (4) & (4) horns which take 1" drivers, all empty, \$600 all/trade for processing gear. B Wilson, 212 Southside Ave, Cville KY 42718. 502-789-1505.

**LIMITERS**

**Want to Sell**

**Gates Solid Statesman**, gd cond but AGC needs new pwr xformer, \$45. M Knight, 339 New Kent Rd, Blacksburg VA 24060. 703-552-5809.

**Optimod 8000**, clean. J Phillips, WZOM-FM, 408 1/2 Clinton St, Defiance OH 43512. 419-784-1059.

**Valley People** 610 limiter/expander, call for info & pricing. M Cooney, Radio 1, 610 N Kiwanis, Sioux Falls SD 57104. 605-336-2706.

**Optimod 8000A**, mint, \$1500/BO. J Phillips, WZOM-FM, 408 Clinton, Defiance OH 43512. 419-784-1059.

**Optimod 8100A**, excel cond, \$2950. E Histed, WWCC/WDNH, POB 1104, Honesdale PA 18431. 717-253-1616.

**Optimod 8000A \$1495 & UP 414-482-2638**

**Orban 111B**, \$400; ATI Emph-A-Sizer, \$700; you pay shipping. D Seavy, KROC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

**Harris MSP 90 (2)**, w/stereo AGC & limiting modules, \$125 ea. D Greer, WZZ/WFDF, 1830 Genesee Towers, Flint MI 48504. 313-238-7300.

**Optimod 8000A**, \$1800; Optimod 8100A, \$2950; UREI 1176LN, black face, \$500 ea/(2) for \$900; all perfect cond. B Watson, KSAK, 714-946-6249.

**CRL SEP400B**, 1w hrs, clean, excel cond, w/manual, \$350. P Hess, 134 Derwent Dr, Pittsburgh PA 15237. 412-366-1249.

**ADR stereo limiter**, gd cond, \$525; Inovonics 201, \$500 ea; API 525, \$375. M Linett, Yr Place or Mine, 1600 Las Flores Dr, Glendale CA 91207. 818-244-1909.

**Inovonics 201 (2)**, peak & rms, \$500 ea. M Linett, Yr Place or Mine, 1600 Las Flores, Glendale CA 91207. 818-244-1909.

**dbx 164** stereo over easy compressor/limiter w/LED meters, \$200. B Harwell, Compact Disc Jockey, 1861 Brown Blvd #630, Arlington TX 76006. 817-649-3535.

**Audio Design Transdynamic** stereo limiter, new, w/user & service manual, \$500. M Shea, Precision, POB 723, NY NY 10276. 212-989-2684.

**Gates Solid Statesman (2)**, just removed from service, excel cond; also, BL-40 Modulimiter; BO. E Delahunt, KPRM, Hwy 34 E, Park Rapid MN 56470. 218-732-3306.

**Harris ME1** modulation enhancer, \$100; Harris MSP90 AM tri-band AGC, \$600; Inovonics 230 AM multi-band processor, \$300. E Moody, KESE, 216 E Main, Bentonville AR 72712. 501-273-9030.

**Want to Buy**

**Gregg Labs 2530** tri-band compressor/limiter, made in mid-late '70s. J Mauk, KMJK/SKS, POB 70002, Fresno CA 93744. 209-266-5800.

**Good unit**, any proven make, will pay cash. D Magnum, WBOG-FM, 608-372-9600.

**Aphex Aural Exciter & studio Dominator** R Sweatte, KUBE/CIRP, 120 Lakeside Ave #310, Seattle WA 98122. 206-322-1622.

**Orban 8100/8100-A/8000**, fair-gd cond, will pay cash & UPS/insurance. F Vobbe, WLIO-TV, 1424 Rice Ave, Lima OH 45805. 419-228-8835.

**Orban Optimod 8100A** w/6-way EQ, gd to excel cond, needed yesterday. N Chavigny, 713-527-0034.

**Optimod 8000A**, will pay cash, leave message at 703-276-0125.

**MICROPHONES**

**Want to Sell**

**RCA** classic ribbon mics, others, send for list. B Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

**EV 635A** dynamic mic, fair cond, \$40/BO. M Saady, 1st City Rec, 141-60 84 Rd 3E, Briarwood NY 11435. 718-846-2062.

**Electro Voice RE-20**, gd cond, no stand adaptor, \$175. T Crockett, Hot Tracks, Box 10501, Blacksburg VA 24060. 703-953-0222.

**Neumann U-87**, excel cond, BO. S Winthrop, Winthrop Prod, 156 W 94th St, NY NY 10025. 212-662-8685.

**Sennheiser MD-421V** w/suspension mount, gd cond, \$225+shipping. R Korbany, WTNJ, 609 Main, Mt Hope WV 25880.

**Shure SM58** dynamic cardioid (4), like new, \$80 ea. N Hammond, PAS, 320 Ethan Allen Ave, Takoma Park MD 20912. 301-891-3567.

**Turner S33D** chrome dynamic w/base, BO. K Patten, 818-267-7424.

**Neumann U-67**, excel cond, pwr supply, \$3000; EV 642 shotgun mic, excel cond, BO. F Virtue, Virtue Rcrdng, 1618 N Broad St, Philadelphia PA 19121. 215-763-2825.

**EV 644** Sound Spot, gd cond; vintage RCA, '40s, gd cond. D Morris, WKUN, 204 W Spring St, Monroe GA 30655. 404-267-6558/404-267-2035.

**Sennheiser MD214** lav mic, \$35; Shure 2-way hand mics; call for details. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

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### MICROPHONES . . . WTS

Telefunken/Schoeps CM-61 tube mic, very rare, uses std 6AU6 plug-in tube, w/o cables/pwr supply, mint cond, \$975/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

Electronic table mic. KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

Presto 45 rpm adapter sleeve for 6N disc cutter, new; manuals: Sencore tube conductance analyzer, Sams transistor sub book #8 & #6, RCA tube manual. Mr. Oliver, 212-874-7660.

EV 630/635 w/cable; RE10 EV-desk mics, EV & Shure all very reasonable; baby booms (3). Mr. Oliver, 212-874-7660.

**Want to Buy**  
 RCA 44s & 77s, WE 639, other ribbon mics, working or not; also, dynamic & other types of mics. B Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-781-9831.

Sennheiser MKE 2002 binaural stereo mic at gd price. F Beacham, NY NY, 212-873-9349.

RCA 44BX/77DX; WE & RCA velocity mics. D deForrest, 7441 Wayne Ave #10-D, Miami Beach FL 33141. 305-866-5401.

Studio condensers: AKG, Neumann & others. K Patten, 818-267-7424.

RCA, Neumann, WE & all other vintage mics; also, parts, flags & stands. R Van Dyke, Caffrey House, 2 Squires Ave, E Quogue NY 11942. 516-728-9835.

Classic mic for display purposes, reasonable price, not a dealer. D Koehn, Central Sales, 609 S 15th, Quincy IL 62301. 217-228-2115.

Telefunken/Schoeps CM-61 tube mic pwr supply & cable, AKG C24. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

AKG 451 preamp CK2 omni capsules (2); CE2 omni capsule for AKG SE5 preamp. N Pearsall, Synergy Sound, POB 632, Chima-cum WA 98325. 206-732-4198.

### MISCELLANEOUS

**Want to Sell**  
 RCA MI11645 audio patch panel, \$50; mini jackstrip: 2 rows of 48 jacks, \$150. L Bawinkel, WWJQ/WJQK, 5658 143rd Ave, Holland MI 49423. 616-394-1260.

Tascam ES-51 sync control unit & (2) ES-50 slaves, barely used, \$3500/BO; Symetrix TI-101 telephone interface, \$225. D Crepps, IBS, 225 W Lockerman, Dover DE 19901. 302-678-4400.

Blonder-Tongue AMT audio modulator for TV chnl 10, puts radio audio on TV systems, \$50; Tone Commander RT-1900 touch tone 19-station intercom, decodes 19 TT combinations to relay output, new, \$75; Telephone System 400 line cards for 1A2 key systems, misc relays, dials, bulls eye lights & bulbs, bells & power supplies, call for details. E Davison, 125 N Illinois, Springfield IL 62702. 217-787-0800.

Kohler S340 auto transfer switch, like new, rated 3 phase, 240 V, 225 amps, 4 wire, 3 pole, \$2500. J Salov, WHGR/WUPS, 517-740-1165.

TIE E3000 10-button key phone TT dial, brand new, \$50; WE field phones, magneto w/modern handset, excel cond, \$75/pr; various other WE phones & key relay, call for info. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

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Gentner FBTRB prewire bay (8), \$195 ea; Gentner GEC-FB-100 Flexiblock (50), SIE-MF2250, \$8 ea; Gentner GEC-50DR pre-wired patch bay, 52DR w/TRS jacks #8 & approx 15' wire, \$90. B Lord, Lord Brcdstg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Orban ACC11 1-3/4" security cover (6), \$15 ea; Pitney Bowes A-120 postage scale, 6200 postage meter & A215 printer, \$1500/all; Fidelipac FID-MR200 200-slot mobile rack, indiv racks can be wall mounted, \$150. B Lord, Lord Brcdstg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Mod Science StereoMaxx, new, \$1500. E Histed, WWCC/WNDH, POB 1104, Honesdale PA 18431. 717-253-1616.

Plantronics miniature operators headset (2), w/289B DBL plug, new, \$25; WE 52 headsets w/289B plugs, jacks, gd cond, \$25; music on hold interface to 1A2 phone systems, up to 5 lines, \$25 ea/\$100 for 10; Bogen Sam phone page interface, new, \$50/BO. E Davison, 125 N Illinois, Springfield IL 62702. 217-787-0800.

Triad AC isolation xformers, 120 V I/O, 7A unit, \$70; 0.5A unit, \$15. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

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 Corpus Christi, TX **(512) 892-1126**

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**RECEIVERS & TRANSCEIVERS**  
**Want to Sell**  
 GE Executive (2), w/cables & control heads, (1) lw band, (1) high band, mics incl, \$100. M Storin, WGOT-TV 60, 457 Varney St, Manchester NH 03102. 603-625-1165.  
 AM EBS rcvr on 1430 kHz, call for info & pricing. M Cooney, Radio 1, 610 N Kiwanis, Sioux Falls SD 57104. 605-336-2706.  
 Kahn Power Side AM stereo system w/signal processing, new, never used, \$7500. J Socolof, KUII, Dallas. 214-526-2580.  
 Elenco LR 2-30 MHz linear amp for 2-way radio communication, 100-300 W, \$50; Hickock 610 TV signal gen, works 0-250 MHz plus markers & sweep, \$30. J Cunningham, KHKC, Rt 2 Box 113B, Stonewall OK 74871. 265-4496.  
 Magnum/Dynalab FT-101 rack-mounted FM tuner, 4 yrs old, factory refurbished, 6792 kHz SCS outputs, selected from front panel, like-new cond, made in Canada, \$475+\$11 shipping; Gran Prix TVP-5.5" B&W TV w/FM-AM radio, AC-DC, modified w/TV-SAP & FM-SCS adapter, tunable to 6792 kHz SCS & TV-SAP & Pro chnl, \$124 incl shipping. B Elving, FM Atlas Publishing, 241 Anderson Rd, Esko MN 55733. 218-879-7676.

Phone couplers, pair, \$25; light modulator w/dimmer, #LM3300 (3x1000 W); Conalort II; VSWR Watchdog, KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

Gorman/Redlich CEB EBS encoder/decoder, looks bad but works, \$195+freight & COD. R Krob, KMUS, 1513 Carey, Cheyenne WY 82001. 307-484-2704.

**Want to Buy**  
 FM dummy load, 5-10 kW. V Baker, WKGM, POB 889, Blacksburg VA 24063. 703-552-4252.  
 Radio/TV station buttons, collector wants to buy/trade. B Massey, WKHX, 360 Interstate N, Atlanta GA 30339. 404-955-0101.

Realistic SA-2000 right chnl volume control, slide type for SA-2000 (31-1985) stereo amp, Radio Shack part #P-1832, mfr part # 28200025 (250K/Bx2). R Kerbany, WTNJ, 609 Main, Mt Hope WV 25880.

ETA/Lepricon lighting equip; also, par cans & spots. B Wilson, 212 Southside Ave, C-ville KY 42718. 502-789-1505.

Vintage bdcst equip, TV studio cameras, literature, 16" transcriptions, theater amps & spkrs, blank recording discs. R Van Dyke, Caffrey House, 2 Squires Ave, E Quogue NY 11942. 516-728-9835.

Full production facility needed in very near future, of recent vintage, must be vg to excel cond. N Chavigny, 713-527-0034.

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

**AM STEREO RECEIVERS**  
**Portable, Home/Studio, Auto**  
**RRADCO GROUP**  
**708-513-1386**

SCA decoder, high quality micro-miniature 6792 kHz, prewired & ready to install, \$15. D Jackway, Backgrnd Music Eng, 5742 Fair oak, Springfield MO 65810. 417-881-1846.

**MONITORS**  
**Want to Sell**  
 Potomac Instruments AM-19 antenna mon, 2 tower, 2 ref, gd cond, \$1000. T Gaiser, KUZZ-FM/KCWR, 3223 Sillect Ave, Bakersfield CA 93308. 805-326-1011.

TFT 713 AM mod & freq mon, \$400. E Moody, KESE, 216 E Main, Bentonville AR 72712. 501-273-9030.

**Want to Buy**  
 Belar FMM-1 & FMS-1 FM mod mon; EBS system; In-line 1-5/8" power meter. HV Madera, WZNZ, Carr Vieja del Vigia #83, Ponce PR 00731. FAX 809-840-1588.

Any older McMartin mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68184. 402-493-1886.

**Want to Sell**  
 Bolex H16 (2), w/400' mag, drive & mag motors, battery packs, 17-65 mm zoom w/r angle VF, voltage regulators, BO. K West, SRSU, Dept Fine Arts/Comm, Alpine TX 79832. 915-837-8219.

Arriflex 16S w/Ang motorized zoom, (3) prime lenses, (3) 400' mag w/torq motor, matte box, assorted drive motors, fitted case, \$2200. J Gagliardi, 20 Country Rd, Holliston MA 01746. 617-432-1752/508-429-7846.

Bolex MST motor for 16mm movie cameras, 24 fps, excel cond, \$175; Bolex sound Barney/blimp for 16mm movie cameras, 2-piece for use with/without 400' magazines, like new, \$225; B&H 2580 16mm sound proj, late model, excel cond, \$200; Eiki RT-0 16mm sound proj, excel cond, \$100; Siemens 2000 proj interlock (dbl board) optical/magnetic 16mm editing proj, vgc, \$350. G Orrod, GFO Prod, 432 X St E, Tumwater WA 98501. 206-352-8028.

**Want to Buy**  
 Moseley TRC15AR 15-chnl remote, '82, recently aligned by mtr, \$500. K Austin, Austin Brcdstg, 1101 Hwy 81 N, Marlow OK 73055. 405-658-9292.

Marti RMC-2AX, gd cond w/manuals, \$400. J Bolton, KKRFP, POB 454, Rayville LA 71269. 318-878-9469.

Me-Com MA23CC 23 GHz microwave system w/xmtr, rcvr & antennas, \$4000 complete. C Haynes, WJMI/WOAD, 1850 Lynch St, Jackson MS 39203. 601-948-1515.

Moseley PBR-15AW wire line remote; Micro-Controls RCR-9 & RCT-9; call for info & pricing. M Cooney, Radio 1, 610 N Kiwanis, Sioux Falls SD 57104. 605-336-2706.

Marti M-25C/MR-30/150-170 base station. D Morris, WKUN, 204 W Spring St, Monroe GA 30655. 404-267-6558/404-267-2035.  
 Chevy van, '72, complete remote studio, 29,000 miles, all aluminum body, \$8000. R Owen, KJOJ-AM, POB 2368, Conroe TX 77305. 409-758-5501.  
 TFT digital remote, vgc, \$1500. E Histed, WWCC/WNDH, POB 1104, Honesdale PA 18431. 717-253-1616.

REMOTES . . . WTS

Mark 5' STL dish (2), \$900+shipping. D Donovan, KCGR-FM, 1620 American Bank, Corpus Christi TX. 512-888-8555.

Ampex 351 series remote control. \$50. D Bailey, Rockshope Prod. 3422 Beech St. Rowlett TX 75088. 214-475-9796.

Moseley TRC-15 studio/xmtr units w/manuals, Telco operation, grt cond, wrking, in-service now, \$400. J Salov, WHGR/WUPS. 517-740-1165.

Marti RPT-30W450, complete system w/antenna & 175' coax, used 3 times, dual freq. B Carr, WRED, POB 6, Perrysburg OH 43552. 419-837-9696.

Moseley PBR-30 chnl remote system, 110 kHz control, subaudible metering units, needs work, \$350; Potomac extension analog metering panel for AM-19, \$150; Moseley 92 kHz sub-carrier I/O cards for MRC-1600, may be moved to other freq, \$150/set; Moseley PCL-404 mono STL system, 948.0 MHz, \$450. J Goode, WCIT/WLSR, 419-228-9248.

Marti STL 10 monaural on 950 MHz, \$2950. A Thompson, DUTI/KXDD, 706 Butterfield, Yakima WA 98901. 509-248-2900.

Moseley MIU-2, \$250; Moseley SCD-8, \$150; Mod Science CP803, \$300; you pay shipping. D Seavy, KROC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

Andrew solid 6' dish, 2 GHz feedhorn & mount bracket, \$900/BO. A Bowab, WDLT, 2402 Wolf Ridge, Mobile AL 36618. 205-344-3698.

Marti RMC-20, cosmetically lacking, functionally perfect, w/(4) RY5T relay panels & all manuals, \$500. S Schweiger, WXLO FM/AM, 146 Worcester Cir, Worcester MA 01608. 508-752-1045.

TFT 7601 CR, just factory checked OK, w/manuals, \$1600. M Blakemore, WCVF-FM, Box 280, Murphy NC 28906. 704-837-2218.

Want to Buy

Scala MF-960 Miniflector for 950 MHz, reasonable, T English, WEZN, 10 Middle St, Bridgeport CT 06604. 203-366-9321.

Moseley PCL505C, Marti or TFT 950 MHz STL equip for export, priced right. K Austin, Austin Brdctng, 1101 Hwy 81 N, Marlow OK 73055. 405-658-9292.

SCA generator, 92 kHz/convertible, prefer CRL, Moseley & Sidekick, G Hilliard, 503/226-9791.

Comrex telephone freq xtender, snl line. L Houck, 512-736-5483.

MACOM/MAL 23 GHz link for short haul A/V, must be working & cheap. A Pezzenti, NE CATV, POB 4095, Youngstown OH 44515. 216-793-7434.

Any STLs. K Thompson, WWIC, 815 W Willow, Scottsboro AL 36768. 205-574-2198.

Marti 26 MHz xmtr & receiver w/manuals, will consider 152/161 MHz w/right price. F Vobbe, WLO-TV, 1424 Rice Ave, Lima OH 45805. 419-228-8835.

Marti UHF & VHF remote equip, used. K Thompson, WWIC, 815 W Willow, Scottsboro AL 36768. 205-574-2198.

Marti 8/10 STL stereo package, will pay cash. D Magnus, WBGO-FM, 608-372-9600.

SATELLITE EQUIPMENT

Want to Sell

Wegener 1602 & 1601 mainframe w/cards for Unistar country format system, 18 mnths old, like new, \$2800. K Austin, Austin Brdctng, 1101 Hwy 81 N, Marlow OK 73055. 405-658-9292.

Adcomm 7550 satellite rcvr for Unistar ACII & CNN, 2 yrs old, \$3500. B Hearst, WWCH, 725 Wood St, Clarion PA 16214. 814-226-8600.

DX Comm DSA-604-1 C & Ku Band satellite rcvrs (5 ea); (3 ea) LNB, pwr dividers, block-down converter; some new cond, some gd cond, w/books, commercial grade quality, \$600 all/BO; Harris 6528 C Band satellite rcvr w/LNA, feed & polar rotor, gd cond, brdctng quality, w/book, \$300/BO. S Urbani, Video-Line, 1641 Garden St, San Luis Obispo CA 93401. 805-544-6280.

S/A DAT 15 kHz demod (3), \$400 ea; S/A DAT 7.5 kHz demod, \$400; you pay shipping. D Seavy, KROC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

Wegener 1602 series satellite receiver tuned to Unistar AM only format, w/all cards & books, excel cond, \$3500. Ray, WDXY, 803-775-2321.

Equatorial dish/LNB w/radome, receiver/controller & printer, used to receive UPI newswire, BO. G Peterson, KIMM, POB 8205, Rapid City SD 57709. 605-348-1100.

Scientific Atlanta 6600/6601 SCPC rcvr, \$750; SMN Superswitch for unattended satellite operation, \$300. S Sands/S Ludwig, 815-459-7000.

NEC EZ-2401-A portable cellular phone, w/padded carrying case, 12 V adptr for car use & 120 V chrg for battery, may need new rechargeable battery, BO. A Burns, WRLC, 908-932-4105.

Fairchild DART-384 downlink 15 kHz dual-chnl audio card & voice cue card. \$600 both. M Rogers, WTX, 504-831-9849.

Want to Buy

Harris 6550 receiver for sports & other. Bob, 303-330-1342.

SOFTWARE

Want to Sell

WireReady™ Wire Management Software. . . Only WireReady™ has the name, the toll-free support and and hundreds of happy users. See us monthly in RW's Product Showcase. WireReady Newswire Systems Inc. 800-833-4459.

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STATIONS

Want to Sell

AM & FM in stable TX market, owner financing possible, grt opportunity for owner operation, real estate & home incl. 216-331-8012 or 305-296-7575.

RADIO STATION FOR SALE

Class A FM, frequency 92.3. Calls: KZMK/Bisbee, Sierra Vista, AZ. Contact Alan Solot, 602-622-4622.

SCA avail on new 30 kW FM in NE IA, serves NE IA, SE MN & SW WI. D Voss, KRDI, Decorah IA 52101. 319-382-4251.

New 50K FM in Southern Missouri Lakes area. 417-273-4308 (evenings & weekends)

Non DA daytime, DA night, 50 kW, low dial position, clear chnl, unlimited time, AM in capital city; also, 3 kW FM, can upgrade to 6/25/50 kW, owner financing. Glenn 501-470-1525.

AM 1480, 1 kW, in Pueblo CO city limits, needs owner/operator, gd equip, gd terms to qualified, \$139,000. G Erway, KRPR, 6208 Momouth Ave, Goleta CA 93117.

Sm business, lrg territory, big potential, music supplier to business. FM, satellite, tape deck, financing avail, Tampa/Orlando area. AEI, 4350 W Waters #105, Tampa FL 33614.

RADIO STATION

In Santiago, Dominican Republic, 930 kHz AM, 5000 W. Modern equip in excel cond. Prestigious since 1953. May be particularly interesting for religious groups. Antenna/xmtr 4 mi outside city on own 10,000 M2 lot, studio in mid-town. For more information fax 809-583-8464.

Trustee estate sale: WEDE 1130 AM in Eden NC, 1 kW w/CP for 5 kW, includes all equip & real estate, will accept best offer to settle trust account. 804-685-3128.

Want to Buy

Seeking troubled/dark stations for no money down/debt assumption, all stations/areas considered. J Ballard, POB 1786, Apple Valley CA 92307. 619-261-7787.

Former station owner seeks FM, CP or LPTV CP in LA/MS/AR/LA. must be no down & owner financing, managing partnership desired, written response only. Airwaves Co, 510 W 2nd St, Rayville LA 71269.

AM, FM, AM/FM combo, no/little cash down w/owner financing, will consider most areas. J Ryder, POB 652, Mishawaka IN 46546.

FM wanted, Chicagoland area, lw pwr/hi pwr/small/big. C Zenkus, 788 Indiana Ln, Elk Grove IL 60007. 708-893-3668.

Broadcaster w/10 yrs+ seeking to buy AM or FM station in Richmond VA area. Looking for no money down, owner financing, H. Pollard, New Visions Broadcasting, POB 13081, Richmond VA 23225. 804-748-2399.

STEREO GENERATORS

Want to Sell

Motorola C-Quam stereo gen mon & CRL 950 SMP stereo processor, \$6000/BO B Shannon, WYWR, 401 N Blaine, Youngstown OH 44505. 216-746-1330.

Want to Buy

C-Quam generator & monitor. D Sawyer, 303/451-6700.

Optimod 8000A, will pay cash, leave message at 703-276-0125.

TAPES/CARTS & REELS

Want to Sell

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Scotchcarts (2300), 3.5/2.5 min. some never used, most like new, \$3 ea. W Bevs, WING, 717 E David Rd, Dayton OH 45429. 513-294-5858.

Commercially recorded tape music, 2 trk stereo, 100,000'. BO. F Anderson, 3801 5 Ave S, Great Falls MT 59405. 406-452-2810.

Scotchcart IIs from oldies station, various lengths; also, Audiopak AA4s, new in box, 100s of various lengths; BO. G Spiller, WVGVO FM, 1011 Boulder Springs Dr #401, Richmond VA 23025. 804-330-3106.

Audiopak AA4 & AA3 (1000), 2.0-3.5 min carts, clean, unused rebuilds, loaded w/new tape, gd cond, \$350/100. free shipping; (900) Audiopak AA4 & AA3, various lengths w/dif programs, used, gd cond, \$1/100; (20) blank 10" reel tapes, new, in boxes, \$10/reel. D Kincaid, 1445 Parran Rd, St Leonard MD 20685. 301-586-2177.

Contemporary Christian music record library & over 2500 top CCM songs on over 100 Ampex 456 tapes w/25 Hz tones recorded on fade of each song. D Schroeder, WSWL, 904-433-1141.

Adult contemporary library w/2200 songs on CD & cart. incl 93 Goldiscs & 230 misc CDs, add'l 170 songs dubbed on Scotchcart IIs, \$5500; country library w/1500 songs on 66 CD Goldiscs & 500 add'l Scotchcart IIs, \$4500; (380) 3.5 min Scotchcart IIs w/country songs, \$2 ea; all used 6 mnths. B Lord, Lord Brdctng, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Fidelipac & Audiopac, over 3200 carts in gd cond, 1500 in complete music library all catalogued, various lengths, \$75 ea; country library: 4278 albums, 7834 45s, 204 CDs, 1624 carts & more, BO. R Owen, KJOJ-AM, POB 2368, Conroe TX 77305. 409-756-5501.

Fidelipac carts (700), various lengths, gd cond, \$1 ea/\$500 all; approx (400) gospel & country albums from '40s & '50s, all gd cond, BO. D Morris, WKUN, 204 W Spring St, Monroe GA 30655. 404-267-6558/404-267-2035.

Reels, 10" (100), some country & easy listening, \$1/tape. E Moody, KESE, 216 E Main, Bentonville AR 72712. 501-273-9030.

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Want to Buy

World library 16" radio transcriptions from '43-45: 6079, 6089, 7049, 7059 & 8349, will pay \$50/disk. H Medina, 181 Thomas St, Brentwood NY 11717. 516-273-1832.

Old 45/78 records, prefer large station collections of 50s Rock, R&B, & Country. K Gutzke, Custom Recording, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

TAX DEDUCT EQUIP

Student operated community NP radio station seeking prod & brdct equip of all kinds, tax deductible receipt given. L Copeland, Ivanhoe Civic League, POB 201, Ivanhoe VA 24350. 703-699-1383.

Educ radio/TV needs any equip, esp cart R/P & player, TT, stereo R-R for prod, all wrking cond, will pay shipping. K West, SRSU, Dept Fine Arts/Comm, Alpine TX 79832. 915-837-8219.

Culturally diverse community radio station needs xmtr & board, will also accept other equip incl cassette decks & CD players. B Rawlins, WAIF FM, 2525 Victoria Pkwy, Cincinnati-OH 45206. 513-241-4260 X225.

High school FM going FT, need 1-3.5 kW xmtr in wrking cond, will pay shipping. S Harris, WSHR, 212 Smith Rd, Lake Ronkonkoma NY 11779. 516-467-0424 8:30A-1:15P EST.

Religious group needs board & TTs to produce well-known Southern Gospel program for worldwide audience, donation is tax deductible: will pay shipping. Dr G Pettijohn, 615-988-6328.

Youth radio station in public housing seeking tax deductible donations of radio brdctng equip. FrankJulie, ARHA, Alexandria VA. 703-549-7115.

A/V & computer equip to donate to local school/university in Kansas City. Ron, 913-268-8520.

UHF xmtr, 5-20 kW, tunable to chnl 32. R 18C F12B Broadcast Training School for Underprivileged needs (2) audio consoles, P only cart machine, R/P cart machine, (2) studio mics w/foam covers & (2) Baby Booms, will pay shipping. F Smith, BTSU, 615-624-7126.

Eng student desiring donation of old brdct equip (anything) in repairable cond, will pay all shipping charges. EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

TEST EQUIPMENT

Want to Sell

RCA WX2-E field intensity meter, excel cond, \$600; HP 330B audio distortion meter, gd cond, \$100; Heath distortion meter, \$50; General Radio 916A RF impedance bridge, gd cond, \$200. D Messing, KNCY AM/FM, 722 Central Ave #1, Nebraska City NE 68410. 402-873-3348.

Quest Electronics 215 sound level meter & CA-12 permissible sound calibrator, w/case, pristine cond, \$425+shipping. C Wagoner, Vision West, 12410 12th Ave S, Seattle WA 98168. 206-242-2042.

Proof of performance machines: oscillator wide range, distortion meter B&W, Gates Gain-set M3625, vgc, BO. L Popp, 814-467-7894.

HP 675-A sweep gen, 10 kHz-32 MHz, w/start-stop, MAN center freq sweep & CW, (5) freq markers, 80 dBm output, VAR sweep & width, \$150. J Gagliardi, 20 Country Rd, Holliston MA 01746. 617-432-1752/508-429-7846.

B&B AM2B phascope, checks headroom, used 6 mnths, \$695. B Lord, Lord Brdctng, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Plate reducer, 3" to 1-5/8", EIA, new, \$25G; LC to 1-5/8" reducer, new, \$140; you pay shipping. R Krob, KMUS, 1513 Carey, Cheyenne WY 82001. 303-484-2704.

Scencore DVM-32 multimeter, digital, like new cond; Leeds & Northrup resistance decade box, .01 ohm to 20 K ohms precision, 10 switches, \$75/BO. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

HP 211A square wave gen, tube-type, gd wrking order, \$75+shipping; Kearfott angular position indicator, cond unknown, nice cabinet, \$40+shipping/BO/trade. D Langston, 820 Harrington Dr, Milledgeville GA 31601. 912-453-9066.

Scencore FC-71, never used, mint cond but battery pack dead, \$600. 303-744-2857.

Tektronix 575 transistor curve tracer, \$400. B Seifried, Eclair Eng, 101 Prospect St, Northampton MA 01060. 413-584-6767.

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Ask for Steve or Chuck

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Patchbays (4), 24 single inputs, also patch cords; Editorial splicing block, 1" tape, audiohead alignment tape for Ampex 7.5-15 ips, 1/4" tape. Mr. Oliver, 212-874-7660.

TRANSMITTERS

Want to Sell

Wilkinson 1000B 1000 W AM xmtr on 1300 kHz, needs filter choke, \$1500. B Hearst, WWCH, 725 Wood St, Clarion PA 16214. 814-226-8600.

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CSI 1 kW FM, 94.3, clean; 10 kW dry load: 4-port 1-5/8" relay. J Phillips, WZOM-FM, 408 1/2 Clinton St, Defiance OH 43512. 419-784-1059.

Harris '80 FM 2.5 kHz xmtr w/MS-15 exciter, spare 4X150A & 5CX1500A tubes, all manuals, currently on-air in excel cond, delivery in 45 days, \$12,000. J White, 616-796-7684.

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Bauer 707 1 kW AM xmt, 1000/250 pwr settings, gd for parts, \$500. R Chambers, KSUE, 916-257-2121.

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FAX 1-802-425-3664  
Kellner Electronics, Inc. Charlotte, VT 05445

Gates BC5P-2 w/tubes, BO: 5 kW AM dummy load, V Baker, WJGM, POB 889, Blacksburg VA 24063. 703-552-4252.

QEI 675 freq agile exciter, excel cond, w/QEI 675T 500 W xmt, \$4500. A Charles, WJLY FM, POB 4340, Sevierville TN 37864. 615-453-2844.

RCA BTF-5, -10, -20E1, over \$15,000 in new parts, some gently used, writecall for list, BO: (2) RCA BTE-15A w/spares & manuals, tuned to 102.1 MHz, w/stereo gen & 67 kHz SCA, BO. M Tomlinson, WMUK, W Mich Univ, Kalamazoo MI 49008. 616-387-5715.

Moseley SCG-9 stereo gen, \$300+shipping, D Seavy, KRCC, 122 SW 4th St, Rochester MN 55902. 507-286-1010.

Continental 317C2 50 kW, installed 5-84, grt cond, new tubes, 1w hrs (day time use only), vry reliable, no bugs, \$13,500. T Sittner, KSJL, 217 Alamo Plaza, San Antonio TX 78205. 512-271-9600.

**FM TRANSMITTERS**  
1 kW CCA 1000DS  
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20 kW CSI T-20-F  
25 kW AEL 25KG  
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CCA 2500E FM 2.5 kW, w/Harris MX-15 exciter, excel cond, \$18,000. C Madraza, TIJ, AP-DO Postal 453, Tijuana BC Mexico 22000. 66-81-9677.

Nautel 1 kW xmt, new, never on air, w/xtras, ready for shipping, \$17,500 firm. T Wayne, 800-477-8283.

McMartin 2.5 kW AM xmt, vgc, also gd for parts/backup, L Popp, 814-467-7894.

Kintronics 25 kW FM isocoupler, fair-gd cond, usable range 95-98 MHz, tuned to 96.1 MHz. \$1500/BO. D Gill, WHON, POB 1647, Richmond IN 47374.

CCA 20000E, tuned to 93.9 MHz but can be changed, no exciter, excel cond & well kept, \$12,000. T Shedlick, WMZQ, 5513 Connecticut Ave NW, Washington DC 20015. 202-362-8330.

Moseley RLP3 15 W xmt, rack mount rcvr, 166.25 MHz, \$900/BO; CSI 1 kW FM xmt, \$3500/BO. J Phillips, WZOM-FM, 408 Clinton, Defiance OH 43512. 419-764-1059.

Motorola C-Quam AM stereo exciter & mon system, on-air w/MW-1 xmt, avail 1/92, \$5995; Collins 310Z-1 exciter w/67 SCA & BB input cards, on 104.9 MHz, working when removed, \$375. J Goode, WCIT/WLSR, 419-228-9248.

Belden 9275 1000' sweep-tested to 500 MHz RG-59, \$300; (3) Moseley LVK-3 line voltage samplers, \$75 ea; Moseley TRC-15 remote, wrking cond, \$200; Moseley relay panel, \$50; RMP-1 metering panel for remote indications of antenna phase/ratio from AM-19, \$50; lighting choke suitable for about 2 kW twr lighting, \$50; Belar FMM-1 FM mod mon, \$250; FMS-1 stereo mon, \$250; Dorough SAP310, \$50; Antitiz processor w/manual, \$250; (2) Gates Statesman limiters, \$20. F McCoy, 312-712-3529.

Eagle Hill PSA-1, allows vry lw PSA & PSSA pws from up to 1 kW output xmt. BO. G Peterson, KIMM, POB 8205, Rapid City SD 57709. 605-348-1100.

RCA BTA-5H 5000 W xmt, 535-1620 kHz AM, \$900; Collins 300J 250 W AM xmt, \$600; Collins 550A 1 500 W AM xmt, \$600; all as-is. K Hill, WONG, POB 1151, Madison MS 39110. 859-8218.

Harris MW50A 50 kW brdcast xmt tuned to 1540 kHz, \$70,000; General Elec BT25A 50 kW brdcast xmt tuned to 1540 kHz, has PCBs, free if you dispose, disassemble & haul. P Thurst, WPTW/WFLY, POB 12279, Albany NY 12212. 518-456-1144.

TTC XLFM FM xmt, dual 1 W outputs, 106.1 in. 103.1 out, never in service, \$2500, J Bremer, KARZ, POB 492890, Redding CA 96049. 916-243-2222.

Collins 831-G 20 kW FM xmt, vgc, all new capacitors, no PCBs, new blower, 25 kW conversion kit, may be used as spare also, \$25,500 w/exciter. D Dayton, Dayton Bdcst Eng, 1907 Lincoln Ave, Mendota IL 61342. 815-538-4681.

Audio xformers: (4) Ampex 15095; (9) Ampex 4580116-20; (2) Triad A-10-J; (2) Triad A-11-J; \$15 ea. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

Collins 830D 1 kW FM xmt, \$2500; Harris TE3 exciter, \$300. E Moody, KESE. 216 E Main, Bentonville AR 72712. 501-273-9030.

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**Want to Buy**

Harris MW1 1 kW AM xmt, gd cond. Howard/Chuck, KWKY, 515-981-0981.

Any LPTV xmt, for chnl 60, 1w priced only. O Eatmon, WAHD FM, 19 W Hargett St, Raleigh NC 27601. 919-833-6259.

FM 350-1000 W mono, w/wo exciter. F Holton, WAHI-FM, Box 195, Augusta IL 62311. 412-263-6600.

FM xciter, any make/model, must work & have manual, \$100-150; also, info on carrier-current systems sought for school station, B Freeman, 526 Penn Ave, Pittsburgh PA 15222. 412-263-6600.

Tepco/Rbt Jones J317/J317-2 translator, sngl/dual 10 W output, will consider dual 1 W. J Stromquist, WNCB FM, 2828 Piedmont Ave, Duluth MN 55811. 218-722-3017.

AM xmtrs, 1 & 5 kW, prefer Nautel or Harris SS. D Sawyer, 303/451-6700.

FM xmtrs, 1000 W, 1w priced, reliable, will consider new. N Chavigny, 713-527-0034.

**WE BUY MOSELEY PCL-303, 505, & 606's 414-482-2638**

Continental 10 kW, recent model, might consider gd cond clean 10 kW Harris if reasonably priced. D Dayton, Dayton Bdcst Eng, 1907 Lincoln Ave, Mendota IL 61342. 815-538-4681.

Any 250 W FM xmt, used but gd cond, tunable; also, xmission lines to be used with above. F Smith, 615-624-7126.

McMartin AM/FM xmt, any model, exciter or stereo modules. Goodrich Ent., 11435 Mansderson, Omaha NE 68164. 402-493-1886.

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RCA/SYL/GE, 32 pieces, also carbon resistors: Canon plugs, 3 prog male & female, new; Lafayette TE22 audio gen; Sencore transistor & diode tester. Mr. Oliver, 212-874-7660.

3CX1500A7, 4CX5000A, 6146B, 4CX250B, 4CX3000A & more. We carry large inventory all major brands, Eimac, Ampere, RCA, etc. Call Stew 1-800-842-1489.

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**Want to Buy**

Xmitting tubes, 4-1000A, for back ups, need several, call collect. K Beach, 803-549-8531.

6072, 6386, 6084, 5651, 6B17, 6AQ5, 6005, ECC808/6KX8, 6JK6, ELL80/6HU8, 6GK5, 300B, 2A3, 13CW4, VF14, AC701, send brand # & S. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-377-5264.

**TURNTABLES**

**Want to Sell**

QRK 12-C (2), need little work & tonearms, \$25 ea. M Knight, 339 New Kent Rd, Blacksburg VA 24060. 703-552-5809.

Technics SL1015 DD quartz w/±10% speed adj, w/Technics EPAA501H arm, used little, local area delivery, \$800. B Rosenberg, WVXU FM, 3684 Savybrook, Cincinnati OH 45208. 513-321-0606.

Harris CB1200 w/Micro-Trak tonearm & preamp, gd cond, \$75. G Wachtler, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Howard rcrdng discs, metal core, slow burning, 6.5"/5.150, 8"/52. W Keepers, Nostalgia Tape Club, 215-338-3639.

Scully VP-131 disk cutting lathe w/Westrex 3-11AH head & lyric drive system, now working, excel cond, \$35,000. F Virtue, Virtue Rcrdng, 1618 N Broad St, Philadelphia PA 19121. 215-763-2825.

Technics SP15/SL1015 TT w/redwood or black base, Technics EPA-A501H tone arms, \$500. K Rider, Unistar Radio Network, 1675 Broadway, NY NY 10019. 212-373-4947.

Scully lathe customized by HAECO VP-131, now in working condition, excellent. Westrex 311 AM head, if interested will send full description of component parts, \$3500. F Virtue, Virtue Recording Studios, 215-763-2825 (24 hrs) FAX 215-676-8992 (24 hrs).

Technics SL1200, like new cond, \$300. A Nen. WGTK, Box 590, Middlebury VT 06753. 802-388-4101.

Technics SL 5100 (2), w/arms & cartridges, (1) w/ balance weight, \$80/BO ea. D Miller, KOOL, 1340 Richwood Rd, Detroit Lakes MN 56501. 218-847-5624.

Technics SL 1200 (4), grt cond, w/cartridges, dust covers, etc, \$300 ea. K Conner, KAMQ, 2001 W Walnut, Rogers AR 72756. 501-636-4611.

Gates TT (2); TT, not brdcast quality, BO: United Audio TT; (2) Sparta TTs; (2) Rodine Rek-O-Kut TTs; Rusco Studio Pro TT. KWYR, 346 Main St, Winner SD 57580. 605-842-3333.

**Want to Buy**

RCA, Presto disc rcrdrs & assoc equip, blanks, needles & pre-recorded acetates or pressed transcriptions. B Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Player, 16", or arm; also, 16" discs. H White, Bi-jouy Rcrdng, 8332 Collax Ave S, Bloomington MN 55420.

Turntable w/16" tone arm on standard base or custom mount. L Telles, Eli-Tea Service, 740 Bockman Rd, San Lorenzo CA 94580. 510/278-2691.

Fairchild disc rcrdng equip: 670 stereo limiter, 602 conax, 641 rcrdng system, 605 stereo preamp, 680 pwr amp, 740 lathe, 741 auto pitch, 742 cabinet; also, disc equip from Neumann, Gotham/Grampian, Presto, etc. K Gutzke, Custom Rcrdng, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

**TV FILM EQUIP**

**Want to Sell**

RCA film island, 29B camera, (2) TP66 16mm proj, TP7 35mm slide proj, 1w hrs, new tubes, like new, BO. D Brennan, Brennan Entrprs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

RCA brdcast film chain, complete, \$2000/tradedonate (you ship), B Franks, KAZO-TV32, 4501 Montgomery NE, Albuquerque NM 87109. 505-884-8355.

Western Elec 35mm film chain: passive 20-chnl console, DeVry 35mm proj, Westrex 1551 3-trk recorder, (6) Magnasync dubbers, all ancillary equip, up & running, \$10,000/BO. W Sear, Sear Sound, 353 W 48 St, NY NY 10036. 212-582-5380.

**VIDEO PROD EQUIP**

**Want to Sell**

Dubners CBG2 charac gen, complete, excel, w/CBG keyboard, (2) 10 meg drives, main frame w/memory expansion, Lambda pwr supply, bit pad, TCE 2000 encoder, some shipping cases & manuals, \$15,000/BO; General Parametrics Video Show 150 video presentation system w/writer interface option, \$300; WYSE terminal, futuristic design, BO. MRG Assoc, 95 Colony Dr, Holbrook NY 11741. 516-447-1041.

Blonder-Tongue ESM TVRO modulator, wrks grt, \$50. M Knight, 339 New Kent Rd, Blacksburg VA 24060. 703-552-5809.

CEL P156-2 digital standards converter, PAL to SECAM to NTSC, excel cond, \$4000. P Russell, Boudon College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Convergence ECS-90 controller w/JVC interface cards, time code & fade to black card, vgc. \$1200/BO. Laird CG-7000 charac gen, (3) fonts, manual, excel cond, \$1100/BO; Crosspoint 6119 SEG, excel cond, \$1050/BO. David, 516-595-3619 days.

Video Data Systems TPT-2500 video prod titler w/operator's manual, \$600+shipping. N Mishaan, POB 335, Lynbrook NY 11563. 516-582-1338.

Consolidated Video Systems/Harris 504B digital TBC, split screen effect, signal correction, xtra boards & options, excel cond, cabinet ready for rack mount, \$650/BO. Pinetucket Rcrdng, 205-826-0390.

Sony, GVG, Abekas, complete prod/post prod facility equip incl Betacam SP, BVP-7S, GVG-200, A-53D, Dubner 20K, BVE-9000, must sell as package, call for list, \$30,000/BO. T Lindberg, Eagle Media, 18842 Teller Ave, Irvine CA 92215. 714-851-9480.

JVC KM2000 switcher; Laird 1400 charac gen; Zenith large screen proj. H Larson, Matrix TV, 615 Tank Farm Rd, San Luis Obispo CA 93401. 605-544-2445.

Sony AVC3400 Rover II, complete system, camera 6:1 zoom, 1/2" portable R-R w/case, AC adapter, charger, (2) 30 min tapes, fitted case, needs battery, '73, \$100+60 lbs freight. R Boyer, BBE Inc, 165 Wensville Rd, Biglerville PA 17307. 717-677-4266.

**Want to Buy**

CVS 510 TBC instruction & service manual, copy OK. C Easlick, MESCO, 2233 Cumberland, Lansing MI 48906. 517-321-1900.

**VIDEO TAPE RECORDERS**

**Want to Sell**

Sony BVU-110 3/4" VTR w/Portabrace case, like new, \$1000. MRG Assoc, 95 Colony Dr, Holbrook NY 11741. 516-447-1041.

Sony VO-2600 U-matic (2), \$395/ea+shipping; Panasonic NV-9100A U-matic, \$350+shipping. N Mishaan, POB 335, Lynbrook NY 11563. 516-582-1338.

Beta video tape, all lengths, bulk erased, vry cln, any quantities, \$5 ea+shipping. Perry, PQ Prod, 5 Behmet Pl, Waldwick NJ 07463. 201-670-0935.

Sony VO-2630 NTSC-PAL-SECAM 3/4" U-matic (3), color video R/P, dub I/O, excel cond, \$250 ea; (5) Panasonic NV-9100 color 3/4" U-matic, need cleaning, w/RF out module, \$200 ea. J Krepol, RNLD, 7 Dustin Dr, Claymont DE 19703. 302-798-4076.

RCA TCR100A, parting out (7) machines incl 1000s of carts, will trade. K Davis, Henson Prod, 3796 Bethania Station Rd, Winston-Salem NC 27106. 919-924-8717.

**Want to Buy**

RCA TR-800, whole machines & parts. K Davis, Henson Prod, 3796 Bethania Station Rd, Winston-Salem NC 27106. 919-924-8717.

Broadcast museum wants Ampex VR1000, VR1100, AVR1, AVR3, ACR2S, RCA TRT-1, TR11, TR22, TR50, TR60, TR61, TR600 w/Super Hiband. H Henson, American Brdcast Museum, 4549 Havensrest Rd, Winston-Salem NC 27106. 919-924-0621.

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# BUYERS GUIDE

Cart Machines & CDs

## ITC Excels in Analog Domain

by Lane Lindstrom  
CE, WJEZ-FM

**PONTIAC, Ill.** Last fall, WJEZ-FM acted as a test site for the new Series 2 from ITC. With all the talk about cart machines being obsolete, I thought it was pretty intriguing that ITC was bringing out another new machine, particularly so soon after introducing its Series 1 in 1990.

But I learned that, in addition to its new digital products, ITC thinks cart machines will be around for a while, and they're not sitting still in the analog tape world.

The Series 2 is evidence that ITC still is the leader when it comes to making cart machines for real people. They've listened to some of the requests we've made over the years, adding features like Dolby HX Pro and a tape timer to make life in the production room and the studio a little easier.

However, they haven't packed the Series 2 with bells and whistles that we not only wouldn't normally use, but that would increase prices beyond our budget.

### Not a lot of guesswork

The machine's front panel provides quick and easy manipulation of functions without a lot of guesswork. Three cue tones are standard on the record/playback version, along with a meter function select button.

LED indicators are provided next to the main function buttons to signal the presence of audio, secondary and tertiary cue tones, 1 kHz defeat or looping and power on/off. LED bar graph meters are switchable for VU-type or peak ballistics metering. Anything a programming staff is going to want or need is right there up front.

## USER REPORT

Audio connections are made with XLR-type connectors on the rear panel. Remote connection is made with a 15-pin D connector. The rear panel also has a modular assembly containing an on/off power switch, fuse holder and universal AC power connector.

The power supply is a switching type, which means that no internal adjustment or tapping is needed to operate from 105 VAC/60 Hz to 264 VAC/50 Hz. That takes care of bad line voltage, a not-uncommon problem for a lot of us. Nice.

Everything is housed in a single piece steel shell, and the entire internal chassis slides right out for access to all mechanical or electrical components. The motor is a DC servo type,

with crystal-referenced phase lock loop control, the same one used in ITC's top-of-the-line 99B machines. ITC doesn't skimp on the basics. And, like the 99B and Delta, the Series 2 is microprocessor-controlled.

### Accurate reference point

The deck is a solid-cast aluminum unit, machined for accurate reference points, then nickel plated. The head blocks have independently locking, micro-adjustable set screws, which really cut down on re-

**ITC is not sitting still in the analog tape world.**

peat visits with the Allen wrench. A nice touch for us service-minded types is the cleaning mode, which lifts the pressure roller into position with the motor running without inserting a cartridge.

ITC came up with a winner in its solenoid and pressure roller linkage design. It's a unique setup that uses a latching cam. The mechanism is so efficient that it allows the solenoid to draw less current once the roller is in place. That, in turn, keeps the heat down and makes the Series 2 one very cool-running machine.

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Inside, a motherboard runs the length of the chassis. Front panel and motor electronics plug into the motherboard. When unplugged, the entire motor/deck assembly lifts right out in one piece for service.

The Record Logic, Record Amp, Play Logic and Play Amp PC boards (two boards in the play-only version) also plug into the motherboard. Access to these boards for audio alignment is a snap, and of course ITC uses multi-turn pots. I like the addition of Dolby HX Pro to help prevent bias and erasure problems in recording. A universal extender board is available.

Although its Series 1 heritage is evident in the outer package, the Series 2 is a more sophisticated machine. It boasts microprocessor logic control, high-end au-

dio circuitry, XLRs and more, but without sacrificing the user-friendly controls and engineer-friendly components.

The Series 2 is a well-built, well-thought-out package. I can see why ITC is



WJEZ found pleasing results with ITC's new Series 2 cart machine.

able to offer a four-year warranty. I may just keep them.

For information, contact Bruce Helling at ITC at 309-828-1381; fax: 309-828-1386; or circle Reader Service 132.

A Broadcast Industry

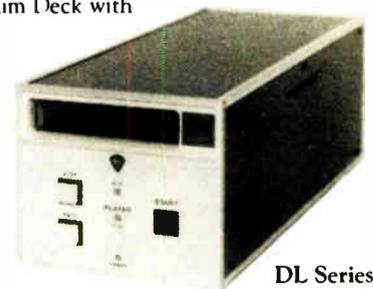
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# The ABCs of the BASYS D-CART

by **Harn Soper**  
**Manager**  
**New Business Development**  
**BASYS Automation Systems Inc.**

**SUNNYVALE, Calif.** Broadcast news journalists who use computers to cover their beat know the joys of newsroom automation. At the touch of a key they can read the wires, view the "Cast" file, open a new story and quickly word process the day's events. And, if they choose, press the print key for hard copy.

Now imagine one simple keystroke to

access and play or edit your actuality . . . all from one single workstation. You've entered the world of BASYS and

## TECHNOLOGY UPDATE

its latest addition to digital audio journalism—D-CART.

Credit for the success of D-CART goes to the Australian Broadcasting Corp. (ABC), which, three years ago, set out

on a course of realigning itself for the next century. The network chose BASYS NEWS to automate all of its news departments across Australia while also deciding to replace analog tape and cartridge machines with comprehensive digital audio editing and operational facilities.

The rub for the latter decision came when ABC found no existing digital audio system that was designed to be multi-user and cost-effective, while also addressing the needs of its radio news journalists. So they built D-CART.

### Magnetic tape

The most common recording media in radio is quarter-inch or cassette magnetic tape, which is used in open

reel and cartridge machines. Although the tape media is cost-effective, the maintenance is expensive and labor intensive. Add to this the fact that analog tape editing is tedious, time consuming and of limited archival value, and the argument for D-CART is strong.

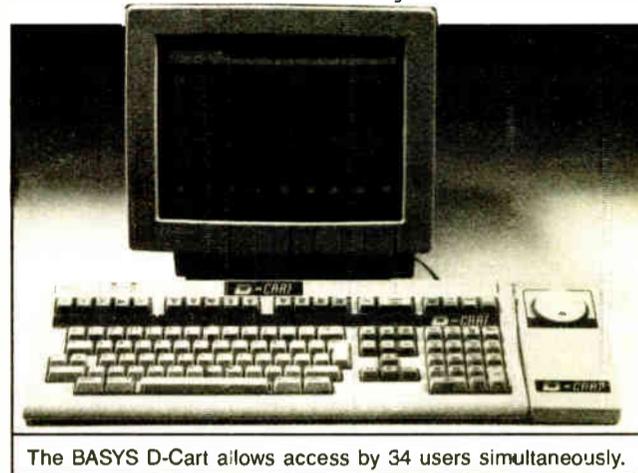
One of the most important advantages of D-CART in a radio environment is the accessibility of the system to multiple users. Up to 34 users can access a single audio item simultaneously on any one D-CART system. Stored program material can be located quickly by all, cued up and played or new material recorded in an instant. For journalists and production staff alike, editing is as easy as word processing.

### Sizeable impact

The impact of D-CART on operational issues is not subtle. For example, in master control, D-CART can be set up to take in network audio feeds at predetermined times. Bureaus can remotely call into D-

CART from anywhere in the world and record their actuality over the phone. The minute an audio feed enters the system, up to 34 people can begin to edit it immediately, each to fit their own purpose.

Security is another important factor. D-CART has security facilities as found in



The BASYS D-Cart allows access by 34 users simultaneously.

multi-user computer systems. Permission to access sensitive or inappropriate program material can be restricted by the system manager to ensure that any unauthorized audio material cannot accidentally be put on the air.

The nuts and bolts of D-CART include its running on one of the industry standard's Motorola 68000 family CPUs, off-the-shelf Winchester hard drives (infinitely expandable), fully redundant system configurations if desired for backup—all within a 19-inch rack system. The audio input is encoded using 16-bit ADCs with 64 times oversampling at selectable sampling frequencies of 32 kHz, 44.1 kHz and 48 kHz. Two audio channels are contained on one ADC module.

The balanced inputs have an input impedance of 30K ohms and the clip level of the converters are 19 dBu. The two channel output DAC modules have 16-bit resolution, 40 ohms output impedance and a 19 dBu clip level. The number of DAC and ADC modules are configured to meet the exact needs of each system and are fully expandable.

### Drive size

D-CART's recording capacity depends on the size of the drives. A standard, single 1.2 GByte drive typically can store two hours of stereo programming at 32 kHz sampling rate. Data is stored in a linear form without any compression to obtain the highest possible audio quality. Currently available compression technologies can be added if desired to significantly expand system storage.

D-CART is fully functional as a stand-alone system, setting economic, productivity and efficiency standards simply not achievable with analog systems. When integrated into a BASYS NEWS automation system, you'll have empowered your news staff to be their absolute best.

There is one downside for radio journalists, however. When the music and production departments experience D-CART, they will insist that it be shared. As was said earlier, the impact of D-CART is not subtle and the benefits must be experienced to be believed.

For information from BASYS, contact Harn Soper at 408-720-1236, ext. 200; fax: 408-720-1346; or circle Reader Service 27.

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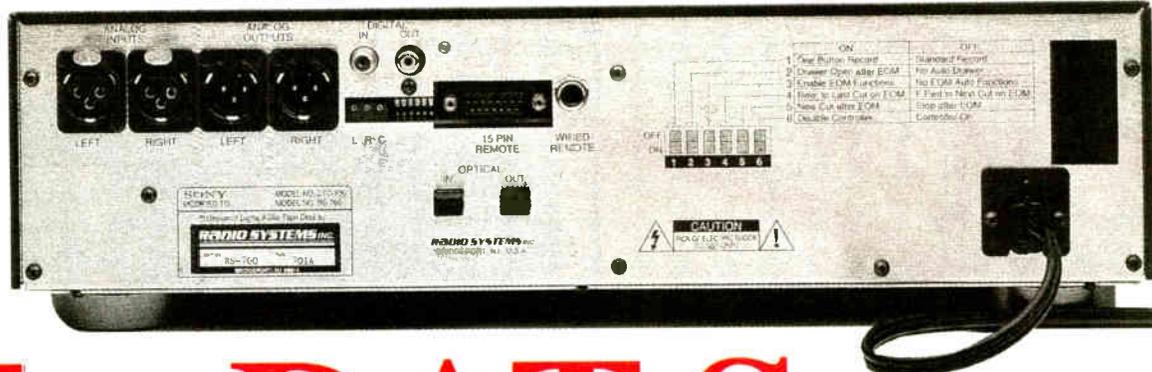
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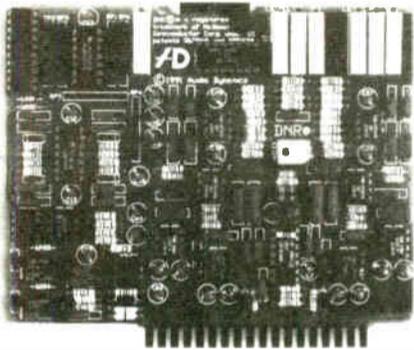
# AD-302 Updates ITC

by Steven W. Yates  
President  
Audio Dynamics Inc.

**CHARLOTTESVILLE, Va.** With the growing popularity of on-air digital audio playback systems, analog cartridge machines have become the weakest link of the audio chain for many broadcasters.

When integrated into an otherwise all-digital format, analog cartridges can demonstrate inferior audio performance, especially in the form of tape noise. To help bridge this performance gap, Audio Dynamics Inc., has introduced the AD-302 retrofit board for ITC Delta series cartridge machines.

Analog cartridge systems have a long-standing record of reliability in even the most demanding broadcast applications. Both the carts themselves and the tape



Audio Dynamics AD-302 retrofit board is made to accompany ITC Delta Series Cart Machines.

machines have earned an unsurpassed record of ruggedness, reliability and convenience that make them the format of choice for most broadcasters, despite newer digital audio technologies. By building on the platform provided by the ITC Delta series of reproducers, the AD-302 retains these advantages while providing significant sonic improvements to analog cartridge performance.

The AD-302's most obvious application is music playback for stations with all-cart formats. However, the AD-302 also can significantly improve the quality of commercials, liners, news actualities and other local productions to allow more effective integration of analog cartridges into otherwise all-digital formats.

The AD-302 incorporates a professional implementation of the DNR<sup>®</sup> Dynamic Noise Reduction System. DNR is a highly effective yet transparent non-encoded noise reduction technique that exploits the psychoacoustic noise masking properties of high frequency audio material.

Continuously analyzing audio spectral content, DNR employs carefully controlled bandwidth reduction during periods of reduced high frequency content to prevent noise unmasking. Bandwidth is increased virtually instantaneously as high frequency signal content increases, so the audio is accurately passed with no high frequency loss and no audible side effects.

Since DNR is fully compatible with existing cartridge libraries, there is no need to re-record the entire library to enjoy the benefits of noise reduction. DNR also requires no alignment, is totally operator transparent and can be disabled if desired. The DNR system on board the AD-302 provides 10 dB of CCIR/ARM weighted noise reduction for a signal-to-noise ratio of 82 dB referenced to a level of 250 nano-Webers per meter (nWb/m) at 1 kHz.

The audio path of the AD-302 is designed for optimum cartridge audio per-

formance. Traditional tape preamplifier design practices have been critically re-examined and improved upon in many cases.

The NAB equalization and tape head frequency response correction functions have been separated in the AD-302. Traditionally, these are combined in the preamplifier stage by moving the equalization curve break frequencies to accomplish head response correction.

## TECHNOLOGY UPDATE

The AD-302 preamplifier stage employs a fixed NAB 1975 equalization characteristic, which can be field-converted to either the NAB 1964 or IEC standards. The preamplifier is based on the OP-37 opamp, which offers extraordinary distortion, noise and transient response characteristics.

Both the high and low frequency equalization adjustments are accomplished by separate stages whose characteristics accurately complement playback head losses. This design enables the AD-302 to deliver a playback frequency response of 32 Hz to 16 kHz ( $\pm 0.7$  dB), and a total independence between the equalization control settings and the 1 kHz reference level.

The large overall amplifier gain is divided among a number of lower gain stages. By so doing, overall distortion is significantly reduced and closed loop bandwidth is increased for improved high-frequency performance.

The entire audio path is direct coupled, except for the DNR circuit, to improve group delay characteristics. All capacitors in the audio circuitry are either polypropylene or polyester film, selected for their low dielectric absorption and excellent stability.

Power supply decoupling is achieved with liberal use of low-impedance tantalum capacitors, and electrolytic capacitors have been avoided altogether to increase reliability. Exclusive use of one-percent metal film resistors, gold-plated machined-pin IC sockets and fully-sealed potentiometers address other common reliability problems.

The AD-302's three-tone cue detector is based on an asynchronous programmable logic device (PAL), which performs both cue tone detection and EOM logic functions.

This PAL-based design produces no high-level digital clock or data signals that can couple into the critical low-level audio chain. It also generates less heat, requires less board space, and is more reliable than either a microprocessor-based or discrete logic design. The cue detection PAL contains the equivalent of eight TTL logic packages.

Full jumper compatibility with the original cue detector is maintained and a cue detector sensitivity control has been added for increased operational flexibility.

In summary, with its on-board DNR Dynamic Noise Reduction, proprietary equalization network and asynchronous PAL-based cue detector, the AD-302 can significantly improve the performance of existing analog cartridge machines.

For information, contact Steven Yates at Audio Dynamics: 804-296-4111; fax: 804-296-4111, ext. 511; or circle Reader Service 21.

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# CD Library Compiled with Care

by **Hank Landsberg**  
President  
Halland Broadcast Services Inc.

**SIERRA MADRE, Calif.** In 1988, Halland Broadcast made the decision to produce Rock'N'Roll Graffiti, a comprehensive oldies library on compact disc. The library would feature the best and most programmable rock oldies of the 1950s and 1960s. Although we knew this was a monumental undertaking, it turned out to be even more so than we thought.

## TECHNOLOGY UPDATE

Months were spent on research. We used record sales statistics, listener request tallies from oldies stations across the country and auditorium testing. The final count was more than 1,200 songs, released on 50 compact discs.

After the playlist had been set, we began the task of finding the best-sounding recordings of these tunes. Technical quality was a prime consideration in creating the library, but finding excellent recordings of 1,200 tunes from 30 and 40 years ago is easier said than done.

Various sources were used: commercial CDs, studio analog masters, R-DAT dubs and, as a last resort, vinyl recordings. In compiling the library, our preference obviously was a digital source—either a CD or a digital copy of a studio master. However, due to the age of the material, even a digital source was not originally digital; it was an analog recording transferred to CD or DAT.

If you've ever bought oldies CDs from a record store, you've probably run into a few of these headaches: "original" versions that aren't really original, CDs dubbed from scratchy records, audible dropouts, badly EQ'd audio, audio with gross phase error (where the vocal disappears in mono), phony stereo or reverb, channel imbalance, clipped intros, chopped off endings, tape hiss, hum, etc.

Interestingly, masters of songs from the 1950s and 1960s usually sound cleaner than those of the later 1960s. In the early days of rock, most studios were limited to two- or three-track tape recorders. This may have limited the producers' creativity, but it also limited the amount of tape hiss.

In the mid-1960s, four- and eight-track recorders came on the scene, most without Dolby. More tracks created more noise.

Another common problem with much source material was phase error. Many times the entire recording was out of phase, indicating a misaligned two-track mixdown recorder. This was rectified by introducing a calculated amount of time-shift into the leading channel to restore the time alignment of the two channels. Problem solved.

In other cases, only certain instruments (or vocals) were out of phase, due to a badly aligned multitrack master recorder. In this case, the only solution is somewhat of a compromise: Use whatever time shift is needed to bring the "most prevalent" audio into correct alignment.

This usually was the lead vocal, because human voices sound very non-human when heard with the comb filter effect of phase error. Instruments are much more tolerant in this regard. The phase-correction device we used contained a combination of time-shift and phase-shift capability, and it too was calibrated for each and every song as needed.

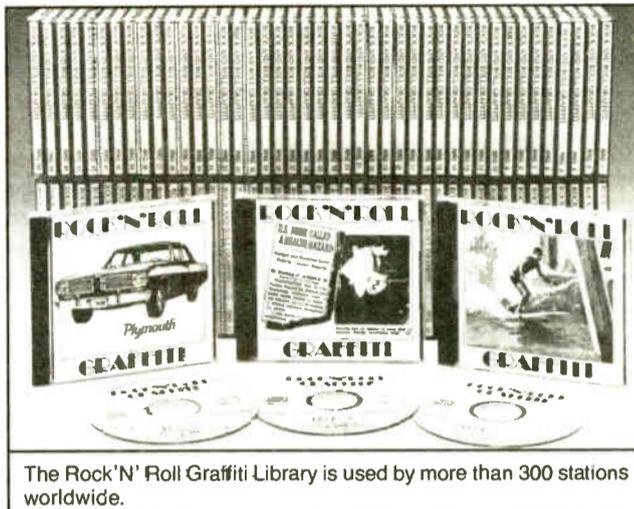
Another concern in producing Rock'N'Roll Graffiti was to eliminate the ticks and pops of vinyl. We were able to obtain a studio master for about 80 percent of the material. For the other 20 percent, either the source material was vinyl or it was a commercial CD that was made from vinyl.

With some hard-to-find material from the 1950s and 1960s (some of it obscure), it's impossible to avoid vinyl entirely. There are many songs on the library for which tape masters either never existed, or the master tapes were lost or destroyed.

We then transferred each pressing to form a composite master. If only a few ticks or pops were evident, this 30 ips analog master was manually edited. If the problems were more severe, we would transfer the material to DAT for digital processing that would virtually eliminate the ticks and pops.

"Hanky Panky" (Tommy James & the Shondells) was probably the

worst-sounding raw audio we had to work with. The master tape for this particular tune was recorded in 1962 at an



The Rock'N' Roll Graffiti Library is used by more than 300 stations worldwide.

obscure recording studio.

Tommy James never received the tape, only an acetate 45, which by then had been played hundreds of times. That 45 has

## 360 Systems' DigiCart Makes the Job Easier

by **Robert Easton**  
President  
360 Systems

**TARZANA, Calif.** Although the DigiCart from 360 Systems closely resembles analog tape carts, inside it's a 16-bit stereo digital recorder with performance specs equal to the best CD player.

## TECHNOLOGY UPDATE

We think DigiCart is the first serious challenge to NAB cart machines in several decades—and best of all, it costs the same as a mid-line NAB cart.

The DigiCart stores more than 20 minutes of stereo on a removable Bernoulli disk, about the same size as a CD jewel box. It acts a lot like a recordable CD, but accomplishes the feat with a reusable magnetic disk cartridge,

been the source of the song, used by Roulette ever since. Now you know why it always has sounded scratchy—it always was.

Problems with audio levels, channel balance and EQ were much more easily corrected, using conventional tweaking. The entire library was monitored using KEF model 107 speakers, although we monitored with Sennheiser Model 560 headphones also. CDs were played on a Denon DN950A player; all analog tape machines used were Ampex ATR-100 Series.

We used a Technics SP-15 turntable with a Shure V15-VMR cartridge mounted in a Stax UA-9 carbon fiber tone arm. The console was custom designed and built by Henry Engineering to facilitate accurate control and monitoring of the entire mastering process. Mastering for CD production was done on a Tascam DA-50 DAT recorder.

Rock'N' Roll Graffiti was first shipped to about 150 client stations in mid-1990. Since then, the library's use has grown to slightly more than 300 stations worldwide.

For information from Halland Broadcast Services, contact Steve Steinberg at 818-963-6300; fax: 818-963-2070; or circle Reader Service 143.

good for five years.

Unlike CDs, there is no limit to the number of selections that can be recorded, and each can be edited, erased and re-recorded indefinitely without degradation to the disk.

### Track record

If there is one reason broadcasters want to get rid of their tape carts, it's because they aren't reliable; so finding a technology with a proven 10-year track record became our R&D department's number-one job.

Unlike many new digital recorders with emerging technologies, the DigiCart uses a Bernoulli disk drive built for 360 Systems by Iomega Corp., one of the largest makers of computer data-backup systems. Bernoulli disks have a 10-year market history and have been sold in the tens of millions. One of the advantages the DigiCart offers over other technologies is that the disks are readily available, and can even be

(continued on page 37)



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# WOVV Is A-OK with AA-4 Carts

by Don Cook  
CE, WOJV-FM

**WEST PALM BEACH, Fla.** WOJV-FM serves Florida's Palm Beaches with a CHR format. Most of the music comes into the station on CD, as it does everywhere these days. But we have only one CD player—and it's in the control room.

All of our music programming comes off of ITC cart machines. I've yet to see a CD player that can offer the speed and ruggedness of a good cart machine.

Why don't we play CDs on the air? In the car or in a single-family home, we hold our own with the other stations in town, but like many broadcasters, we have problems reaching inside some of the big buildings. If you're trying to pick up the station inside an office building, a condo or a hotel where there's a lot of concrete and structural steel, reception might be poor.

Because of this, WOJV's owner is par-

ticularly anxious that we start out with the best possible audio quality.

## Which is which?

When he asked me about airing CDs, I just took him into the production room,

## USER REPORT

dubbed a CD off onto an audiopak AA-4, then put the original CD through one channel of the board and the Audiopak cart through another. I switched back and forth and asked him to tell me which source he was listening to.

Eventually he gave up trying to tell which was which. Of course, I was pleased that the station owner understood and approved of my choice of audiopak carts for on-air use, but I wasn't surprised by the results of the test. I've

put AA-4s up against CDs many times with many different people, and always get the same results.

The people at Audiopak tell me that AA-4s get their superior audio performance from 614 tape's special oxide formulation that supports elevated record levels (250 nano-Webers per meter (nWb/m)) with increased high frequency saturation headroom.

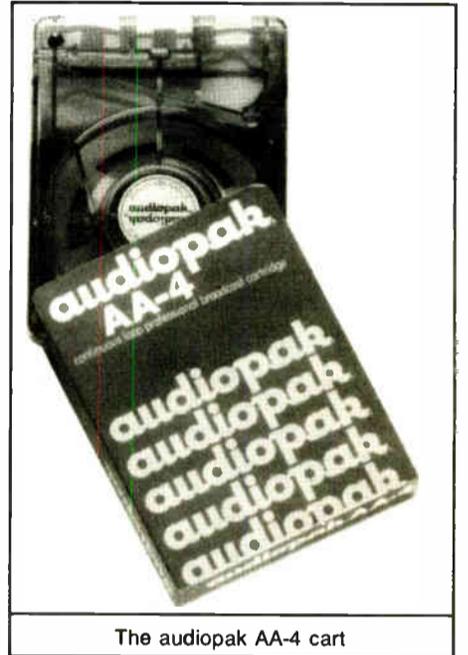
## On the scene

Four years ago when I came to WOJV, we switched from "red" carts to "true blue" Audiopak AA-4s. We have about 4,000 in the station now. Some of the music carts are still totally original from four years ago, but I'd say on average we send them out about once a year for reloading.

The Broadcast Cart Clinic in Ocala, Fla., puts in fresh Audiopak 614 tape and replaces the foam pressure pads if they seem to have lost their sponginess. It

seems the tape will last for about 600 passes over the head, so if you're playing the cart twice a day, you should get a year out of the tape. Of course, commercial carts that get played 10 times a day will require reloading after a shorter time period.

With 4,000 carts in the station and tape stock that ranges from four years to a month or two old, you might expect some



The audiopak AA-4 cart

# Dynamax Cart Cues Up Quality

by Scott Martin  
Director of Sales  
Fidelipac Corp.

**MOORESTOWN, N.J.** The Dynamax DCR1000 Series of Digital Cartridge Machines from Fidelipac is a practical alternative to the NAB audio tape cartridge machine. It combines the benefits of cartridge machines, the audio quality of CDs and low maintenance at an affordable price.

NAB cartridges have been a broadcast standard for 30 years. Historically, nothing could beat a cartridge for convenience, simplicity and cost.

Virtually all other media must be cued prior to play. The ability to insert a cartridge into a player at the last possible moment and then immediately press the Start button could not be rivaled. The simplicity of a cartridge holding a single cut (or an automatic rotation of related spots or jingles) was unbeatable. The cost of a cartridge has been stable for many years and remains lower than most other media.

serve the fundamental simplicity and convenience that made the cartridge attrac-



The Dynamax DCR1000 Series from Fidelipac features familiar options backed by cutting edge technology.

tive, while eliminating its mechanical maintenance and technical limitations.

Over the years, challengers to the cart machine—such as the compact cassette, CD, PCM, AFM videotape and DAT—have failed on one or both of these counts. Even the newest challenger, the digital audio workstation, fails the simplicity of operation test.

## Familiarity

Enter the Dynamax DCR1000 Digital Cartridge Recorder. This device operates identically to a tape cartridge machine. A 3½-inch diskette replaces the analog tape cartridge as the recording medium. Everything about the machine is familiar, from the placement of front panel buttons to the remote control interface.

The only mechanical component in

(continued on page 34)

performance variations from batch to batch. But we haven't had that problem at all. Except for tape that's worn out, we get the same dynamic range and frequency response from all our carts.

With CD-equivalent sound and consistent quality like this, I'm more than satisfied with audiopak carts. More important, so is the owner and so are WOJV's listeners.

■ ■ ■

For information on audiopak AA-4, AA-3 or A-2 broadcast tape cartridges, contact Gordon Stafford at 805-481-8278; fax: 805-481-8279; or circle Reader Service 34.

## TECHNOLOGY UPDATE

Why then have equipment manufacturers spent the last 30 years in search of a replacement for the cartridge?

### Electro-mechanical complexity

A cartridge and the equipment necessary to record and play it have a high degree of electro-mechanical complexity. Heads must be cleaned and aligned regularly. Pinch rollers, solenoids and capstan motors have a finite life. Since the advent of the stereo cart, the industry has focused on improving the technical performance of the endless loop format. Phase stability, wow and flutter, and noise have been addressed and reduced—but not eliminated.

For many years, broadcasters have recognized that it would be advantageous to have a digital replacement for the cartridge machine. This machine must pre-



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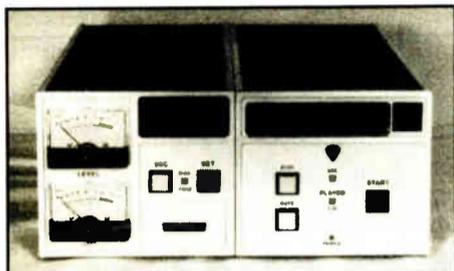
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# DL Series Aims to be Best Buy

by **Andy Rector**  
President  
Audi-Cord Corp.

**NORMAL, Ill.** Audi-Cord's DL Series is the product of more than 30 years of Carl Martin's experience in designing broadcast cartridge machines, and reflects a reversal in design philosophy trends.



Audi-Cord's DL Series is the result of 18 months of R&D.

Martin saw several things happening in broadcasting in the mid-1980s that led him to see the need for change. He felt it was time to reverse the trend of more features for higher cost and design instead for cost reduction.

Audi-Cord launched an 18-month program to design a basic cart machine that would qualify as the industry's "Best Buy." The cart machine, we think, succeeded in identifying the features that a majority of broadcasters needed on a regular basis, while discarding or offering on a limited list of options all

other features. From then on it was a continuous cost/value analysis in which each concept and design was challenged.

The result was Audi-Cord's DL series, a reliable, durable cartridge machine with what we think is the industry's lowest price tag. Another result was a change in Audi-Cord's manufacturing philosophy. Today, Audi-Cord buys few parts from outside vendors, instead preferring to manufacture mechanical parts in our in-house machine shop. PC cards are manufactured in-house as well.

### High volume

The price of electronic parts has been going down for years—if you carefully select parts that are being manufactured in high volume. We shop the world market for the best electronic values. Sometimes we take delivery on large quantities to assure the lowest possible price.

Our biggest challenge remains to find less expensive ways to build the mechanical and electro-mechanical parts without cheapening the end product.

For example, environmental concerns about chemicals have resulted in major increases in the cost of plating and anodizing. So, we went to brushed aluminum, vinyl clad aluminum and aluminum extrusions for our chassis and cases.

We also looked for ways to reduce the

size of the metal parts in ways that would reduce scrap. Our machine's infrastructure is a series of sub-assemblies, which reduced our assembly costs.

### Recorder or reproducer

The DL series from Audi-Cord is available as mono or stereo in either reproducer only or recorder/reproducer configurations. A dual recorder/reproducer makes it possible to record two cartridges simultaneously, "dub" a recording from one cartridge to another or have two independent playback machines.

Certainly, you can pay more, you can get more features and you may be able to find a machine you consider more attractive, but in these days, we like to think most broadcasters are looking for

## TECHNOLOGY UPDATE

the best value.

In this department, we will proudly match the Audi-Cord DL series against any other cartridge machine.

■ ■ ■

For information from Audi-Cord, contact Carole Pedigo at 309-452-9461; fax: 309-452-0893; or circle Reader Service 111.

# Cart Cues Quality

(continued from page 33)

the Dynamax DCR1000 is the diskette drive, which can be replaced quickly and easily. Drive replacement is analogous to head replacement in a cart machine, except that there is no subsequent alignment to be done. The entire process takes less than 15 minutes. The drive also costs less and will last longer than new heads.

This is the only maintenance required. Gone are pinch roller cleaning and replacement, head cleaning and alignment, and optimization for your favorite tape formulation. The only electrical adjustments are input and output level trims.

The DCR1000 offers additional features that were never practical in a tape cartridge machine. Each player is equipped with a countdown timer. An RS232/422 interface is provided for machine control or logging output. A built-in clock/calendar can check commercials against their kill dates, solving an important operational problem. A port is provided for a standard PC keyboard.

While not required for operation of the machine, the keyboard opens up a wealth of new options. It allows diskette titles to be entered and displayed on the front panel of the player. These titles may then be printed on diskette labels via the Centronics parallel printer port.

The keyboard saves time by allowing the most common production errors to be corrected. Secondary and tertiary

cues may be moved or their durations changed. The tightness of the dub may be adjusted after recording. The beginning and end of a cut may be previewed without listening to everything in between.

Other features include several sampling rates, which may be selected during production. Players automatically detect the sampling rate and determine whether the recording is mono or stereo. An AES/EBU digital input allows direct digital dubbing from CD or DAT without the need to set recording levels. The ability to Start On Audio at a selectable threshold level further simplifies dubbing.

The DCR1000 eliminates cartridge runout. Every cut recues within one second. This allows an announcer to preview the beginning of a selection and then have it ready to play on-air almost immediately.

The DCR1000 embodies all of the operational advantages of cartridge machines while leaving the technical limitations and mechanical complexities behind. It adds desirable new features while reducing time spent on production. The best news is that it does all of this at a price comparable to an analog cartridge machine.

■ ■ ■

For information on the Dynamax DCR1000, contact Scott Martin at Fidelipac: 609-235-3900; fax: 609-235-7779; or circle Reader Service 119.

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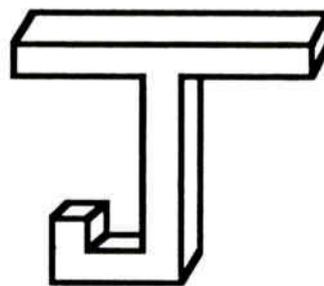
**...and to us.**

That's why broadcasters with high standards are our best customers. They know they can count on us for great deals on Audiopak, and all our lines, plus dependable service and delivery. And that's what makes for durable customer/dealer relationships. If you're looking for that "extra value," call us today.

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# Alaskan FM Warms Up to Radio Systems

by Kevin McBride  
CE, KASH/KKSD

**ANCHORAGE, Alaska** I've become a solid fan of equipment made by Radio Systems.

Need proof? Take a look in the studios of KASH/KKSD. In the last year I've installed the following here in Anchorage: four RS Series consoles, four RS DAT machines, five RS-2000 SRP cart machines and 15 RS-2000 SP cart machines. If not for my belief in Radio Systems' workmanship, I would not allow one company to place so much critical equipment in my facility.

The purchase of the cart machines was the result of an unhappy circumstance—in June 1990, the stations suffered serious damage in a fire.

During the insurance stage of the rebuild I borrowed studios that utilized Ra-

easily without the whole shooting match falling apart, which is a problem with some brands. The manual is unusually clear, and contains a section on equipment grounding that would be helpful in any installation.

## USER REPORT

The electronics use gold-plated, gas-tight connectors for true fit. All ICs are socketed. Critical pot settings are located on top of the modular boards. The record, play and logic boards lift out easily. The only circuit board that isn't modular is the servo, located under the deck, but it can be removed without removing the motor.

All those features are very good, especially in such an affordable machine.

The SRP and MRP models allow the user to access three modes by pushing the Record button multiple times: twice to defeat the primary tone, three times to engage an on-board noise generator, and four times to start the built-in splice detector. Somebody should have thought of this before.

But perhaps most impressive is the system of stereo phase correction. The compensation is done on playback, through an all-pass voltage-variable filter network that compares common elements in both channels and delays the audio appropriately. An LED display on the front panel shows the degree of phase correction required. Like most features on this deck, the system can be defeated with a jumper, but who would want to?

### Correcting jitter

A separate feature is an encode/decode method of improving the flutter performance. During recording, the machine lays a 4.8 kHz tone into the cue track, then demodulates it on playback to correct for jitter.

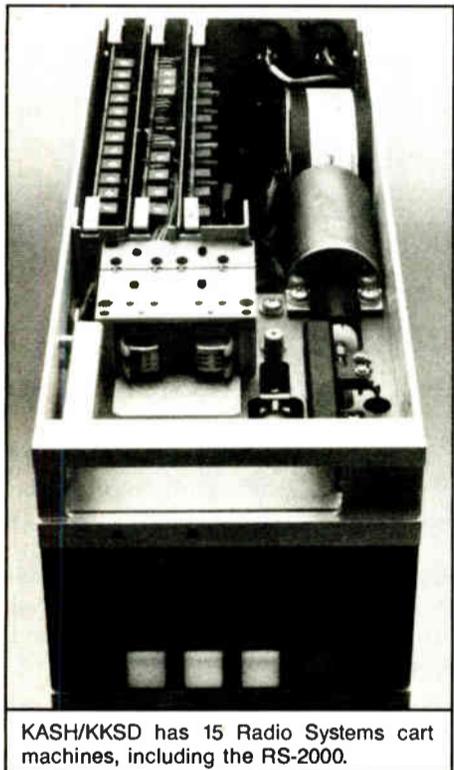
I like the way the RS-2000 is built. I like the feel of the heavy-duty chassis metal, the comfort of a direct drive DC servo motor, the tight grip of the unusual hold-downs, and the audio—the best I've heard on a cart.

My machines were certainly among the first production units; but problems have turned out to be minor, and the factory has lived up to its promise of super service. Whenever I've had a question or problem, Radio Systems has provided solutions within 24 hours. That's comforting.

I would like to say I've given the Radio Systems cart machines a good heat test, but that's tough to do in Anchorage. However, they did pass a good cold test when our station heat failed last February.

The pinch rollers—and the entire staff of the station—were a little stiff at six degrees below zero Fahrenheit, or 56 degrees below the cart machine's published guidelines. But the machines—and the staff—kept right on working.

For information from Radio Systems, contact Gerrett Conover or Paul McLane at 609-467-8000; fax: 609-467-3044; or circle Reader Service 137.



KASH/KKSD has 15 Radio Systems cart machines, including the RS-2000.

dio Systems consoles. At the same time, I learned the company was about to introduce a new cart machine.

The quality of the consoles, plus an on-site visit by design engineer Mike Sirkis (from 4,000 miles away), also helped convince me to use Radio Systems cart machines.

### Sound investment

The investment was sound; the RS-2000s have performed superbly.

They come in four flavors: SRP, SP, MRP and MP. The company does not offer a triple-decker, but they assure me you can expect to pay very little more for three separate machines, which certainly is a sounder approach technically.

Each machine is 15½ inches deep without connectors and offers Fast Forward, three tones, "cart not cued" lockout, a multi-function recording meter, roller cleaning switch and a timer. The timer is a nice touch, particularly on the play-only models.

User service is convenient. You can set head azimuth using a recessed Allen wrench adjustment on the front panel. The side plates of the machine remove

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And while relentless play tends to take its toll on conventional tape heads, the 122MKII's three cobalt amorphous heads are built for the long run, delivering crisp, clean sound that's enhanced even more by a choice of Dolby\* B, C and HX-PRO.

But even all that's not all. Because the 122MKII also features front-panel bias and EQ, +4 dBm XLR-balanced Ins and Outs and a suggested retail price of just \$1099.

For more on the broadcast deck built to work like there's no tomorrow, every day, call or write TASCAM.

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► Circle (24) On Reader Service Card ◀

# Micromax Is NewCity Standard

by Conrad Trautmann  
CE, WSYR/WYYY

**SYRACUSE, N.Y.** At NewCity Communications' WSYR-AM/Y94-FM, we had at least one cart machine from every manufacturer scattered throughout the studios, which made stocking parts quite a challenge.

Rather than purchase additional machines to round out our existing inventory of ITC Delta and Series 99 machines, we decided to see what else was out there—and standardize to one brand of cartridge machine

throughout the facility.

Pacific Recorders & Engineering is known for its Tomcat cart machine, which we have in many of our other NewCity stations. The company also manufactures a machine called the Micromax. We evaluated all of the top-rated cart machines and decided to go with the Micromax.

### Ideal feature

The most important feature we were looking for in the machine was good phase stability. In many of our older machines, putting a cart in too hard

was enough to throw out the entire alignment. We constantly had to reset tape guides to maintain good phase stability.

## USER REPORT

The Micromax has a fixed tape guide arrangement machined to maintain the exact tolerance of the tape you are using. The plastic cartridges are not seated against the guides. They are seated against an entirely flat block, which helps ensure the cart is in properly.

The guides are mounted to this block, so the cart and the guides always are in the same position. We have had only one machine in 40 get a bent tape guide—the result of a tape going in backwards.

The performance of the machines has been excellent over the 15 months that we've had them. We do a spot phase check once a month and we pulled every machine out and bench tested them at six months. Of the 40 machines, we may have had to adjust three or four, and even then they were only slightly out, not more than 90 degrees. Even recording on a Micromax recorder and then playing back on a reproducer, we found that the phase stability was rock-solid.

### Accessible service

All electronics in the Micromax are laid out horizontally on top of the machine, instead of sliding down vertically into edge connectors. All level and equalization controls are on top and easy to see. Pacific took many of the field adjustments that many other machines require and made them factory preset.

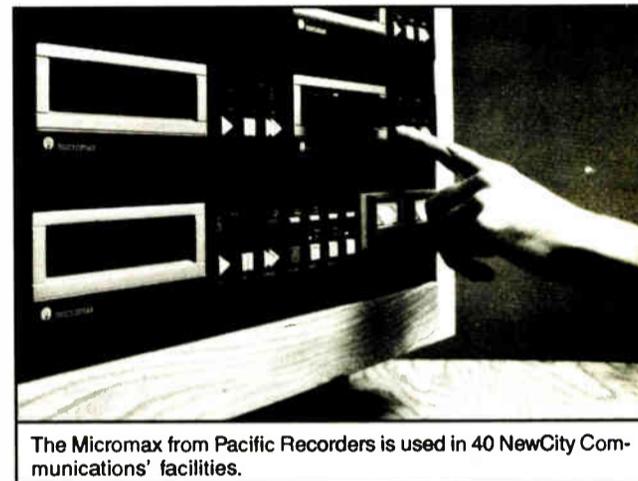
The pinch roller tension is a good example. Rather than having to adjust the solenoid pull in tension, Pacific uses a spring loaded arrangement that is preset. You never have to adjust it. And since there is no solenoid in the Micromax, the pinch roller engages quietly, rather than the "clunk" you get from many machines.

Some serious engineering went into this machine, including things such as reducing pinch roller drag by mounting it on ball bearings. Since the unit is belt-driven, the capstan also is mounted on bearings.

The belt drive, which scared us a little at first, works flawlessly. We just went through a complete wow and flutter test on all of the machines and every one still meets spec after 15 months with the same belts.

### Deck numbering

Pacific has thought of everything, even down to the programmable deck number, which eliminates sticky Dymo™ labeling or masking tape to



The Micromax from Pacific Recorders is used in 40 NewCity Communications' facilities.

number the decks.

The Micromax cart recorders and players have worked out well in the new facility, and the sound quality of the machines is far superior to the nearest competitor. From performance to serviceability, these units have been excellent and problems have been kept to a minimum.

■ ■ ■

For information from Pacific Recorders & Engineering, contact Mike Dosch at 619-438-3911; fax: 619-438-9277; or circle Reader Service 149.

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# BE DT-90A Passes Test at SER

by **Pedro Collado**  
SER

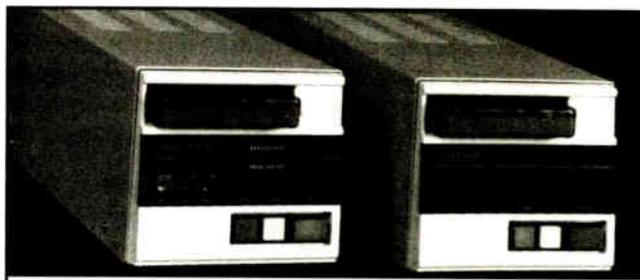
**MADRID, Spain** Sociedad Espanola De Radioifusion (SER) has placed more than 60 Broadcast Electronics DT-90A tape cartridge machines in service in the last year.

As a privately-owned national radio service, SER needed reliable, easy-to-use cart machines. After extensive evaluation, the DT-90A was selected.

The DT-90A is a well-constructed and attractively styled machine, accessible for routine maintenance. The DT-90A is built around a half-inch thick deck plate; a solid metal casting is used for the front panel.

All PC board connections are gold-to-gold pin and socket contacts and all integrated circuits are socketed. SER also

is particularly pleased that the DT-90A uses a DC servo motor, as opposed to



SER has installed more than 60 BE DT-90A cart machines over the past year.

the hysteresis motor used in the DT-90.

The servo motor, coupled with a low voltage, current-regulated solenoid, enable the DT-90A to run cool. This is further enhanced by the custom-designed toroidal power transformer

used in the DT-90A.

When delivered, the DT-90A met or exceeded all of its published specifications. The instruction manual included with each machine is thorough and complete, and includes a large number of detailed drawings and complete parts listings.

The manual also includes a detailed trouble-shooting guide and step-by-step setup and alignment procedures.

Drawbacks that we have found are limited to a softness in the Play button, though no failures have occurred. We also would like to see an option available for XLR connectors.

In summary, the DT-90A represents a good value and SER will continue to

## USER REPORT

add more DT-90As to our stations.

For information on the DT-90A, contact Ted Lantz or Bob Arnold at Broadcast Electronics at: 217-224-9600; fax: 217-224-9687; or circle Reader Service 82.

# 360 Makes the Job Easier

(continued from page 32)

be bought on weekends at computer stores.

Where DigiCart really outperforms analog carts is its ability to instantly access any spot on the disk. A Cue Select knob lets the user rapidly jump to any one of dozens of spots, while an easy-to-read display shows the name of the spot, time remaining, and other useful information.

Unlike tape carts, the DigiCart can cue up a second selection (or many more) while the first one is playing; each cue does a smooth follow-on play from the last one.

### Digital editing facilities

Digital editing facilities are a standard feature of the DigiCart. Edits can be done in the usual time-code format of Hours, Minutes, Seconds, Frames and SMPTE Bits. Even though the DigiCart doesn't

have on-screen waveform editing, it's very fast to use.

After a cue is recorded, head trims, tail trims or even fade-ins and fade-outs are done in a few moments. And if a cue's loudness doesn't match other material, the DigiCart's digital signal processing can recalculate the audio data to make it match. Loudness adjustments from +6 dB to -90 dB can be done on the fly.

DigiCarts come with a full-featured serial port using the ES-Bus communications standard. This makes them ideally suited for applications where on-screen playlisting, live-assist programming or recall from large libraries is desired. They can be fully controlled from a computer, so that the serial port gives all the capability that the front panel has.

Third-party suppliers, such as TM/Century (Dallas, Texas) provide complete live-assist systems for stations, using the

DigiCart as the central store for all spots, station IDs and jingles.

Although most broadcasters are looking at digital audio today, the big question is, "What's the most bang for the buck?"

Workstations are the big topic of conversation, because they seem to do so much. But in an on-air situation, many people don't want a computer. They want an audio recorder that's friendly and easy to use.

The DigiCart offers much of the workstation's feature set, including an optional internal hard disk and a maximum of 44 hours of full bandwidth storage. It's priced at \$3,995, which makes it the most cost-effective disk recorder on the broadcast market.

For information on 360 Systems' DigiCart, call 818-342-3127; fax: 818-342-4372; or circle Reader Service 61.

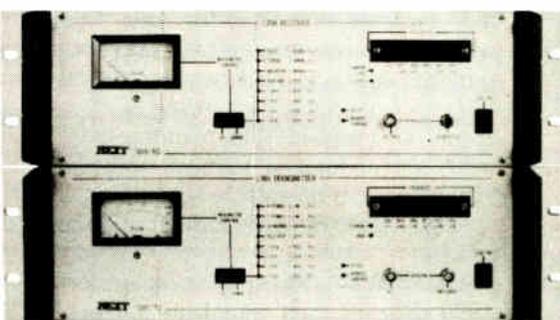
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can justify a second BEXT system (remember - two BEXT STL's mean full stereo redundancy). It handles main program and subcarrier frequencies up to 100 kHz.

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# BUYERS BRIEFS



**NASHVILLE** Studer's new D740 CD Recorder delivers state-of-the-art digital audio in a convenient, reliable and cost-effective format. Featuring the latest WORM technology, the D740 is a completely self-contained, single-package, rack-mount recorder.

Studer sound is achieved through A-D/D-A converters. The logically arranged keyboard allows convenient operation, fast cueing and easy access

to all commands.

Applications possible with this new technology include music recording demo tapes, archival storage, CD refs, jingle production and complete sound libraries.

For information, contact Dave Bowman at Studer at 615-254-5651; fax: 615-256-7619; or circle **Reader Service 127**.



**QUINCY, Ill.** The new Audiometrics CD-10 CD cart machine brings advanced features and reliability to the industry's standard CD cartridge system.

Its design includes an Autolock feature that prevents DJs from yanking a CD cartridge out of the player while it's still playing. A programmable End of Message indicator provides from five to 35 seconds of early warning that the cut is almost over.

The excessive Start lag time that plagues some CD cart players has been reduced to a barely noticeable 200 milliseconds with an advanced linear tracking system.

CD cartridges are held in a heavy aluminum deck plate, not a plastic tray. The machine features a Sony optical pickup and tracking assembly that hinge up to meet the CD via servo-driven clampers.

The CD-10 has XLR outputs and a standard 25-pin D connector remote interfacer and is designed to fit three-across in a standard 19-inch rack.

For information, contact Tom Harle at 317-962-8596; fax: 317-966-0623; or circle **Reader Service 47**.



**MONTEBELLO, Calif.** The Tascam CD-601 contains many of the advanced functions of the company's CD-701 into a half-rack package that includes Auto Cue, which starts play on the first frame of a program, an End Check function that allows user-definable monitoring of a program's end and is ideal for planning cross-fades, and an integral, frame-accurate Jog Wheel for fast, repeatable searching.

Additional features include front-panel

**SOUTHAVEN, Miss.** The Tapecaster 900 Series cart machine offers mono/stereo playback in a 5 1/4" x 16 1/2" x 6" box.

Features include a three cue tone standard with a defeat function; CMOS Logic; 600 ohm active balanced output, playback amp muting; fast forward manual or automatic; a cartridge replay indicator and front-panel LED indicators for all cue tones.

It also offers a plug-in amplifier and logic boards, motor on/off control, user-selected optical sensor for automatic selection of mono stereo and a toroid power transformer.

**NEW YORK** Frankford/Wayne Mastering Labs, in conjunction with Fuji Film Co. and Yamaha, offers write-once optical CDs for direct real-time recording.

The optical disc is the same size as a standard CD, but uses a greater level of reflection to ensure that it can be played on all CD players, professional or consumer. Tests by quality control departments at different record labels confirm the compatibility of the Yamaha PDS/Frankford-Wayne/RMG system.

A protective sheet covers the recording layer of the disc and guards it against contamination and inadvertent damage. The optical disc's capacity is 68 minutes of audio program time.

Frankford/Wayne also provides an analog-to-digital transfer service. To transfer analog or digital source material to the Sony PCM-1630 digital CD format with SMPTE time code and CD indexing information, Frankford/Wayne charges \$100 per CD project. Material must be ready for transfer with all proper sequencing, equalizing and editing complete. A log sheet showing complete program information must be supplied.

For information from Frankford/Wayne Mastering, contact Tom or Carol Steele at 212-582-5473 or circle **Reader Service 102**.

**NEW YORK** The TDK Professional Master SM Series cassettes feature the company's Super Avilyn high-bias formulation for low noise and wide dynamic range. The SM Series also employs TDK's anti-resonance cassette mechanism to ensure exceptional phase accuracy and low modulation noise.

The studio demo-length cassettes are available in 10-, 20-, 30- and 60-minute configurations.

TDK SM Series cassettes are available from Sonocraft Corp, a distributor of multi-media presentation products. For information, contact Ed Sternbach at 212-760-9300; fax: 212-564-9488; or circle **Reader Service 8**.

Variable Pitch and 12-position LED readout for detailed track information display.

With the addition of the RC601, post-production users will find the Three Locate Points useful for spotting effects, The Numeric Key Pad allows direct locating to any track, index or time reference location.

For information on both products, contact Ken Hirata at Tascam: 213-726-0303; fax: 213-727-7656; or circle **Reader Service 88**.

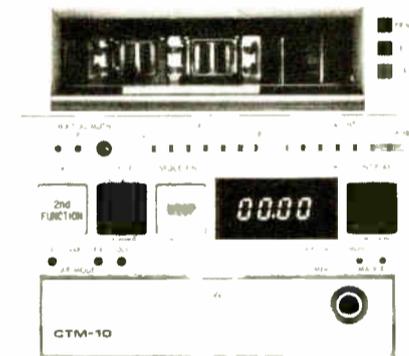
For information, contact Bob Jones at Tapecaster: 601-349-2881; fax: 601-349-2882; or circle **Reader Service 92**.



**FOSTER CITY, Calif.** The Otari CTM-10 Series NAB audio cartridge players and recorders are designed for broadcast and audio post-production professionals.

The series consists of three models: the CTM-10SR stereo record/play deck, the CTM-10MR mono record/playback deck and the CTM-10 combination mono/stereo playback deck.

The record decks use Dolby HX-Pro bias optimization circuitry, which increases the CTM-10's high frequency dynamic headroom to yield high-frequency performance at 3.75 ips, which is equivalent to non-HX performance at 7.5 ips.



For information on the Model CTM-10 cart recorder/players, contact Otari at 415-341-7200; fax: 415-341-5900; or circle **Reader Service 54**.

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Our model A-500 is a thoroughly engineered on-air console: it delivers the level of performance your clients now expect, and DAB demands. All components are selected for long life—gold bus connectors, gold I/O connectors, all gold contact switches, gas-filled relays, triple burned-in integrated circuits, solid state ON/OFF amps, and precision laminated Lexan control surfaces for a lasting, wearproof finish. And we back that up with a 3-year parts and labor warranty, complete with

factory support from a technically competent and responsive staff.

We've also handled your special requirements as well with a super family of accessories, including a choice of three different telephone modules, an intercom module, an off-line mixer module for your remote feeds, talent control stations, accessory panels, failsafe power supplies, and auto cart and CD sequencing options.

**So take a close look:** we've got the quality, we've got the innovations, and you've got our commitment to top-notch support.



## *The Better We Look!*

A-500

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These consoles give you full multitrack production capability while at the same time providing familiar program and audition busing so your production room can double as a back-up on-air facility. They free up your primary Air studio for routine calibration and maintenance sessions. They are a perfect solution for complex talk or news formats.

Beyond its on-air capability the SP-4 is a powerful production console offered in 2, 4 and 8-track formats. Production crews will love the smooth sounding equalization, the auxiliary send buses, and, of course, the full on-air type machine and console logic. There's also plenty of room for those special functions: like a phone module that can handle multiple callers, yet

doesn't tie up your line inputs: an intercom module that lets you communicate with other Wheatstone consoles and rackmount locations throughout your facility; plus a studio control module, line preselectors, tape controllers, and automatic timers.

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**The fact is.** Wheatstone's got the features, the componentry, the reliability, the performance and the reputation you can depend on.

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