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**RADIO 1991 PREVIEW**  
See our special section, pp 49-54.

# Radio World®

Vol 15, No 16

Radio's Best Read Newspaper

August 21, 1991

## RDS, Cue Paging Testing Planned

by John Gatski

**LOS ANGELES** In defending its claim that its paging system can be multiplexed with the Radio Data System (RDS) that is being proposed in the U.S., Cue Paging has announced that it will conduct broadcast tests of a hybrid system Aug. 28-29 from KLON-FM.

Cue Paging's system has been a sticking point in the National Radio Systems Committee (NRSC) attempt to come up with a U.S. RDS standard of the European-based technology.

The NRSC has been trying to incorporate Cue Paging into the RDS standard without compromising any of the RDS capabilities, which include display of station call letters, emergency alerting, and format selection.

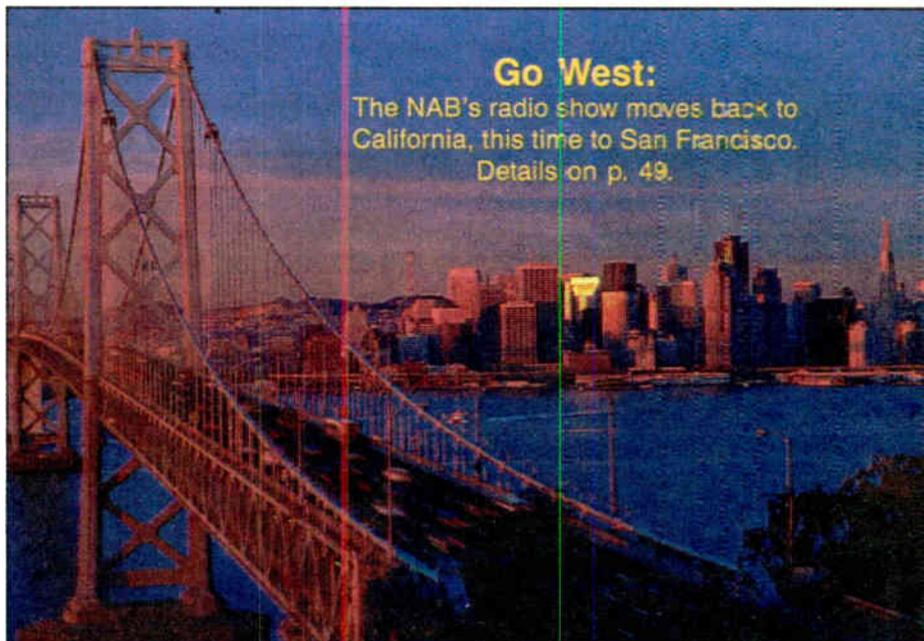
Both systems are 57 kHz subcarrier-based, but Cue Paging detractors said the service is not compatible with RDS receivers that are designed according to the European standard.

Cue Paging said a hybrid standard can work if alterations are made to the U.S. version of the European RDS stan-

dard, and if changes are made to its software.

NRSC spokesman Tom Mock confirmed that Cue Paging will coordinate the testing at KLON and the NRSC's RDS subgroup will hold a meeting concurrent with the testing. He said that RDS receiver manufacturers and the NRSC are concerned that the Cue Paging function "can slow down the access" to RDS functions.

(continued on page 13)



### Go West:

The NAB's radio show moves back to California, this time to San Francisco. Details on p. 49.

## Midwest to Sell to Harris

by Alan Carter

**MELBOURNE, Fla.** Harris Corp. plans to acquire the systems and radio frequency divisions of Midwest Communications Corp., in a \$3 million deal expected to be finalized by the end of August.

Harris announced July 24 that it signed a letter of intent to buy two of the five Midwest divisions up for sale.

Midwest's radio frequency division designs and manufactures UHF and VHF

TV transmitters. Midwest's systems division is responsible for Midwest's radio and TV turnkey projects covering satellite uplink, electronic newsgathering, and studios. The systems division also includes the company's overseas distribution arm, Midwest International.

### Under Harris Communications

The Midwest divisions will become part of the Harris communications sector, under President Guy Neumann who is based at Harris' corporate headquarters in Melbourne.

"Adding these businesses will further expand our broadcast product line, enabling us to provide our customers with an even greater breadth of products and service," he said in a prepared statement.

Details of the acquisition were not finalized, and Harris officials in Melbourne and Quincy, Ill., were not available for comment.

But Jay Adrick, executive VP and general manager of Midwest Systems, said he expected the systems division would report to the Harris Broadcast Division in Quincy under a yet-to-be-determined Harris name. As part of the acquisition, Harris will take on 57 Midwest systems employees, including Adrick.

The Harris Broadcast Division, under VP/General Manager Tom Yingst, includes Harris Allied of Quincy, manufacturer of radio and TV transmitters and antennas; Harris Allied of Richmond, Ind., distributor of more than 5,000 products; and Harris TVT of Cambridge, England, manufacturer and distributor of TV transmitters in Europe.

### Details to be finalized

For the operations, Harris will lease space from Midwest in the existing (continued on page 17)

## NAB To Consider In-Band

**WASHINGTON** Responding to criticism that surfaced in letters to the FCC and during a day-long meeting of radio group heads, the NAB's DAB Task Force has decided to consider in-band DAB systems on a "parallel track" with the European-developed Eureka 147 system.

In a move seen as backing away from the exclusive endorsement of Eureka the NAB's Radio Board made in January, Task Force Chairman Alan Box said the group had heard from four other DAB systems in two days of meetings and would hear from another four at a meeting during Radio 1991.

Box said the Task Force would modify NAB's DAB goals to reflect encouragement of in-band technologies, which are all being funded by U.S. firms.

In the meantime, Box said negotiations on a possible licensing agreement between NAB and Eureka would continue as planned, as would the push for coprimary status for L-band spectrum at next year's WARC.

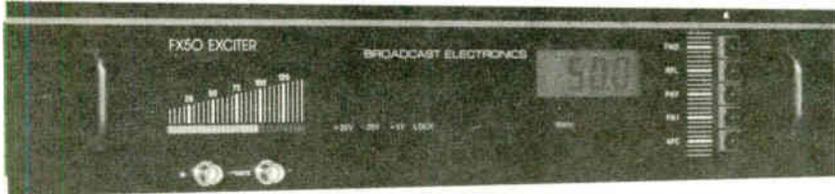
NAB has had two all-day meetings with Eureka negotiator Thierry Seuer and a third is planned for August. The original letter of intent expired on April 1, and an extension expired July 1. A second extension has pushed the deadline to December 1.

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World Radio History

## NEWS BRIEFS

### AES Nominates Candidates

**NEW YORK** The Audio Engineering Society (AES) nominating committee has named its 1991 candidates for office. The election is scheduled for Sept. 20.

The slate includes: Floyd Toole and David Clark, president; John Bubbers and Ron Streicher, secretary; Arthur Gruber, treasurer;

Russell Hamm and Len Feldman, VP Eastern Region, U.S. and Canada; Roy Pritts and Bob Thurmond, VP Central Region, U.S. and Canada; Richard Burden and Ron Bennett, VP Western Region, U.S. and Canada; Gerhard Steinke and Dan Popescu, VP Europe Region; and Tim Shelton and A.N. Thiele, VP International Region.

The candidates for governor

include Ken Pohlman, Don Keele, Neil Muncy, Peter Joss, and W. Woszczyk.

### DAB Seminar Planned Prior to 1992 Montreux

**WASHINGTON** The NAB and the European Broadcasting Union (EBU) have announced that an international digital audio broadcasting symposium will precede the 1992 NAB Radio Montreux show in Europe.

The symposium will be held June 8-9 while the Montreux show is scheduled for June 10-13.

According to the NAB, the dig-

ital session will include a post-WARC update and "possibilities for the introduction of DAB in various parts of the world." Political and regulatory challenges and the economic prospects of DAB also will be examined during the two-day event.

### FCC Lab Gets New Phone System

**COLUMBIA, Md.** The FCC laboratory now has an automated telephone "attendant" that allows people to call staff members directly and leave voice mail messages.

The new system also allows computer link to such information as how to file applications for equipment authorizations, filing fees, and filing changes for "grantee" information.

The system provides prompts to allow requests for forms, measurement procedures, and test site lists to be sent to a specific address.

Equipment authorization application status can still be updated via the Public Access Link (PAL) by dialing 301-725-1072. Status inquiries that cannot be made via computer access will be accepted on 301-725-1585, ext. 300 from 2 p.m. to 4:30 p.m., EST.

### DAB Papers Sought by AES

**NEW YORK** The Audio Engineering Society (AES) is soliciting papers from DAB systems proponents for its digital audio broadcasting session at the fall AES show. Contact David Bilalick at 914-634-6595.

### Correction

In the July 24 issue of RW, a news brief incorrectly stated that the July repositioning of Satcom C1 from 139 degrees west to 137 degrees west would require stations to reorient their satellite dishes to receive many network audio feeds.

Although Satcom C1 was repositioned, network audio feeds have been switched to Satcom C5, which remains at 139 degrees west, requiring no repositioning of station receive dishes.

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# Digital Interconnect Debated

by Judith Gross

**WASHINGTON** With more and more digital product introductions making their way into the radio market, the need to ensure that these products can "talk" to each other and still perform up to spec has become a main concern in the industry.

A handful of equipment manufacturers with digital gear has come to the conclusion that the industry could benefit from a digital interface standard for broadcast, similar to one already developed for audio production by the AES/EBU.

"If we go back to analog in between each link in the chain, then there's no interconnect problem. The problem comes if we want a digital chain all the way through," explained Bob Weirather of Harris-Allied, who was one of the first to bring the problem to light.

Harris-Allied introduced a digital FM exciter at this year's NAB show, but even before the debut, Weirather said he began talking with other manufacturers about the need for a common interface.

"We've contacted a number of companies with digital products and we all pretty much agree there's a need. The ball is in our court," Weirather said.

Among those contacted and apparently concerned about the lack of a common interface are QEI, with a digital stereo generator and T1 STL; Orban, Au-

dio Animation and Gentner, each with digital processors; Broadcast Electronics, Arrakis and MacroMedia, which introduced digital store and play products; and Dolby and Moseley who each have digital STLs.

## Data rates and other problems

Whether to use serial or parallel interfaces is one concern, according to Weirather. Another is what happens if each product employs a different source coding scheme or compression algorithm. Manufacturers are worried about multiple generations of data reduction.

But a major concern when connecting audio to RF gear in a digital chain is what sampling rate to use. Standard rates are 32, 44.1 and 48 kHz. Some equipment vendors offer a choice while others have already made the decision.

"We chose 44.1 sampling in our digital STL," noted Kevin Tam, broadcast product manager for Dolby. "It seemed logical since most stations are using CDs as the audio source on-air."

Another reason many manufacturers use at least 44.1, according to Tam, is that "the ideal for digital radio will be CD-quality, which means at least 20 kHz frequency response."

What happens when different sampling rates are employed at each step of the digital chain? "It shows up as unwanted products in the audio," said QEI's Jeff Detweiler. "And with com-

pressed audio, it may be even worse."

Detweiler and the company's design engineer, Eric Eckstein, pointed out that the problem can be overcome by adding filters or sample rate converters, or by returning to analog in between each link. But the former is costly and may affect the audio, while the latter "defeats the whole purpose of going digital in the first place," Detweiler said.

## Some solutions

"It makes a lot of sense to have some standard, hopefully an international one," noted Moseley's Jamal Hamdani. He said that Moseley suggests an "open architecture" approach.

"We should look at each block in the chain and standardize each one, so users with equipment manufactured by different companies can have compatible equipment," Hamdani said.

But QEI—which is farthest along in that its T1 STL, CAT/Link, has been on the market for some time—has proposed a solution of its own. Detweiler said that QEI solved the problem in its equipment with a 38 kHz sampling rate, one which the company would like to see become a standard—at least for now.

"An FM composite signal has a pilot of 19 kHz, and samples left and right audio at 38 kHz to make the stereo signal,"

said Detweiler. He explained that QEI would like to see the industry agree on the 38 kHz rate in a standard QEI is calling "QChain."

Detweiler said in addition to accommodating the stereo pilot, the 38 kHz sampling rate also reduces delay in the line and prevents unwanted audio products from folding back into the line.

But other manufacturers are not quick to jump on the QChain bandwagon. Many see the standard-setting process as one in which to consider future needs. "The desire for CD-quality audio, especially when DAB becomes a reality, seems to necessitate at least 44.1 kHz sampling," said Tam.

"We have a product right now, and it's a real problem for station engineers right now," said Detweiler, who noted that DAB is at least a decade away.

He and other manufacturers agreed that while there is no hard data to prove it, the general feeling is that stations may be postponing digital equipment purchases because of the interconnect problems.

Others caution about jumping to a quick solution. "It's similar to the situation we had before the MIDI standard," observed Jim Ruse of Audio Animation. "Those who got entrenched in their own way of doing things found themselves left behind."

## Cooperative effort

With agreement on at least the need for some interface standardization, the ques-

(continued on page 10)



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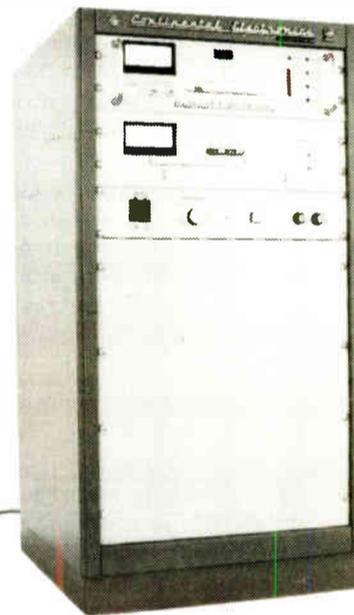
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# A Frighteningly Good Show

by Judith Gross

**FALLS CHURCH, Va.** "The FCC and the press perceive us as being a **divided** industry."

The subject, of course, is **DAB**, and the speaker was one of many who tried to put a **show of unity** on a very **polarized** controversy.

It was at the **Radio Operators Caucus** in D.C., a meeting that started at the beginning of a week of **DAB discussions**. First came the ROC meeting, which lasted most of the day and was considered important enough for an **in-person** appearance by NAB CEO **Eddie Fritts**.



Then came two days of **NAB DAB Task Force** meetings at which four systems other than **Eureka 147**—including **USA Digital**, or **Acorn**—were invited to make a presentation.

Then came some sort of culmination, which is still **up in the air** as I tap this out, so tune in next time for details.

But I love how **the press** always gets blamed for **creating** these controversies. That's right, **shoot the messenger**. I guess it was the press that **endorsed Eureka 147** before most of the industry had a chance to find out what **DAB** is.

And wasn't it **the press** who figured out that **Eureka's** set-up might mean **parity** for AM and FM or different classes of FMs? And **the press** who decided that **Eureka's** set-up might even mean **more stations** overall? And, oh, yes, the press who suggested **L-band** as a place to put terrestrial **DAB**?

But no, the radio industry isn't **divided** over these issues. That's just the **perception** of the press.

Well, we'll get a chance to find out just how **divided** or **united** the industry is at what promises to be a rip-roaring session at the **radio show**.

**They used to call it "DAB: Friend or Foe?"** until a **broadcaster at the Vegas show** pointed out that there were no **"foes"** on the panel of NAB staff and Board members.

Now that's changed. **"DAB: How Will It Affect You?"** is slated for Wednesday, September 11, and features some **vocal opponents** of the NAB's **DAB** position. That's right—if they don't agree with you, put 'em on a panel.

Anyway, on the panel is **Randy Odeneal** of **Sconnix**, the loyal opposition on the **DAB Task Force**; **Arthur Kern** of **AmericanMedia**, one of many who wrote letters to the FCC opposing the NAB's policies on **DAB** (see below); and **Ron Strother**, who has on more than one occasion taken the association to task for some of its **DAB** maneuvering.

Taking the heat for the NAB are **Alan Box**, Task Force chairman, and Senior VP of Science & Technology **Michael Rau**.

Don't you think they should call it something else? How about **"Digital Altercation?"** OK, gentlemen, come out with your dukes up and no hitting below the belt.

Then there's the **Fourth Digital Radio Seminar**. It's on **Friday the 13th**. No fooling. Just to be sure we get full coverage, we'll be sending a **special correspondent** to that one. We've included his picture. By the way, his name is **Jason**. And he really has a way of dissecting a good story.

Those **letters to the FCC** I mentioned earlier were part of that letter-writing campaign started by **Randy Odeneal**. He asked station groups who **disagree** with the NAB's **DAB policies**, endorsement of **Eureka** and/or preoccupation with **procuring L-band** spectrum to make their views known to the Commish.

Well, the tally so far is **37 against** the NAB's policies and **L-band**; four more **against L-band** for **DAB** in general; and four neutral letters **urging caution** on the FCC's part (as if they needed another rea-

son to go slowly).

Three, count 'em, **three letters** poured into the FCC supporting the NAB's **DAB** position. They were all written by **NAB Radio Board** members.

Well I've had enough of **battling** over controversial things like **DAB**. Let's turn to

**pliance remotely** through the modem to make sure you aren't cheating by **overmodulating**.

If you **overmodulate**, they tell you and you have **12 hours** to correct it. On your **third** overmodulation, you're out, just like in baseball.



DAB: Fiend or Foe?

something more **tranquil**, like **modulation monitoring**.

Right. The battles over **how loud** and over **how to measure** how loud continue despite the fact that citations for same are few and far between. But those who might speed are put off by the absence of clear, stated methods for how the radar works.

So the concern over how **new monitoring devices** are treated by the Field Operations Bureau persists.

Not to worry, says **Eric Small**. His company, **Modulation Sciences**, now has a **special guarantee** for **ModMinder**, which fostered the controversy over monitoring in the first place.

It's like this. You get your **ModMinder**, set it for **FCC mode**, add the demod and a **modem** that you connect to your transmitter phone. Then you adjust it so you don't **overmodulate**. **Mod Sci** checks com-

Now for the **guarantee part**. As long as you stay with the program, you should never get a **citation for overmod**. But if you do, **Mod Sci** will take care of your **defense** and **pay any fines**. Sorta like a radar detector manufacturer offering to pay your speeding tickets.

The competition isn't **clamoring with praise**, however. Nor are there plans for the **other mod monitor manufacturers** to follow suit. In fact, they think the whole idea is moot, since they say the FCC cites **few stations** for overmodulating anyway.

And I've about had my fill of the **battlefield** for one day. See you next in the city where **Tony Bennett's** heart was left. Now **Jason**, put down that knife. Jason, I mean it, Jason . . .

Heard a juicy tidbit? Spill your guts to **Earwaves** by faxing JG at 703-998-2966 or writing to P.O. Box 1214, Falls Church, VA 22041.

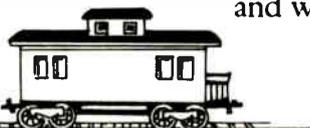


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### More on avionics

Dear RW,

Since an incident last year in our market in which an air crash was blamed by a pilot on RFI from radio stations, I have been hesitantly considering writing to RW regarding the inter-agency battle between the FCC and the FAA about receiver standards for aircraft navigation and communication. Tests done by both the FCC and the FAA seemed to reveal that the problem was a combination of the design of and the maintenance of the radios in private and rental aircraft, and not a problem with compliance with the transmission standards for these broadcast stations.

In the Miami, Florida market, there is a large ad hoc antenna farm located between four major airports. In this case, there are about 50 broadcasters of both television and FM radio and a huge number of two-way and special service users on a collection of tall towers (up to 1,050 feet) that stretches over about five miles from west to east on a line between these airfields. In all cases the airfields and the towers are spaced on acceptable distances as defined by the FAA. Also, the FAA has recently given approval for

the construction of at least one additional tall tower in this "farm" which seems to support the idea that the FAA has no problem with the existing spacing restrictions applied to these facilities.

I guess then that the question here seems to revolve around a "control" issue, not a technical issue.

The technology seems to be clear . . . so clear that the FAA is insisting upon upgrades for aircraft communications equipment. This upgrading is *not* because of errant broadcasters or others who are polluting the sacred airspace of the FAA near airfields, but simply because a good bit of the "radio" product out there for use in airplanes is junk. I can say this with such resounding clarity because of the previously mentioned series of tests done in this market by both the FCC and the FAA.

This testing clearly showed that the root of the problem is not in the antenna farm, but in the cockpit, with radios subject to receiver-induced problems with reception. Most of those problems seem to be in private or rental aircraft where either the pilot/owner or the rental company don't wish to invest in anything other than minimal equipment.

As reported to a meeting of station owners, managers and engineers in Boca Raton a little while ago by the FCC, the tests done seem to indicate that there are three grades of equipment: one for the low-budget private aviator, the middle perhaps for the rental community, and the third for the commercial aviation companies. Perhaps there are also three "maintenance levels" depending upon the class of service, or the budget.

This is not meant to imply that private aircraft owners are somehow "restricted" in the type of apparatus they purchase . . . rather, that the acceptance by the FAA of the lower quality radios gives the pilot a false sense of security in the products he uses or purchases. After all, if there are three radios on the shelf ranging from \$500 to \$4,000 in price, "why spend more than you have to if the FAA says they all comply with the rules?"

A person in the rental business will typically not spend more than is necessary to comply with regulations, as this cuts into the profits. That's good old American business sense, right?

I'm not a pilot so it's easy for me to say that I would not like to hang under a pair of wings talking through some of the trashy gear that I understand is up there. I kind of suspect that anyone who can afford a plane and likes to "pilot" as a hobby can probably afford to buy a first class radio set, and anyone who rents a plane for hobby flying can make a believer out of the rental guy by insisting upon first class equipment in anything he rents.

Refuse to rent junk, spread the word, and see how fast the rental guy shapes up.

In a recent issue of RW's *Readers Forum*, Gordon Pugh, a professional engineer, a pilot and a ham, points to a potential problem with the aviation com-

Each year the NAB offers radio broadcasters two chances to meet with their colleagues, see the latest in equipment and hone their professional skills by attending industry-wide conventions. The spring show is long gone, but the Radio 1991 convention in San Francisco is just around the corner. Be sure to attend.

As the smaller of the two shows, Radio 1991 provides engineering seminars alongside management and sales offerings at a less frenzied pace than its spring counterpart. This enables GMs, engineers, programmers and sales people to check out sessions they might skip at the larger show.

In particular, managers should note that the technical sessions don't focus exclusively on numbers and hard science—although there's enough of that to whet

even the most jaded engineer's appetite. The NAB fall show also approaches technical issues from a management perspective, with panel discussions on upgrading facilities and regulatory issues such as maintaining compliance with FCC rules.

Also, as the smaller show, the overall number of sessions is fewer at Radio 1991. Engineers should take note of that, and make an effort to attend at least some of the more management-oriented

## Radio '91: It Pays To Attend

sessions they might otherwise overlook.

By taking advantage of these various offerings, GMs, owners and engineers alike can learn more about what it's like on the other side of the fence. That's important because it makes each group more aware of the other's problems and concerns.

Then, of course, there's the exhibit hall. Although all manufacturers may not be in attendance, the majority are looking to Radio 1991 as a good way to display their products to the widest possible range of radio professionals—free from the distractions of television equipment manufacturers that dominate the spring show.

Also, Radio 1991 exhibitors have had five months since the Las Vegas gathering to get feedback on the products they introduced there. These five months have taken some products from prototype to beta test, or from beta test to ready-to-ship. Attendees can see a more mature version of new technology.

Invest in attending Radio 1991 in San Francisco. It offers a well-rounded view of the state of the radio industry. Then learning more can help you make your station operate more effectively—and that means a healthier bottom line to pay back the investment.

—RW

## Radio World

Vol 15, No 16 August 21, 1991

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**Radio World** (ISSN: 0274-8541) is published semimonthly by Industrial Marketing Advisory Services, Inc., 5827 Columbia Pike, Suite 310, Falls Church, VA 22041. Phone: 703-998-7600, Fax: 703-998-2966.

Second-class postage rates is paid at Falls Church VA 22041 and additional mailing offices. POSTMASTER: Send 3579 forms and address changes to Radio World, P.O. Box 1214, Falls Church VA 22041. Copyright 1991 by Industrial Marketing Advisory Services, Inc. All rights reserved.

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Radio World  
September 11, 1991**

munity pressuring the FAA to fight so they don't have to spend the money to upgrade. Granted, Mr. Pugh and his colleagues will need to open the pocketbook and part with some cash to upgrade their equipment, which is no doubt an unpleasant prospect. (I'm trying to think of how many private pilots I know, out of the thousand or so people with whom I can claim a "talking" relationship. I've come up with about three.)

Regardless, I concede that this can be a very real political problem, so I want to ask aviators a simple question:

"If the agency which is responsible for your safety in the air (the FAA) and the agency which is accepted as being the most expert in radio transmission and reception (the FCC) both agree that your radio might be sub-adequate in its performance, do you really want it in the cockpit with you?"

There is some history which may make the problem more understandable. Radio antennas and airports started to be built in about the same places because they were both built on "waste land" that was A) out of the way, and B) cheap to buy. When this whole thing started, there weren't many flyers, but there were a fair number of broadcast properties. Certainly flyers don't want to have to go to an airport that's a long distance from home, and broadcasters also need to be close to their communities of license.

It's a problem. Growth in both industries has not helped, but the number of private/hobby pilots has grown by at least an order of magnitude over the increased number of broadcasters.

Let's look at the cost question. Technology has changed radically in recent years—it is very possible to build a first class receiver for an airplane that is reasonably priced, so that can't be the problem. My understanding is that the FAA requires inspections of all the stuff

you fly in and with on a very regular basis, so that can't be the problem either. Is it possible that the FAA simply didn't keep up with technology? That's not an accusation, but an honest question. Is it equally possible that the FAA didn't ask the guys who know the most about this stuff (the FCC) for advice "because you just don't cross agency boundaries?"

Politically, the problem seems to be that there are an awful lot of private aircraft out there of which a good percentage may need upgrading at very serious cost industry-wide. I would suspect that the FAA finds this solution to be the least acceptable . . . telling the aviation community that they need to spend a few bucks and upgrade their equipment . . . not to protect themselves from us nasty broadcasters, but to ensure their own safety.

Kind of makes it look like the boys at FAA dropped the technology ball. For any agency charged with the responsibility of making its charges safe and secure to hesitate to implement better technology seems a touch irresponsible.

If I were a pilot, like Mr. Pugh, I would not speculate on the cost factor involved in using sub-adequate equipment, but would be writing to the FAA demanding to know why they weren't on top of this and doing something about it long ago.

If I were the FAA, I would go to the FCC and say, "Boys, you are the experts, tell us what the best way to do this economically is, and we'll adapt to your thinking." After all, you don't diagnose your own illnesses do you? You go to a physician who is trained and specializes in that kind of work. In turn, he calls you when he needs your specialty.

As far as broadcasters are concerned, our industry has often insisted upon changes in the regulations that ended up costing this industry lots of money

(continued on page 18)

# “Other guys imitate us, but the originals are still the greatest.”

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# STLs Enter the Digital Domain

by Judith Gross

**SAN FRANCISCO** As radio heads toward its digital future, no one can accuse STLs of being the archaic link in the chain. This is the year the digital STL has come of age.

At Radio 1991 there will be a new entrant in the field: Dolby, which plans to introduce its DP 5500 digital STL, a digital system and STL transmitter-receiver.

This past spring, Moseley, a company which has already built a reputation on STLs, introduced its DSP 6000 digital STL.

The benefits of going digital with STLs, in addition to just preparing for the future, make it practical for a station to make the change before the days of DAB arrive.

Digital technology offers a more robust signal over longer distances, which is of special concern to stations that are now at their distance limit or are contemplating a site change that will put them at that limit.

For stations not facing that problem, digital may just mean less "work" (and perhaps power) to get the same signal quality. In addition, the needs of narrowband frequency users have not been ignored.

**New entrant**

The introduction of a digital STL marks Dolby's crossover from the audio field, where its name has become a standard, to the RF side of the business.

The Dolby STL includes source and channel encode and decode, RF transmitter and receiver all in one, and is a replacement for a station's current STL, according to Dolby Broadcast Product Manager Kevin Tam.

"It takes a left channel, right channel, SCA and voice channel, converts each to a digital stream separately, then puts all of it into less spectrum than the 300 kHz of narrowband STLs," Tam explained.

As to Dolby's foray into RF, Tam said, "The secret of digital STLs is really in the audio coding, with the RF part a bit easier to tackle."

Dolby has already solved that problem with its own source coding algorithm, AC-2, which offers 6:1 compression with a delay time of 10 milliseconds. Tam pointed out that the compression scheme has been modified to achieve the 10 millisecond delay.

The delay introduced by data compression has fostered an ongoing industry debate. The crux of the question is: How important will on-air monitoring be in the future? Some engineers feel it is critical and that any delay is unacceptable.

Others feel that on-air monitoring may have to go the way of transcription machines. But Tam says that Dolby design engineers feel 10 milliseconds is tolerable.

**Moseley's approach**

Moseley's DSP 6000 takes an "open architecture" approach, according to Jamal Hamdani, the company's marketing director. "It can be a complete digital STL, or a station can use its current STL transmitter-receiver and just add digital encoding and decoding."

The Moseley digital STL includes a source and channel encoder and decoder and the company's analog STL 6000 series. "We wanted to preserve a station's investment in its current STL," Hamdani said.

While Moseley's design calls for the digital portion to operate with its analog STL, Hamdani said that "theoretically, it should work with other STLs if they meet the requirements for accepting digital."

The compression algorithm in Moseley's digital STL is apt-X, which several broadcast manufacturers have chosen for its short delay time of three milliseconds.

"People are looking at short delay times for monitoring," said Hamdani. "They also want to maintain their current levels of processing and the apt-X algorithm maintains more of the infor-

rowband users.

Hamdani noted that Moseley offers users a choice between 300 and 500 kHz, depending on the congestion of the frequency in their particular location.



STLs, like the DP5502 from Dolby (above) and Moseley's DSP 6000, are the latest digital link in the broadcast chain.

mation than other compression algorithms do."

**Narrowband accommodated**

Both companies are offering 15 kHz frequency response, although Dolby's STL samples at 44.1 kHz and Moseley's at 32 kHz.

Tam said Dolby chose 44.1 because more and more stations are using CDs as their main source of music. "But we are restricting our frequency response to 15 kHz for stereo FM," Tam said, pointing out that this would no doubt change once DAB becomes a reality.

Both companies also offer a stereo generator as an optional product.

The chief competitive features come with Dolby's claim for "better spectral efficiency."

"We're marrying our audio coding with a carefully selected appropriate modulation scheme to achieve the spectral efficiency that we want," said Tam. He declined to name the modulation scheme employed.

Tam said that the entire signal, left and right, SCA and voice channels, can fit into 300 kHz bandwidth, critical for nar-

A second point of competition is the "installed base" versus "new buy approach."

Moseley believes stations will want to buy fewer new boxes in a time of economic sluggishness. But Dolby points out that current analog STLs can become a station's back-up.

Dolby plans to begin shipping digital STLs early next year, Tam said. He noted that the price, not yet set, will be "in the mid teens."

Moseley has begun shipping product and says its digital STL, including transmitter and receiver, is priced at \$12,995.

As far as Dolby's entry into the field of RF, both companies are ready to face the competition.

"Competition is good," Hamdani said. "We've already made our name in analog STLs. A digital product from us is the next logical step."

"We've built a good, solid reputation in the audio industry," Dolby's Tam noted. "We're staking our reputation in the radio industry on this. It would be foolhardy to go into a new industry without a reliable product."

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# DAT Royalty Agreement Reached

by John Gatski

**WASHINGTON** Professional digital audio recording devices will not be directly affected by a recent recording industry/manufacture agreement requiring royalty levies on consumer digital audio recorders and blank media, if such an agreement passes into law.

After several years of resisting royalty proposals for DAT recorders, manufacturers have finally agreed to music publishers' demands for a royalty fee system that could be distributed to publishers and artists.

The agreement, made in July, covers DAT as well as the upcoming Digital Compact Cassette (DCC) from Philips and the Sony Mini-Disc.

## Pushing for quick action

Supporters of the digital audio royalty agreement have been pushing to get legislation introduced into Congress very quickly. At press time, action was hoped for as early as late July or the first part of August.

DAT supporters said they hope the agreement finally settles the four-year-old controversy over copyright that has sharply curtailed the product's market penetration.

Key industry players including the Electronic Industries Association (EIA) and the Recording Industry Association of America (RIAA) agreed to support an eight percent levy on recorders with an

\$8 limit on single decks and \$12 on dual decks. Blank tapes would be subject to a three percent fee.

The agreement also calls for legislating the Serial Copy Management System (SCMS), the Philips-developed technology that does not allow a direct digital DAT recording of a CD to be copied. DAT manufacturers tried unsuccessfully to get SCMS legislated as a way around

## Professionals definitely would benefit from the legislation . . .

royalty fees on hardware and tapes in 1990.

Professional DAT recorders, consumer audio tape recorders and video recorders that have digital recording capability would not be subject to the fees on recorders, or the SCMS provision, according to the agreement.

Agreement details, however, are not clear as to whether professional stores selling DAT blank tapes would be subject to the levy or whether such tapes would be exempt.

EIA Consumer Electronics Group VP Gary Shapiro said the issue of tape levies is not spelled out as clearly as the exemption on professional recorders, but the intent of the agreement is to also ex-

empt professional tapes or digital discs.

Professionals definitely would benefit from the legislation if it allows manufacturers to aggressively market DAT products, according to industry analysts.

A major consumer demand for DAT will mean lower prerecorded tape and accessory prices that will benefit both pros and consumers. Right now, DAT is a minimal product in the consumer tape recorder market, garnering much of its sales from the professional realm, according to market surveys.

## Reverse the trend

Many analysts blame the lagging sales on timid DAT marketing due to the music publishers' legal threats.

Music publishers had threatened companies with litigation if they brought DAT decks into the country with direct CD copying capability, unless some type of royalty system was employed. Their argument focused on DAT's ability to copy CDs "perfectly," thus decreasing consumer demand for pre-recorded music.

The publishers did follow through on one suit in 1990, following Sony's introduction of a line of SCMS-equipped consumer DAT recorders. That suit has been dropped as part of the new agreement.

Despite apparent industry consensus, which often impresses Congress, a digital audio recorder royalty law's passage is not totally assured, according to Denon of America President Bob Heiblim, who supports the levies.

Denon produces both professional and consumer DAT recorders and a professional CD recorder.

## An amicable agreement

"I think that this agreement is very, very good," Heiblim said. There is a real value in being able to sell this stuff. If this is the only way to do it, so be it."

But, he cautioned, "we don't know if it will pass."

Heiblim said members of Congress may remember that the companies now supporting the levies are the same ones who opposed them in years past. He said Congress could be wary of support from companies who once opposed royalties on a right-to-tape principal, but now support the levies because they want to make money from a larger DAT market.

Also, Heiblim noted, if the royalty law was challenged in court, it could be struck down, based on the 1974 U.S. Supreme Court precedent that upheld private use of video recorders.

Heiblim added, however, that similar royalty systems have been put in place in European countries such as Germany, and they work.

Even though initial reaction from manufacturers has indicated that they would absorb the royalty fee costs if the law is passed, the cost is likely to be passed on to consumers, according to one DAT manufacturer.

Audio industry analysts predict, however, that a levy added onto a consumer DAT or other type digital recorder's price will not be the determining factor in buying the product—except when comparison shopping.

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# DAT's Use by Radio Increases

by Frank Beacham

**NEW YORK** A recent survey of audio professionals indicated that nearly 60 percent plan to own DAT equipment by 1993 and that explosive growth of the digital audio format is expected to come from the ranks of radio broadcasters.

The Professional Audio Marketplace, a survey published by New York-based Sheer and Chaskelson Research, claims the DAT audio format already has penetrated 22.1 percent of the total professional audio market—mostly in commercial recording applications—but will climb to 57.3 percent by 1993.

By mid-year, only 7.7 percent of radio broadcasters reported owning DAT equipment, but 36 percent said they plan to buy DAT equipment by 1993, according to the survey. DAT far outdistanced other digital recording media in the radio market, including magnetic floppy disks, magnetic hard disks, WORM disks and multitrack digital tape.

Several industry sources involved in DAT sales felt the results of the Sheer and Chaskelson research, as it relates to the radio market, are understated.

"I don't think it is possible that the percentage is this low," Radio Systems President Dan Braverman said of the report's data on DAT penetration at radio stations. "It has got to be that 20 to 30 percent of commercial radio stations own DAT equipment of some type today and 80 to 90 percent of public stations now own DAT."

### A bit conservative?

"We've sold about 500 machines and there are about 10,000 radio stations. That means we've sold about five percent of the stations alone and we've certainly not sold more DATs than several larger companies," Braverman said.

Other DAT manufacturers agreed with Braverman. "Their number sounds very low to me," said Art Gonzales, Sony's product manager for non-time code DAT products. "We have no printed number anywhere, but my personal guess is DAT is already in at least 10 to 15 percent of radio stations."

Panasonic's Chris Foreman also felt the survey's numbers were low. "Among commercial stations, I think it's more like 20 percent and among public stations about 50 percent," Foreman said.

Michael Garrison, owner of The DAT Store in Los Angeles, said he has sold DAT machines to about 250 individual stations in North America and most of those stations bought several machines. "Most of our sales have been to major market stations and owners of multiple

market stations," Garrison said. "If that survey were correct that would mean we sold two and a half percent of all machines to radio stations. I don't believe that could be true."

Sheer and Chaskelson partner Douglas Sheer stood by the accuracy of his survey. "Manufacturers have a tendency to inflate their sales. Our survey is statistically sound," he said.

"We presented the potential respondents a laundry list of possible important technical trends," Sheer said. "In this case, the list included virtually all the possible digital formats. We said, 'OK, take out your crystal ball and put on your thinking caps. Tell us your perception of what you think is going to be the dominant format by 1993.'"

### Sound data

"It is not so significant that 36 percent of the radio stations said DAT," according to Sheer. "For example, at TV stations it was 41 percent and at commercial recording studios 81 percent. What is important is that of all the formats presented to radio stations, the highest ranking went to DAT, and it was clearly twice as many as the nearest runner-up, which was magnetic hard disc," Sheer said.

"My perception of this survey is that DAT represents not only competition for cassettes—which are kind of yearning to be replaced—but also will be competition for CDs," Sheer said. "Because (with DAT) you have a recordable medium and I think that will appeal to a lot of people."

Braverman, however, said DAT will never replace the cart in radio stations. "DAT is great for recording network feeds and for automation but we do not recommend it for short clip formats such as spots, PSAs or music cuts. The reason is that DAT has cueing accuracy

problems, it is not as rugged as the cart and you can't do random access computer control. It will be hard disks for spots," Braverman said.

DAT was originally introduced by Japanese audio manufacturers as a consumer replacement for the analog audio cassette. The format has gained little acceptance among consumers because of a prolonged dispute between manufacturers and the music industry, which held up the release of pre-recorded software.

The format, however, became an instant hit in commercial recording applications where its low cost, convenience and high quality were quickly recognized. Audio manufacturers are now positioning newly-designed professional DAT recorders with time code and editing capability as a replacement for analog reel-to-reel two-track recorders.

### The survey says . . .

The overall Sheer and Chaskelson survey covered 25,000 radio stations, TV stations, video and film production and post houses, commercial recording studios, at-home professional studios, at-home amateur studios and sound companies. Respondents picked magnetic hard disk as second most popular (22.3 percent by 1993); magnetic floppy disk as third (14.5 percent by 1993), and magneto-optical disk fourth (10.3 percent by 1993.)

About 4,000 radio stations received questionnaires, Sheer said. Responses were received from 131 of those stations. That number, the researcher said, is

sufficient for a statistically sound survey.

Radio System's Braverman questioned whether accurate information can be obtained by polling radio stations.

"A large percentage of stations don't have an engineer on staff. They have a contract engineer, so the engineer is not filling these things out. They have a general manager or owner who half the time doesn't know what the equipment is and the other half of the time is on the air himself and is too busy to answer this



DAT use by radio stations is increasing. The survey numbers however, have been questioned.

stuff. These surveys are often filled out by secretaries that don't know the answers," Braverman said.

"We (Radio Systems) tried to do product research by actually asking radio stations," Braverman continued. "You either get the most inane answers or none at all. Finally you have to use common sense."

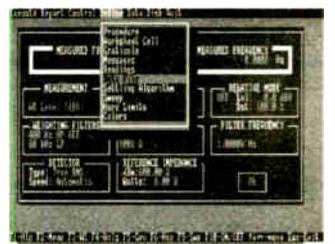
Sheer's response: "I agree with much of what Dan says about the problems of surveying. In fact, the whole audio industry is problematical. There is some confusion. But remember this is a survey and no one knows with absolute certainty."

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# No L-Band WARC Accord Yet

by Judith Gross

**WASHINGTON** Discussions about procuring L-band for DAB are continuing "at the highest levels," according to behind-the-scenes sources. But as next year's World Administrative Radio Conference (WARC) looms closer, no agreements have been reached.

Meetings have taken place and are continuing between FCC Chairman Al Sikes and the National Telecommunications and Information Administration's (NTIA) Janice Obuchowski, as well as their respective staffs.

There is no official deadline for a de-

cision on DAB spectrum, although proposals for WARC positions are supposed to be submitted well in advance of the conference.

The FCC recommended that some L-band (1500 MHz) and some S-band (2300 MHz) be set aside for DAB—or BSS (sound) as it is called on the WARC agenda. Presumably, any spectrum allocated for DAB would include terrestrial and satellite systems.

The NAB, meanwhile, hopes to get enough L-band to accommodate current radio licensees with terrestrial implementation of the Eureka 147 DAB system, and also has been lobbying behind

the scenes.

But L-band is currently used by the military for flight testing operations; both the executive branch and the NTIA oppose handing it over to broadcasters.

In other parts of the world, the push for L-band is not as strong, with the exception of Canada, which wants to use it for both satellite and terrestrial DAB. Brazil also favors L-band.

But in Europe, where DAB was born,

and in Japan, no band above 860 MHz (UHF) is being eyed for terrestrial DAB. Europeans are also looking at the higher S-band—but for satellite DAB. Terrestrial DAB supporters consider S-band impractical because of high power requirements and cost.

At a spring EBU technical conference, two countries—Germany and the Soviet Union—said they had already decided on spectrum blocks to request for DAB.

In Germany, broadcasters are clearing TV channel 12 (223-230 MHz), while in the Soviet Union a portion of the FM band (100-108 MHz) is being set aside for DAB.

## Disney Requests DAB Testing Authorization

by Paul Rebmann

**ORLANDO, Fla.** Walt Disney World has asked the FCC for permission to test the effects of in-band FM digital transmission.

In an application for experimental test authorization submitted to the FCC in May, Disney said it plans to transmit a digital signal on the adjacent channel of an existing experimental FM station Disney World already uses.

The existing station, near Lake City, Fla., has an experimental authorization to test a highly directional FM antenna pattern. KA2XXZ, Columbia, Fla., operates on 107.9 MHz.

Disney's experimental application does not specify testing of a particular digital broadcast system, but instead hopes to simulate a digital signal at 107.5 MHz from the same tower as KA2XXZ to test the effects it may have on the FM station.

Walt Disney World Publicity Manager John Dreyer said, "It will not actually be a digital broadcast."

Although Dreyer said Disney has no plans to get into digital broadcasting, the company "has always been in the forefront of technology and that this merely an area we wish to explore."

The existing KA2XXZ 250 W FM station is operated by the Disney World marketing department, broadcasting traffic, weather and safety information.

The station's authorization expires in August of this year, according to the FCC.

Dreyer said that the digital test experimental application was not a ploy to justify extending the license of the KA2XXZ, stressing the new application is purely for technical research.

"You can go back to the first Mickey Mouse cartoon and see that Disney has always been a leader in innovation," Dreyer said.

## Digital Standard

(continued from page 3)

tion is: Who should get the ball rolling?

"The demand should really come from the broadcaster," Detweiler said, but he added that a standards effort involving an industry organization would give added credibility. He suggested the SBE might become involved.

Other manufacturers feel the effort should come from equipment vendors themselves, but concede the difficulty of getting competitors and vendors from diverse quarters of the marketplace all in one place.

"It has to come from us, because we're the ones who have to design the equipment," said Ruse. "We're flexible, we'd like to sit down with others and be a part of a standards process."

Harris-Allied's Weirather has taken the effort a step or two further. He has contacted other manufacturers and suggests meetings at upcoming fall shows to begin the effort.

Weirather has also contacted the NAB, which helped solve a standards problem last with tape cartridges. "SBE may be a possible candidate, but NAB has both manufacturers and stations as members."

The NAB's Senior VP of Science & Technology, Michael Rau, said he's aware of the concerns about digital interfaces. He said NAB would consider spearheading a standards effort if one were organized by the industry.

"We're open to the idea; we know there's a need for it. I'd like to see the manufacturers approach us with a proposal to begin standards activity," he said.

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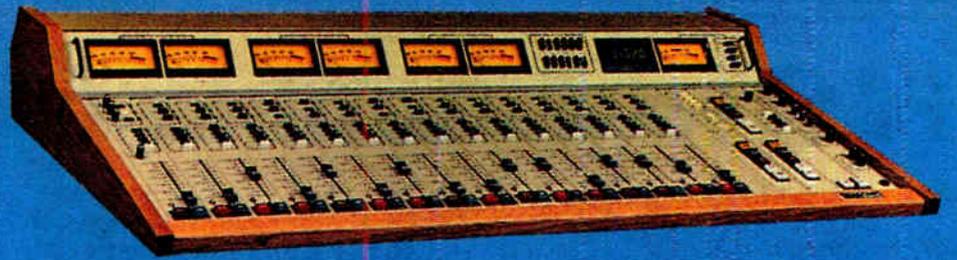
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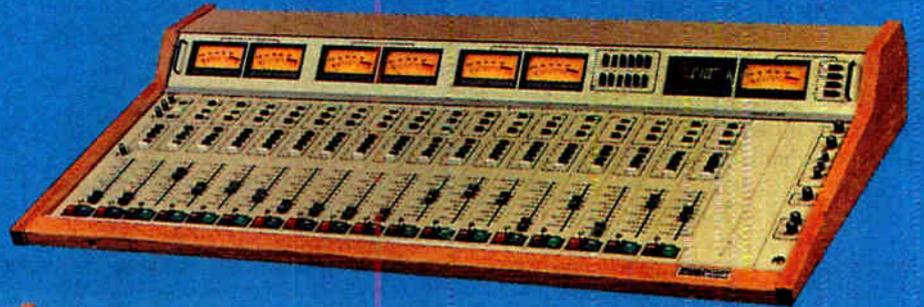




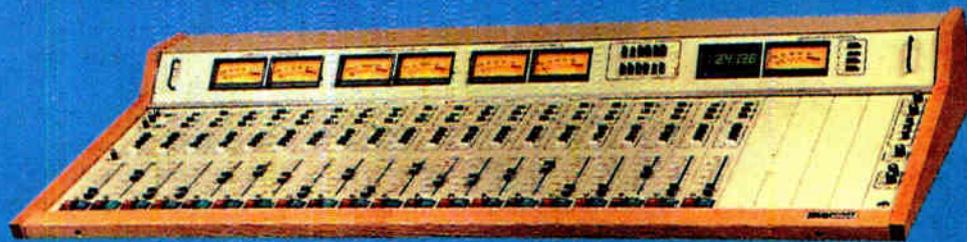
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# FCC to Examine Mod Rules

by John Gatski

**WASHINGTON** The FCC hopes to take some kind of action on revision of modulation rules for broadcasting—perhaps by October, according to the Mass Media Bureau.

FCC Assistant Mass Media Bureau Chief Bill Hassinger said the FCC's "first preference" would be to undertake a Notice of Proposed Rulemaking (NPRM), but he did not rule out issuing a Notice of Inquiry (NOI) first if more information is needed.

Hassinger, who announced at the NAB spring show in Las Vegas that the FCC would reexamine its modulation

rules, said action ideally could be completed by the spring of 1992. He would not, however, predict a more precise date because of the complicated nature of the issue.

"It depends on what emerges from the comments," Hassinger said. "It could be in the spring, but if complications set in I can't predict a date" when an actual rulemaking may emerge.

## Criticism of FCC

The FCC has been criticized recently for its modulation policy, which changed following deregulation in 1983. The deregulation included elimination of

modulation monitor type acceptance. The Commission also has drawn fire for being vague in elaborating on how they measure modulation during station monitoring and what is considered over-modulation.

Criticism intensified in 1989 when Modulation Sciences introduced the ModMinder, a monitor that ignores very brief peaks ("peak weighting"). This peak weighting enables a station to increase its "legal" modulation, according to the company.

Other modulation monitor companies cried foul, criticizing the ModMinder, and taking the FCC to task for no longer

having standards governing modulation monitors. One company said that the rules are adequate, but the FCC needs to enforce them.

Modulation Sciences defended its new product, stating it met the pre-1983 rules, but even that company said the Commission should reexamine its modulation rules.

The FCC intends to close loopholes and eliminate gray areas that can allow a station to overmodulate, but claim they are still legal, according to Hassinger.

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

Hassinger said one MMB engineer is now working on the NPRM. "We would like to look a little bit at the theory of FM modulation, the definition of the terms, and I suppose we want to take a look at the consequences of a station over-modulating," Hassinger said.

## Considering weighting

If any rules are changed, Belar President Arno Meyer said the FCC is unlikely to alter them to accommodate peak

## The FCC intends to close loopholes and eliminate gray areas . . .

weighting.

"With peak weighting, you will be penalizing the stations without subcarriers," Meyer said.

Currently, stations are supposed to modulate no more than 100 percent without subcarriers, 105 percent with one subcarrier and 110 percent with two or more subcarriers.

Meyer contends that if peak weighting is written into the rules, it will create a tremendous advantage for the stations that have subcarriers.

Adding peak weighting to the rules also would result in a controversy over whose algorithm would be used for the definition, Meyer added. He said there are several algorithms now used for peak weighting readings, including the ModMinder and Belar's Wizard.

Meyer said current FCC modulation rules based on the subcarriers are adequate. "The only problem has been that they are not enforced enough," he said.

Meyer did note that some markets, such as Philadelphia, seem to be turning down their loudness. The Philadelphia market was monitored by the FCC in 1990 and several stations were warned about overmodulation.

Modulation Sciences Engineering VP Eric Small said he was "surprised" that the Commission would commit resources to settle the modulation issue via an NPRM. It is an issue "that could be settled administratively," he noted.

In challenging the Commission's timetable for settling the issue, Small said a rulemaking is not likely to be completed by the spring. "Technical rulemakings typically run 18-24 months," he said.

Modulation Sciences' attorney, Harry Cole, said rulemakings usually don't move any faster unless there is pressure, which he maintained is not the case in this issue.

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# RDS, Cue Paging Test Slated

(continued from page 1)

"It may. We don't know. That is the purpose (of the tests)—to decide if there are problems," Mock said.

Cue Paging could not be reached for comment about testing procedures, but Mock said the firm planned to use a cross section of RDS radios to assess whether a hybrid RDS/Cue Paging system is compatible. Cue Paging is based on the MBS system that is used by Swedish Telecom Radio and is similar in theory to RDS.

## Urged against hybrid RDS

Several receiver companies, including Grundig, Becker, Philips, Blaupunkt, Clarion, Sanyo and Delco have written to the NRSC, urging it not to recommend an NRSC hybrid RDS standard. The proposed hybrid systems, the firms allege, could slow the station ID display on RDS receivers from the acceptable two second delay to nearly a minute. Some companies said that the hybrid system would result in an incorrect display—or no display—under noisy conditions.

According to a letter to the NAB, receiver manufacturer Becker said it had witnessed a demonstration at NAB '91 where the results of broadcasting RDS with Cue Paging were discouraging.

"At the NAB booth our fears were confirmed. We tried various radios, including our own, on the true RDS stations that were on the air and on the Cue Paging sta-

tion. The Cue station locked up on some radios, and not at all on others. The lock-up time was often as long as 30-40 seconds," the Becker letter stated.

A letter from Philips to the NRSC echoed Becker's assessment regarding the use of a hybrid RDS system. "Probably all existing RDS car radios will lose RDS synchronization very frequently. The existing RDS receivers will have difficulties to get re-synchronized again under disturbed reception conditions (low signal levels and/or multipath distorted signals)," the letter said.

Blaupunkt also was distressed by the proposed hybrid system. "Looking at the proposal of a hybrid system, RDS/MBS, it is evident that a receiver will have big problems to lock and synchronize on the RDS signal because it will find only 3 RDS (type OA) groups per second and the fly-wheel effect, which ensures perfect function, especially in the case of interference, will be destroyed . . ."

## No synchronization

Blaupunkt said that portions of the signal will be interpreted as bit errors and "it is not predictable what kind of information a receiver will read out . . ."

Many of the receiver companies said they already produce RDS radios based on the European standard and they are not willing to alter their products if the hybrid system is not compatible.

In a July 15 letter to Mock, Cue Paging CEO Gordon Kaiser acknowledged "an incompatibility of multiplexed RDS/MBS with existing hardware."

But Kaiser said "it is important to understand that desired compatibility is achievable by software changes alone" and they should be written into a hybrid RDS standard.

Cue Paging also noted that RDS proponents must realize that a U.S. standard should reflect U.S. requirements.

Kaiser said: "The United States is not Europe. In the United States, unlike Europe, there are over 70,000 subscribers us-

ing an MBS paging system." About 270 radio stations participate in the network according to Cue Paging.

"It would be wrong for the Europeans to assume that this paging network is going to disappear simply because RDS radios are introduced into the United States. It will not," Kaiser said.

Kaiser also challenged several of the receiver companies' assertions that Cue Paging will defeat RDS functions and provide incorrect text messages.

He added that, "The theory of European Broadcasters, and possibly Delco, is that there will be such a demand for RDS that the Cue network will be forced to abandon its existing technology."

Finally, in a counter charge, Kaiser said there has not been any conclusive evidence that broadcasters even want RDS.

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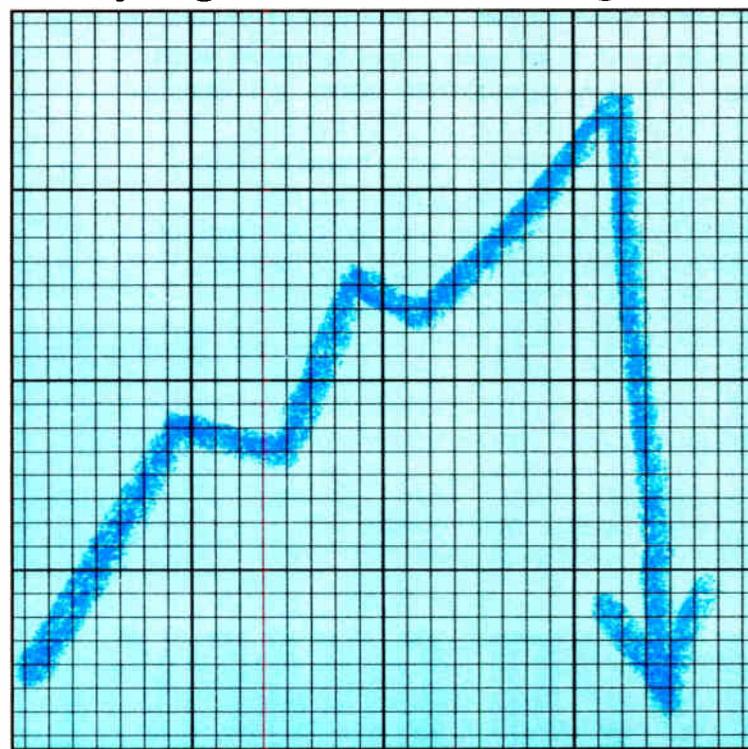
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# U.K. Radio Uses XIS Digital

by Tim Frost

**MANCHESTER, England** The French digital broadcast system manufacturer XIS won the race to be the first company in Europe to set up a live, full-bandwidth digital radio link-up using 64 kbit/s digital telecom links.

By using a WIM system at each end of an Integrated Digital Services Network (ISDN) line in Montpellier, France, and in Manchester, England, 15 kHz bandwidth commentary on a Manchester United football match was transmitted live back to the local independent sta-

tion, Piccadilly Radio.

The WIM digital audio network system from XIS of Montpellier, France, is a radio commercial storage and playback system, based on PC computers, that stores audio onto hard disks.

## Digital stream

To obtain adequate recording times, XIS uses a sigma-delta conversion rather than the more traditional PCM techniques to convert the audio to and from the digital stream. Also incorporated is a data compression format developed by the French telecommunications research

institute CNET, which gives them more than a 7:1 data compression ratio.

A development of WIM's facility to

international link-up in April this year.

According to Jos Marien, XIS international marketing and sales manager, the networking facility previously had been used at full bandwidth only for sending batches of data.

"Although there are WIM systems using ISDN in France," he said, "they are

**. . . approximately half the U.K.'s analog telephone exchanges and switching stations have been replaced by digital exchanges. . .**

transmit data between workstations, either by using a hard-wired network or the ISDN service, was used for the in-

used for transferring advertisements and not in real time. This 15 kHz system is quite new and the first time it has been used."

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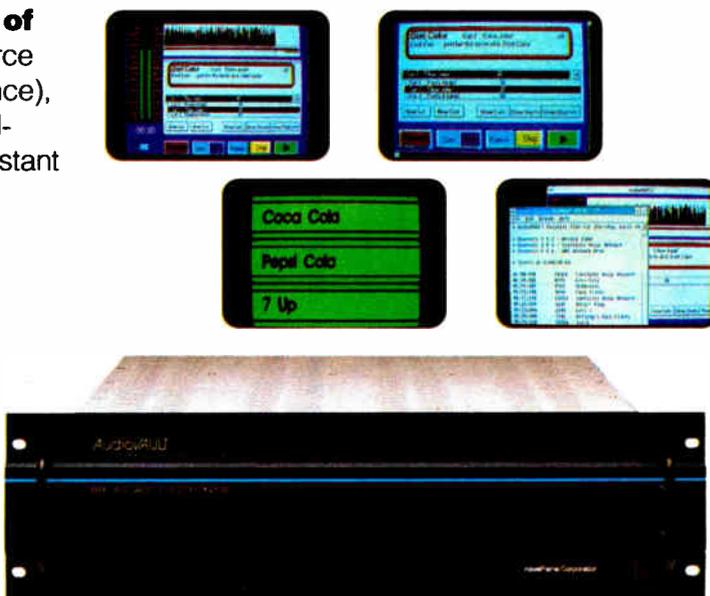


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# On the Air with KTWR Guam

by Robert E. Chick

**PITI, Guam** Trans World Radio-Pacific is part of the international Trans World Radio (TWR) Christian network that offers programming in 80 languages from locations around the world: Monte Carlo, Cyprus, Sri Lanka, Bonaire, Swaziland, Uruguay and the U.S. territory of Guam.

In 1975, TWR began broadcasting from Guam on KTWG, a 10,000 W medium wave local station. Two years later KTWR signed on the air from Merizo, Guam, with two 100,000 W shortwave transmitters driving TCI curtain antennas. By 1985, TWR had added five 100,000 W curtain antennas.

Now, KTWR's five antennas beam programs into China, Japan, the U.S.S.R., India, Indonesia, Australia, New Zealand and Africa.

## Different rules

Having worked in broadcasting before coming to Guam, I was familiar with the basics of transmitters and audio equipment. If you are familiar with AM/FM stations, things seem vastly different in shortwave broadcasting. The same rules of electronics, such as Ohm's Law, apply. The difference is the practical application of your engineering techniques.

Routine maintenance of our four Harris SW-100A transmitters plays an important part in the normal operation of a station of this size. We carefully check each transmitter each month.

The Harris transmitters exhibit a combination of solid state and tube hybridization. I knew the tubes were big when we used a hoist to make a tube change. Changing 54 pounds of tube with the attached boiler/separators takes time and muscle.

During maintenance we clean each section of the transmitter with Tri-Solv to reduce the potential for arcing. All variable inductors are removed, cleaned and lubricated. Even the water system is drained and cleaned for greater efficiency.

Regular maintenance has yielded improved transmitter operation. Since 1983, the downtime caused by component failure has dropped by 95 percent.

## A different approach

Downtime had always been one of my major concerns. While working in the States I was upset if our FM or AM station lost more than a minute or two a year. When you start working with 30 kilovolt high voltage supplies and a tropical climate like that in Guam, the mixture of high voltage and high humidity can cause problems.

It appears that most of our large tubes fail due to thermal shock when powering up the filaments. To help reduce thermal shock the transmitters at KTWR were modified. The filaments operate at roughly one quarter their rated filament voltage when off the air. Access to the transmitters is limited to maintenance and repair only—no more opening up just to poke around. We should know in a few years whether this practice successfully extends tube life.

Other alterations have played a part in reducing component failures. In 1984 and 1985 we changed from the original 4CV50,000E tubes to a larger

4CV100,000E tube.

Also, the original high voltage supply was controlled by a motorized circuit breaker. In 1985 and 1986, we replaced these with SCR voltage controllers. This has eliminated the mechanical failures prevalent in the motorized breakers.

## On the air

The audio equipment is controlled by a specially designed automation system

## If you are familiar with AM/FM stations, things seem vastly different in shortwave broadcasting

from Sonomag Corp. that can control up to six transmitters and 32 audio input sources. At KTWR, we have designed an interface circuit to augment the SMC transmitter controls.

Two additional controllers installed in each SW-100A allow the signal intended for frequency change to change the antenna slew and turn on filaments also. This ensures things are warm and ready when it is time for a carrier.

Four AP-128 voice shapers were tailored to provide high quality audio with

consideration to inconsistent high frequency propagation. Using pulse-duration modulation techniques in the SW-100A transmitters, we are subject to modulation changes when the carrier output drifts. As a result, the audio input requirements to the transmitters vary with the carrier output.

To compensate, the KTWR staff designed and built four modulation level controllers. They monitor the modulated audio and raise or lower the transmitter input to guarantee a specified percentage of modulation.

Audio programming arrives on reel-to-reel tapes. Mandarin, Swatow, Hakka and other Chinese language programs are produced in Hong Kong. Indonesian programs come from our studios in Jakarta, Indonesia. Russian programming comes from our studios in Monte Carlo, Monaco, and some programming also is locally produced.

## What we do

On Guam, Trans World Radio staff is involved in many different phases of the operation. At the shortwave site there are three engineers and two technicians. We also have a rigger who maintains the large curtain antennas.

To maintain a safe operation there are normally two operators on duty per shift. One person tends the audio control room while the other operates the

transmitters. Each day includes two broadcast shifts timed for the target broadcast area.

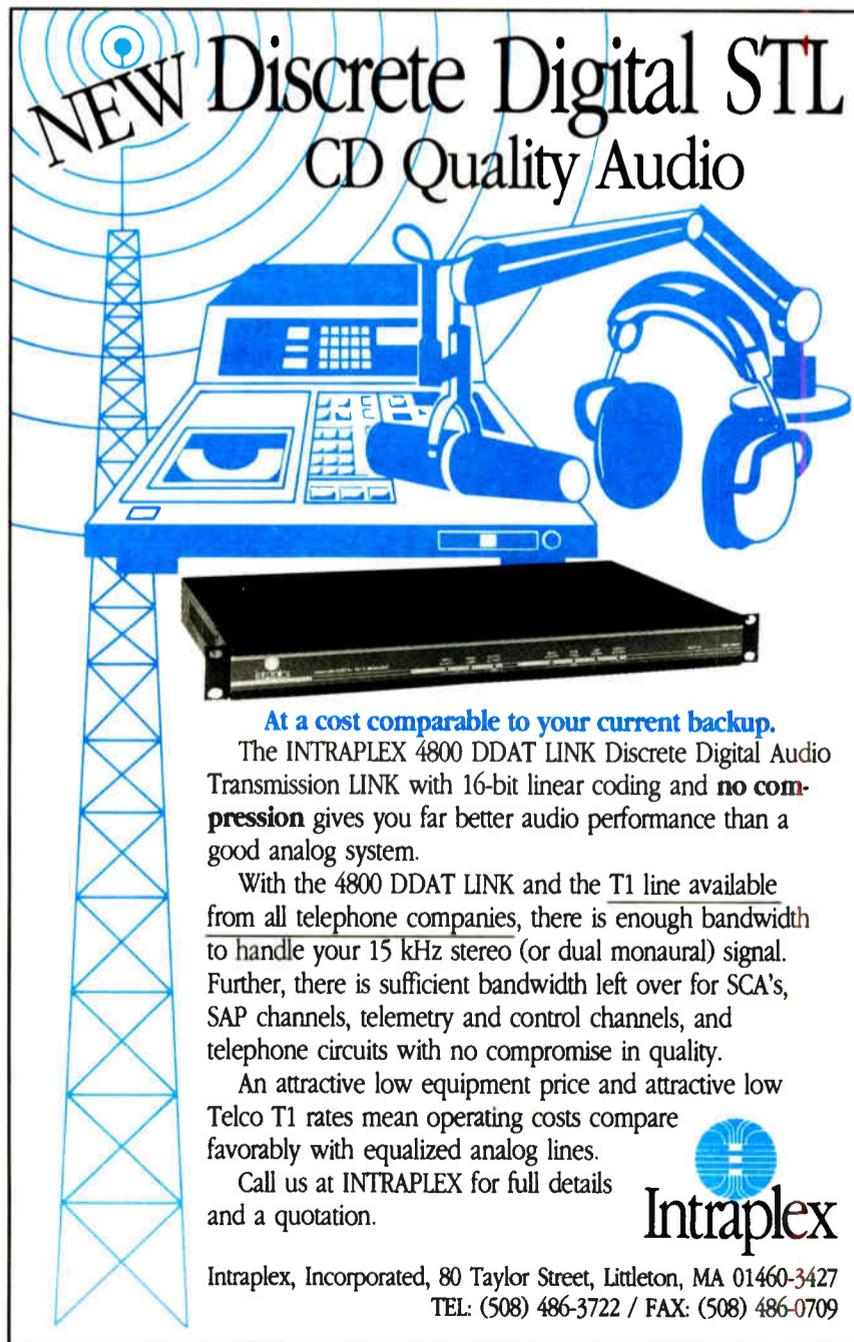
Operating from such a remote location has its peculiar needs. We must maintain a large inventory of spare parts because it is difficult to go down to the local electronics store in Guam and pick up a 4CV100,000E transmitting tube.

Other difficulties also make their intrusions into our daily operation. The local power company has improved remarkably over the years, but unfortunately they still account for most of the downtime. We also have typhoons that are Pacific versions of large hurricanes with sustained winds of more than 70 miles per hour.

Also, water for cooling transmitter tubes must be properly prepared. To maintain a low conductivity in the cooling system we distill the local tap water

(continued on page 16)

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# World Band Radio Use Grows

## Desert Storm Sparks More Receiver Sales

by James Careless

**OTTAWA** World band radio. It is an "Alice in Wonderland" medium. A place where most domestic broadcasting rules do not apply. And those few that do, tend to work in reverse.

Consider that receiver sales in the United States have jumped dramatically, but the overall world audience is still shrinking. Government and public stations are on top, while commercial rock stations cannot obtain a foothold. And, finally, some world band broadcasters believe the only way they will survive in the future is to get out of the world bands.

Before trying to make sense of these contradictions, understand what the "world bands" really are.

### From 3.9 to 26.1 MHz

Technically, world bands are the shortwave bands that cover 13 sections of the radio spectrum ranging from 3.9 to 26.1 MHz. This is why many people use the terms "shortwave" and "world band" interchangeably.

In terms of content, the world bands are home to five different broadcasters.

First, there are publicly owned stations, such as the British Broadcasting Corp. and Radio Netherlands. Then there are government-run stations such as Voice of America (VOA) and Radio Moscow. Between them, these two groups own the lion's share of world band's audience.

Next there are religious broadcasters, such as *Heralding Christ Jesus' Blessing* (HCJB) in Ecuador, and the *World Service of the Christian Science Monitor*. The list also includes domestic-style commercial stations, like WRNO-New Orleans, La. And finally, there are the illegal amateur-run pirate stations, operating under names such as "Voice of Anarchy," "He-Man Radio," and "XERK."

All operate in a broadcast medium entirely reliant on the reflective qualities of the ionosphere. At best, these change from hour to hour, making daily frequency changes a must. At worst, they do not work at all, due to occasional geomagnetic disturbances originating at the sun.

### 200 million listening

According to BBC research—whose accuracy is widely accepted by other world band broadcasters—nearly 200 million people tune into world band radio at least once each week. As it turns out, BBC has the largest audience, 120 mil-

lion, followed by the VOA, and then the combined audience of Radio Free Europe/Radio Liberty.

And why do they tune in? "Traditionally, the first reason that people listen to shortwave radio around the world is for news," said Sherwood Demitz, head of communication research at the United States Information Agency (USIA), the parent of VOA. Added Jonathan Marks,

**The final irony of world band is that many of its major players believe the future lies elsewhere: mainly on someone else's domestic station.**

editor of Radio Netherlands' weekly communications magazine *Media Network*, "Shortwave radio is very much crisis driven."

This year, 1991, has been a year of crisis, and world band receiver sales in the U.S. have been booming, according to Jock Elliott, contributing editor to *Passport to World Band Radio*, an annual directory that the *New York Times* has called a "TV Guide for world band radios."

"With Desert Storm, we got an enormous spike in the sales," Elliott said. "What had been a very respectable growth curve all of a sudden looked like a launch trajectory."

Sales, however, were not too bad to begin with. "They've been growing steadily for about the past five years at 20-25 percent a year," Elliott said.

Elliott credited this increase in sales to America's growing hunger for international news; a hunger that Cable News Network (CNN) and Desert Storm only whetted.

### Improved receivers

The new generation of digitally tuned radios are as easy to operate as a telephone. And unlike their huge, tube-filled predecessors, these sets are small,

powerful and reasonably priced.

Yet, as good as this news would seem to be, world band broadcasters will tell you their market shares are dwindling. Why?

"It's due to that 'pesky freedom' that's sweeping the world," Kim Andrew Elliott, audience research officer at the VOA, said in jest. "Wherever you have that, the audience for international broadcasting declines."

The growth of other media such as television in areas like India also are starting to cut into "the time that was formerly used to listen to shortwave," Elliott

said.

But what about the sales growth in the United States?

Although the shortwave growth is real, its actual impact is relatively small. The U.S. shortwave audience is estimated to be only two percent of the 194 million, 12 years of age or older, listening to commercial radio each week.

There are more strange features to world band radio—at least, strange to those accustomed to domestic broadcasting.

For example, public and government stations with their emphasis on talk, beat commercial rock outlets hands down. In fact, there is only one such station left in operation.

That is WRNO New Orleans. Others that have gone off the air—which means they were sold to religious organizations eager to spread the word at their own expense—include KUSW Salt Lake City, Utah, which broadcast the music that drove Manuel Noriega crazy when he was holed up at the Vatican Embassy in Panama.

These American-owned rock stations have not had an easy time for two reasons.

First, as noted before, world band listeners want news, not music. Secondly, when it comes to sound quality, even domestic AM sounds better.

### The future

The final irony of world band is that many of its major players believe the future lies elsewhere: mainly on someone else's domestic station.

The reason is simple, according to Marks at Radio Netherlands. Audiences that relied on world band in the past—such as those in Eastern Europe—are tuning in to increasingly reliable outlets at home.

"So stations are going to have to wake up to the fact of, 'So how are we going to keep them? Do we say goodbye, or do we change our programming, or do we change our method of distribution?'" Marks noted.

Distribution seems to be the most popular answer; whether by taped recordings, or, increasingly, by direct satellite relays as offered by the BBC.

All this poses a question: Will world band survive into the next century?

Marks said he believes so . . . with certain qualifications. "Shortwave will certainly survive to Africa and to Asia as an important broadcasting medium for a long time," he said. "(But) I think that if shortwave stations stick to shortwave as their only means of distribution, they are probably going to fade into the distance."

## On the Air with KTWR

(continued from page 15)

and use a Barnstead de-ionization filter to purify it.

A unique situation was found in preparing water for transmitter use. When the water was properly distilled and de-ionized, it was stored in clear plastic containers. After four or five days of sitting in the container, the conductivity of the water would rise through ions gathered from the plastic. Now, all water is run through the filter on a regu-

lar basis before use in the transmitters.

High power shortwave broadcasting is an exciting and varied work where there are new areas of technical information to be studied. It is worldwide outreach from a small island.

Robert E. "Bob" Chick is assistant chief operator of KTWR. For information, contact him at telephone: +671-477-9701; fax: +671-477-2838; or write him at 1868 Halsey Drive, Piti, Guam 96925.

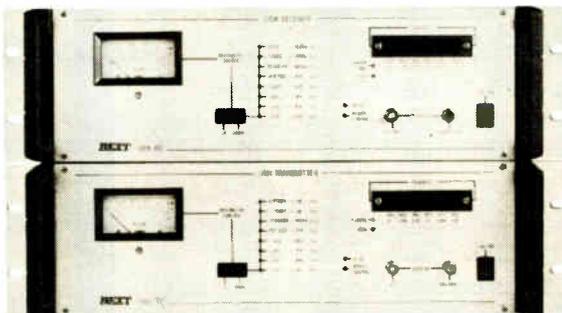
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**BEXT**

# Digital System Used in U.K.

(continued from page 14)

unit, the CDQ-2000 stereo codec that will be in production in September, using the MUSICAM A/D encoding system.

MUSICAM also offers a 7:1 reduction in data transmission requirements. But instead of cutting out redundant data once the signal has been converted to digital, MUSICAM uses the ear's masking ability to substantially reduce the quantity of audio information converted into digital data in the first place.

## More to come

Other systems are likely to follow, and although the WIM system was not initially developed for live links, it showed for the first time that ISDN has a practical application for radio. It performed well enough to convince Piccadilly engineers that, on a technical level, such a system could be used reliably for such work in the future.

"It worked OK, although the XIS is not designed for live reporting and there were some problems with a signal delay, which ran to around three seconds," engineer Gary Bridge said. "This, we think, was partially due to the line and partially to the buffers used in the computers."

He was not convinced, however, that local stations will embrace digital links until the network becomes better established and the hardware costs reduce. "We would only seriously consider putting in digital lines here at the station, once ISDN lines were already installed into places like football grounds," Bridge said.

"Also our existing analog music lines are paid for 24 hours a day. If we are only using them for a few minutes a week, then ISDN will be a lot cheaper. But if you are on the line for five hours, setting up and transmitting a football match, then the call charges may cancel out the savings. Investing a lot of money in the gear and the lines at the moment is not economically viable."

Other engineers looked to new possibilities that ISDN links could offer. "By using the multiple ISDN lines," a BBC Radio engineer said, "we could take a complete multitrack clean feed from a concert venue, and mix it for live broadcast back at the station."

While the idea of replacing an OB vehicle with ISDN lines may be a bit adventurous at this early stage in the network's evolution, stations here are keeping watch on hardware and network de-

velopments.

Stations will be ready to install once the hardware market has settled down, and

they are convinced that there are enough ISDN terminals around the country to be able to access a digital line anywhere where news stories are breaking.

■ ■ ■

Tim Frost is a U.K.-based international journalist and technical writer specializing in broadcast and recording topics.

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# Midwest to Sell to Harris

(continued from page 1)

Highland Heights, Ky., facilities or from new owners of the buildings that are also for sale, according to Adrick.

Adrick also said there may be some joint marketing arrangements between Midwest International and Harris Allied International.

The Midwest radio frequency division is expected to be incorporated into the existing Harris Allied transmitter line, Adrick said. No decisions have been reached concerning name brands.

Employees in the radio frequency division, who numbered 11 at the peak of

operations, are not included in the acquisition, but Harris is negotiating with each individually, Adrick said.

The Harris acquisitions are two of three recent division sales by Midwest. SAIC of San Diego, Calif., a government and military contractor, purchased the low voltage systems division, which is involved in local area networking.

Still on the market is Digital Processing Systems, of which Midwest owns 55 percent, and the Midwest coach division, the distribution sales operation considered the "core" business of Midwest, Adrick said.

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# Engineer Finds Niche Out West

## KFWB Staff Engineer Enjoys the Daily Rigors Of Keeping a Major Market Station Operational

by Pamela Watkins

**LOS ANGELES** It was 1972. The revolutionary energy from the 1960s was still vibrant. Radio was making a valiant return to its glory days. And Sandra Woodruff wanted to be in the club. She wanted to be in radio.

Fresh out of the Cleveland Institute of Electronics, Woodruff found out how tough it was getting her foot in the door. From her home state of Michigan she sent resumes, called stations, wrote letters, answered ads for over two years before she was hired at a little radio station in British Columbia.

"I finally found this little out of the way station that couldn't find anybody to write commercials and do its logs," she said.

The station manager told Woodruff, "we've had this job open for two months and we can't get anybody to come up here." "I said, 'I'll take it, I'll take it,'" Woodruff exclaimed.

Woodruff's first taste of radio has led her into all facets of the business. She not only kept competent logs and wrote exhilarating commercials, but also "kind of fell into fixing the station's equipment."

"I'm just mechanical," Woodruff explained. "Plus, it didn't take me long to realize the sales force and the engineers make the best money."

Within the next several years, Woodruff returned to the U.S., earned her First Class License and became a member of the Society of Broadcast Engineers (SBE). She then went to work at an Idaho station, switched to the corporate arena by becoming a technical writer for Sony, then moved back to radio at a Michigan station. She eventually decided to move west in 1989.

Today, Sandra Woodruff is a staff engineer at KFWB-AM (Radio 98) in Los Angeles, the number one market in the

country. Woodruff's responsibilities include being there during any crisis, and designing, installing and assisting with major complex projects.

Although women engineers are rare and prejudging-type attitudes still remain, Woodruff has persevered in her position by maintaining a high degree of professionalism.

Her duties include handling the sta-



Sandra Woodruff

tion's overall maintenance and installation of broadcast equipment. "We all have our specialties," Woodruff said. "I do more of the newer stuff."

In discussing recent projects she has had a hand in, Woodruff said, "We added a cable system, a satellite dish and a new security system. We already had the rooftop antenna for the commercial stations, which we continue to use," she said.

Woodruff said the projects involved adding special channels on the cable system and integrating the satellite dish and security system. "I designed and installed (the) two additional channels," she added.

Although special projects are challeng-

ing, exhilarating and just plain fun for Woodruff, she believes 90 percent of her job is good old public relations. "It's just reassuring people that we understand, we know it's important and we're fixing it."

Woodruff continued, "I think a big part of this job is just to be positive, understanding and not making people feel like morons when they come to you with a problem."

That understanding, positive attitude also aids Woodruff when she has to deal with a particular customer (station employees are considered customers by KFWB's engineers) who doesn't really want to be helped by a woman. Her professionalism and an attitude that the problem has to be solved usually changes their minds.

Along with her own special projects, Woodruff also assists the other engineers. One main project that will be completed in the next several months required the expertise of the entire engineering staff, Woodruff said. It is the installation of a

computer-controlled switcher system. The basic concept: The new switcher system will eliminate 32 pairs of wires going to one panel.

The new switcher system will have just two wires, one wire will be the computer data line, the other, an audio line. Woodruff explained: "When everything we've got (from point A to point B) is completely on-line, every station in the place that has audio will be able to call up to 32 or 64 sources (each station can have different sources) and we won't have to add any more wires. It will be computer programmed."

However, along with this new switcher system, new challenges have arisen. The

new switcher system demands that audio levels be the same throughout the building. Woodruff's job therefore included installing an amplifier panel for each station. "My part in the project was to make sure that all the amplifier boards were pulled apart with new parts and transformers installed to bring the amplifier boards up to our current standards: +4 dBm."

Woodruff has completed 40 amplifier boards with 22 ready for completion on an as-needed basis. Meanwhile, the every day crisis and Woodruff's other projects (a new emergency broadcast system design) keep her hands busy and her mind challenged.

"When you're in engineering, it's always your job," Woodruff explained. "I mean if an anchor drops dead and the copy is lying there, I'd read it if I had to. Whatever it takes to get the job done."

## Readers Forum

(continued from page 5)

(antenna monitors versus phase monitors for AM, NRSC, etc.). We did this for our own long-term benefit, to ensure our ability to properly serve the public (yes, we really believe that), and to hedge our bets on being able to operate profitably in the long run.

Am I missing something here, or is this really a very simple issue—political for sure, but really simple if you look closely at it? Reminds me of those vector (or was it trig?) contests involving walls and aiming points we used to get into on beer night in college.

The difference is that we didn't have people flying the walls around.

Thanks for a fine publication and the chance to learn from others . . . and to vent a little.

James L. Sorensen, CE  
WJQY-FM  
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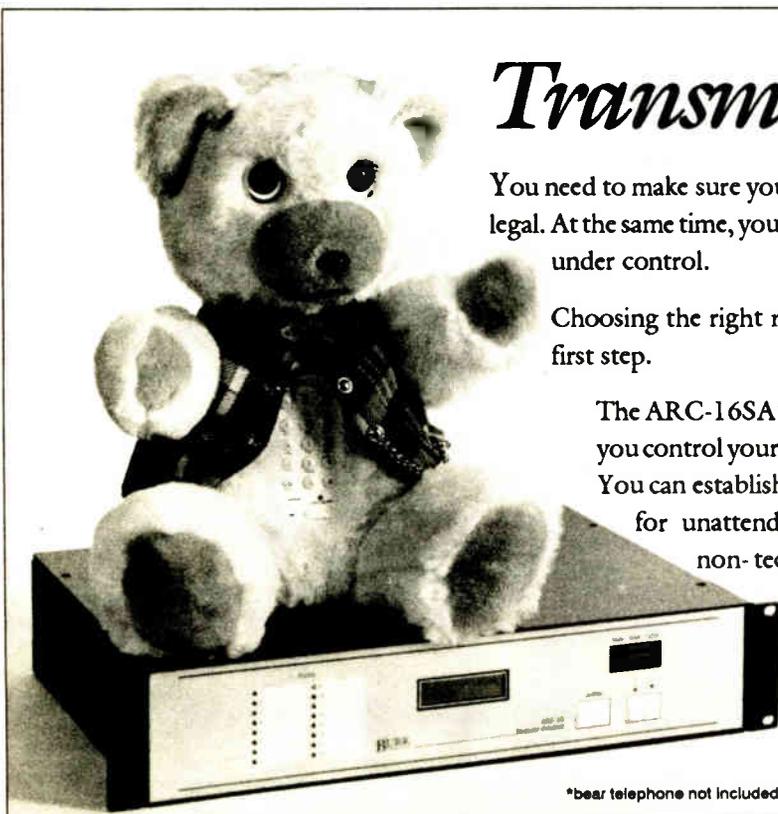
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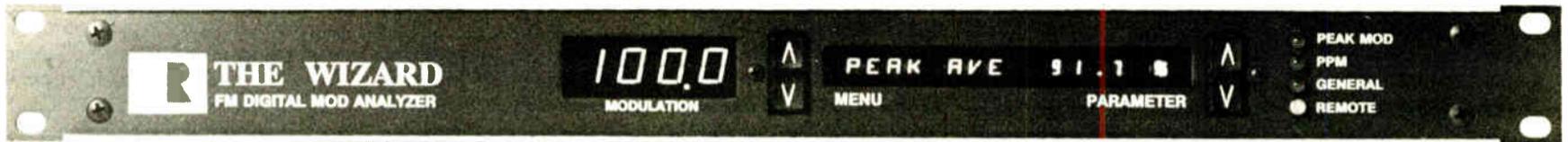
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# Upbeat Mood at APRS Show

by Alan Carter

**LONDON** With the U.K. in the midst of a recession, the 1991 APRS show opened on a cautious note. By the show's closing, however, the mood was more upbeat.

This was the 24th annual International Exhibition of Equipment and Services for the Professional Recording Industry sponsored by the Association for Professional Recording Studios (APRS). The show was held June 5 to 7 at the Olympia 2 in London.

Anthony David, sales director for

Solid State Logic based in Oxford, England, and chairman of the Professional Audio Exhibitors Group (PAEG), summarized the show. "In general," he said, "at best it is as good as last year's."

This year, broadcast products were emphasized on the exhibit floor with more than half of the manufacturers and distributors reportedly showing products directed at radio and television. APRS traditionally is oriented toward music recording studios.

This emphasis comes as the worldwide commercial radio market opens under deregulation.

Among the exhibitors displaying radio-oriented products was Clyde Electronics of Clydebank, Scotland, with a mock-up of the new Prima Broadcast Mixer. The Prima was developed from the Presenter on-air mixer series. It will be available this fall.

### On the floor

Three standard mainframes will be available. Horizontal script ledges and comprehensive meter panels are standard, and a removable panel is fitted to either side above the channel modules. Euro cardframes may be fitted in the panel positions.

Also on the floor was the Aircom, a modular on-air console from D&R of Rijnkade, The Netherlands. Designed as a "radio tool," the separate meterbridge has high resolution meters and space to accommodate several accessories.

MBI Broadcast of Brighton, England, had its 24 Series console, a modular stereo broadcast mixer. The mainframe is available in different sizes and the power supply is remote sensing and 10-inch rack mounting.

Other consoles included the Neve 44 Series broadcast console shown for the first time in the U.K., which is fitted with new stereo modules. Neve also promoted the Neve 66 Series broadcast console with an integral computer-controlled reset system for switch status

and input gain, with an optional recall system for all rotary controls.

Soundcraft of Hertfordshire, England, highlighted its SAC 100 radio console, which has a choice of mono and stereo input modules, with and without EQ, and a Telco module.

On display from Chilton of Middlesex, England, was the CAD400 4 Group modular broadcast/production boards with frame size for up to 32 inputs. All signal paths use bipolar ICs operating at low impedance and  $\pm 20$  VDC, giving a low noise floor but high signal clip levels.

As part of the SSL Soundscreen presentation, HHB Communications of London displayed the new Yamaha DMC1000 digital mixing console for which radio is a targeted market. All recording and mixing are digital with fader levels and mutes, and channel parameters automated.

And from the new Revox U.K. division of Studer Revox, was the new mixing console and a new CD player, due out this fall.

### More for radio

Other radio product at APRS included the RQD 6400 twin stereo limiter and RQP 3200 expander/noise gate from Calrec of West Yorkshire, England.

KW Electronics of North Wales, U.K., showed the Audio Stream, its first range

(continued on next page)



The Sights to see at Radio '91 are at Booth 420.

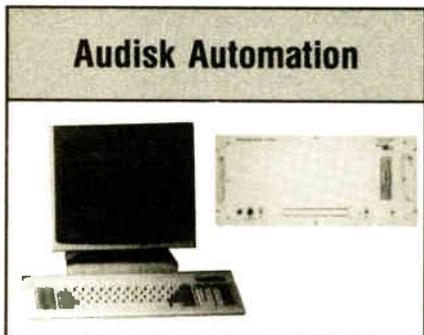


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(continued from previous page)  
of high quality wideband speech units with applications including commentary channels for transmission, ISDN speech and integrated speech/data terminals, and audio conferencing.

Otari brought the ProDisk-64 to APRS; the device was invented by Digital Dynamics, a company Otari acquired in April. Manufacturing is expected to be transferred to Japan.

A new introduction by distributor Michael Stevens & Partners of Kent, England, was the Bel BDE 5000S profanity delay unit which has eight seconds delay. The "catch-up" facility enables the delay to be built up in real time, allowing the program to flow without interruption.

Bruel & Kjaer of Denmark showed the new WA0609 acoustic pressure equalization (APE) for the 4003 and 4006 low noise omni-directional microphones. The device allows for increased presence and intelligibility of sound, preserving detail and clarity.

Lindos of Suffolk, England, displayed audio test equipment, including the LA101 audio oscillator and the LA102 audio measuring set.

Among the products the U.K. division of Sony introduced were the PCM-2700 and PCM-2300 professional DAT recorders, intended to replace the PCM-2500 and DTC-1000ES.

Aimed at on-air broadcasting, both recorders are free from the SCMS copy restriction and can record and play back at a choice of 44.1 kHz, 48 kHz and 32 kHz sampling rates.

The 2700 is a 19-inch rack mountable unit that features a four-motor direct drive mechanism for tape transport. It also is a four-head machine, permitting Read after Write for confidence monitoring of recorded signals.

With the exception of confidence recording, the 2300 shares many of the same features on the 2700, including Absolute Time record, Long Play mode capability, a digital I/O port and subcode management facilities.

Sony also highlighted the Version 2 software for the PCM-7000 professional DAT series, which allows radio users the

capability of Absolute Time (A-Time), ensuring convenient operation with consumer DAT models.

Lyrec of Denmark promoted its portable editing tape deck, FRED, for review and cut/splice editing of quarter-inch

manager for broadcast commercials. The system can be extended into network configurations with several different broadcast stations.

Plasmec of Surrey, England, had the new PC version of the ADAS hard disk

408 OMX optical multitrack recorder/editor designed for radio use in jingles, news, commercials or dialogue.

Audio Solutions of England presented a level converter, with Industrial Acoustics (IAC) of Middlesex, England, promoting studio designs.

And at the Stirling distributor booth was a variety of Denmark-produced Dynaudio acoustic monitors.

At the JWM rep booth of Wiltshire, England, was the Paragon digital audio studio processor from Audio Animation of Knoxville, Tennessee.

In addition to Symetrix being represented at JWM, other U.S. companies on the floor included those at the PRECO booth, from London. These companies included Sound Technology, Audiopak, Broadcast Electronics and Circuit Research Labs (CRL).

**Numerous broadcast products were emphasized on the APRS exhibit floor this year.**

tape, and other products including a timecode version of the FRIDA, the company's professional quarter-inch, two-channel tape recorder.

From distributor Philip Drake was the Maycom Automation VAMOS, audio

recording system on which you can record and play back to or from a hard disk at 44.1 kHz and 48 kHz stereo sampling rates with full linear 16-bit quality using Atari computers.

Augan of The Netherlands showed the

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## FROM THE TRENCHES

by Alan Peterson



## DADs from the Field

Dear Alex,

Hard to believe August is nearly shot already. Time to think about those Labor Day Oldies specials, preparations for the fall book (our spring numbers were superb) and ... every child's nightmare ... Back to School sales.

To this day, the smell of vinyl binders and new pencil wood at K-Mart instantly rockets my memory back to Mrs. Rock's sixth grade homeroom of 1968.

Of course, I'm still waiting for lunchboxes to come out with cartoon caricatures of Marconi, Tesla, DeForest and Stubblefield, instead of that little dopey kid with the grocery bag haircut.

The kids get the Back to School dreams, but we're still stuck with Dear Ole DAD ... the Dead Air Dreams. I had meant for my one note to you two months back to have been the only word on the subject, but mail response has shown me my little corner of hell is a bit more crowded than I thought.

Russ Hamnett of KNAU wrote me from Flagstaff, Ariz. (don't forget Winona-naaa) to confess his secret terror to Reverend Al. Russ is station manager there and even in such a lofty position, the DAD still haunts him vividly enough to recall the very gear in front of him.

"In front of me is the Gates Studioette board, three Presto Pirouette tables with GE VR11 cartridges and a Magnecorder PTA6J behind me in the rack," Russ recounted. "The jock on the air asks me to sit in for him for only a moment; he leaves the building, never to return.

"The record on TT2 is three seconds away from being over and there is nothing else *anywhere*. No carts, no records, no copy—nothing. I have absolutely nothing to fill with and no idea how long I'm going to have to fill. Dead Air Dreams. Don't *do that* to me!"

Russ was describing the old WCNC Elizabeth City, N.C., studios of some 30 years ago, but time never erases the stark terror of DAD.

Matt Locker of WALL/KOJ in Middletown, N.Y., calls his DAD "performance anxiety nightmares," but they still fit the bill. The wrinkle in his dreams I never had (until I read his letter—thanksabunch, Matt) is that his studio is never in a "normal" place, like ... oh, let's say inside a *radio station*.

Matt is lucky enough to have his studios at Grandma's house, Macy's front window, the place he gets his haircut, an attic crawlspace or in high school.

Too bad we're always scrambling for a record in these dreams. Just once I would love to stop and look through the boss's file for the FCC "change of SL" application. What in blazes was he thinking when he built the studios in the boiler room of the Harrisburg,

Pa., Fire Department Pump & Ladder #4 building?

Washington-based attorney Dennis C. Brown, while off air for about 13 years, wrote to tell me he still gets DADs about twice a year. His dreams used to put him in a studio with a record winding down, and at the last note he finds himself completely physically paralyzed.

No voice, no motor function, no nuttin'. The disc runs out, the hotline rings

---

**Mail response has shown me my little corner of hell is a bit more crowded than I thought.**

---

and Dennis "wakes up mute with the DAD."

Nowadays, Dennis' dreams have him taking a shot at talk radio at a very prominent Top 10 station. The news ends, his logo/jingle cues him to begin and once again—cold dark silence. Not one single coherent thought, not one synapse controlling his voice is firing, and the faces through the glass are sloooowwwly drrooopiiiiinnng ...

While my mail ran a lot heavier than this, I think Matt, Russ and attorney Brown more than sufficiently capture the white-knuckle essence of DADs. There are, of course, variations, and it always impresses me why there's never a CD or cart involved in a DAD.

Guess those last two grooves on a plain old record demand, "Do something!!" more terrifyingly than any countdown clock will ever do.

It really doesn't matter what one does for an occupation. Attorney Brown reminds me that each person has his or her DAD in a version that pits them against the failure they fear most. This really does mean the deli owner four doors down from the station has dreams of the olive loaf brutally attacking him in the freezer. It's not a great consolation for those of us who've gotta face an audience each day, but the dream dies the moment the cans go on.

Alex, I raise my official **Radio World** mug to everybody who's ever had a DAD. May they shake it off and get on with a great show.

Your Sandman-in-Training,  
—Al

♦♦♦

Last time Al got a letter from an attorney, it cost him \$300, the silverware and the living room set. His *Dead Air Dreams* are IMAX-sized and in Q-Sound stereo. Write him directly at WLAD/98, Danbury, Conn. 06810.

# EBS: A Little DAB'll Do Ya?

by Harry Cole

**WASHINGTON** In an interesting sidebar to the ongoing saga of DAB, in late June the FCC initiated an inquiry into possible changes in the Emergency Broadcast System (EBS).

What, you may ask, does the EBS have to do with DAB?

Well, it looks like the Commission may be opening a second front in its effort to "digitalize" the airwaves: The EBS inquiry involves the possible establishment of standards for an EBS system dependent in large measure on digital transmissions.

The primary focus of the FCC's inquiry is on the signaling mechanism used in the EBS to get the operators' attention at participating stations. Under the current rules, a person at each station has to hear the EBS alert, determine the nature of the emergency (usually from the announcement following the alert) and then decide what action to take. The process is a little cumbersome, even in

from another source (for instance, another EBS station).

Obviously, such technology could have significant advantages over the

## COLE'S LAW

present-day system. And on that basis, the Commission is looking into some of the broad operational questions such a digital approach might present. For example, should the digitized message be transmitted on the main channel, or

would it be better to use a subcarrier?

Should an EBS alert be permitted to automatically switch the station over to an EBS announcement on another station? What are the cost implications of new EBS alerting techniques? Could (or should) automatic EBS alerting lead to relaxation of other EBS-related requirements?

### Introducing the system

As is the case when virtually any new technology is being considered, the Commission also is looking at how a new approach might best be introduced.

For instance, should the FCC itself se-

lect a system, or should the marketplace decide? As anyone who lived through the AM stereo wars probably figured out, there is major resistance to a purely marketplace approach. And, as any AM stereo veteran knows, refusal to impose some such standard can be disastrous to the viability of any of the systems.

Also, would it be a good idea to implement standardized coding of messages? While government-imposed standards tend to run against the grain of the deregulationists at the FCC, some standardization certainly would make sense, since it would permit consumers to buy a single receiver and use it anywhere they might travel in the country.

The downside of standardization is that it might require the Commission to select not only uniform coding, but also

(continued on page 30)

### What will the nitty-gritty technical specs of a digital EBS system look like—and how will they fit into any future DAB service?

the best of all possible worlds.

What has concerned the Commission is that the process can be extremely burdensome at a station that is highly automated. EBS monitoring, after all, requires a warm body in direct and immediate control of programming.

#### An alternative to warm bodies

But current automation techniques (in tandem with the FCC's deregulation efforts) have made it possible to operate without such a warm body so strategically placed (although you still must have a licensed operator in control of your transmitter at all times of operation).

Putting two and two together, the FCC believes that highly automated stations may be inclined not to participate in the EBS because of the relatively high cost such participation would impose—that is, to play in the EBS league you would probably need more personnel on your team than a fully automated station's licensee wants to pay for.

So what's the alternative? You guessed it—digital technology. According to the Commission, a number of systems have been developed that permit automatic alerting in emergency conditions. Basically, it is possible to send a digital data transmission containing information about the existence of an emergency, the nature of the emergency and the geographic area affected.

Receivers could be programmed to react when they receive an alert involving a particular type of emergency or affecting a particular area. The receiver's reaction could include setting off a warning at the station (or its control point), or even automatically switching the station's transmitter over to an EBS signal

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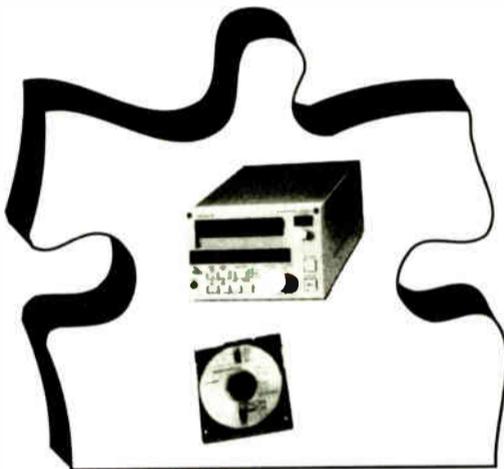
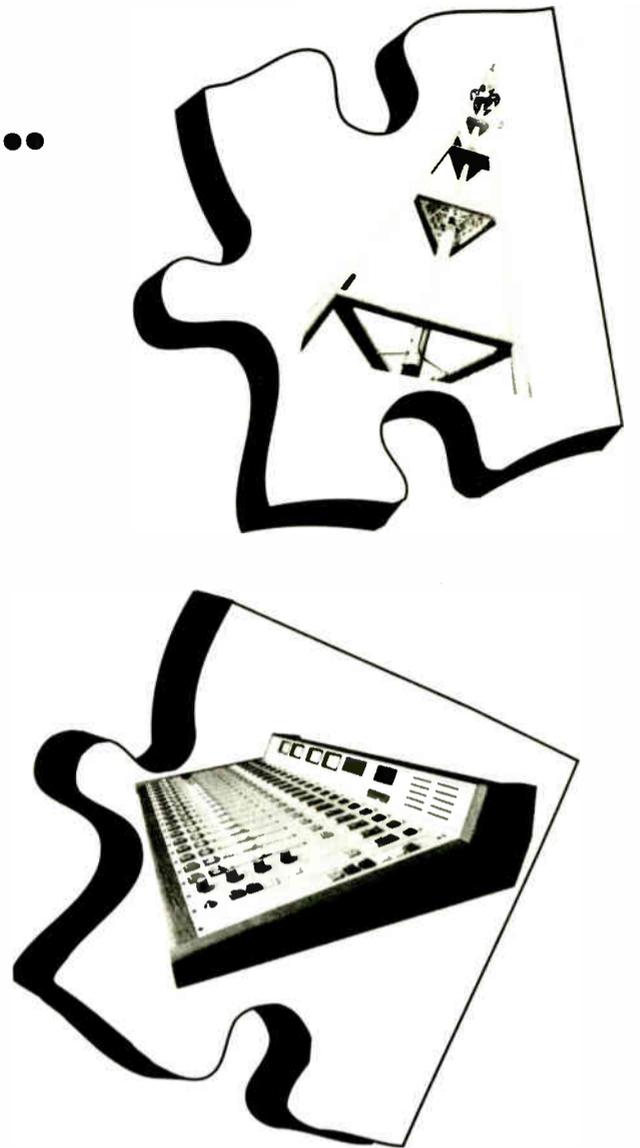
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# Understanding Synetcom's DAB

by Steve Crowley

**WASHINGTON** One of six proposed in-band DAB systems has been introduced by Synetcom Digital of Hermosa Beach, Calif. Synetcom was formed by two engineers, Etienne Resweder and Brien Laufer, who previously had been affiliated with the satellite/aerospace engineering field.

Called Digital FM•S™, the DAB system is said to provide near-CD quality. Unlike USA Digital's Project Acorn, which would insert a DAB signal "beneath" the FM signal, Synetcom proposes to use each FM station's subcarrier region to transmit the DAB signal "alongside" the analog signal.

steering, where the receive antenna places a null toward any interfering signal, including interfering multipath signals.

## Steering nulls

As a car travels down a road, the antenna system would dynamically steer nulls toward interfering signals. This technology, called "Adaptive Excision" or Ap•X by Synetcom, would require an antenna more complex than a standard whip, and may incorporate elements in

the glass. Null-steering is more sophisticated than spatial diversity now used on some

may still contain an interfering signal. Existing SCAs would be

**The system already has been modeled on a computer, and should be ready for field tests in 1992.**

present car radios.

Spatial diversity simply switches to the antenna that is getting the strongest signal; the strongest signal, however,

moved to digital subcarriers. An open protocol is envisioned, whereby multiple SCA programs can be transmitted using time division multiplexing.

The system already has been modeled on a computer, and should be ready for field tests in 1992.

What about AM? Synetcom is working on that too, and hopes to announce details of its AM solution in a few months.

■ ■ ■

Steve Crowley is a consulting engineer with the Washington firm of du Treil, Lundin & Rackley, Inc. He can be reached at 202-223-6700.

## CONSULTANTS CORNER

Multipath mitigation is provided using convolutional error correction, time-interleaving of the data and, for automotive uses, an adaptive directional antenna. The system provides for graceful degradation at the coverage threshold, so the listener doesn't experience noise bursts associated with bit errors.

### Public domain

Much of the technology used in Digital FM•S is said to be based on public domain engineering techniques that before now have been used primarily in military/aerospace applications.

The digital transmission technique used is called Multiple Subcarrier Digital FM, which involves placing multiple digital subcarriers carrying the digital audio data in the FM baseband next to the current stereo transmission.

The system is expected to fit within the FCC's FM emission mask, but may require slightly more room than the FCC currently provides for subcarriers in the FM baseband. For stereophonic FM stations, the FCC currently limits multiplex subcarriers and their significant sub-bands to the range of 53 kHz to 99 kHz.

Like all DAB systems, this one will have to employ audio bit rate reduction, such as MUSICAM, to reduce the amount of information that needs to be transmitted. Synetcom is looking at several reduction techniques at this time.

The adaptive antenna system is being developed in conjunction with the San Jose firm of Radix Technologies and borrows techniques used in military anti-jamming systems. One such technique is null

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# Removing Studio Hot Buttons

by Ty Ford

**BALTIMORE** One of the most difficult and valuable lessons a production pro can learn is how to mentally process a situation that is not resolving itself the way you expected.

I was fully prepared to give you the lowdown on the Shure FP410 Intellimixer this month, but a variety of things occurred to keep that from happening.

Several engineer acquaintances showed interest in specific applications of the Intellimix. Shure's John Phelan was on the ball in getting me the unit well in advance of my deadline. Try as I might, however, it became increasingly apparent that I would have to reschedule that review.

For one thing, one of the engineers was on the road with the Baltimore Orioles for an extended period. My own life took a twist when I was called to sit in for the booth announcer at WUSA-TV in Washington for two weeks. This meant that two-thirds of every day had to be dedicated to getting there, being there and coming back to Baltimore.

## Parallel lines

Don't get me wrong, I really enjoyed it. But even though I checked regularly for messages and answered them as quickly as possible, I was relatively "out of the pocket."

Then it hit me. There were striking parallels between my attempts to get the job done and the curses of the processes most production people deal with on a regular basis. In my opinion, nothing is more important than being able to hang loose while remaining focused. In this particular case it meant acknowledging that my deadline would come and pass and the Shure mixer story would not be

## PRODUCER'S FILE

written. Once I accepted that, life got simpler.

In logic language, this presented a "if not, then what" situation. Whether you're faced with a deadline crunch, a problem with a piece of copy, a piece of equipment or even the concept behind a particular production, you have to exit the "do it" mode and enter the "hang loose" mode. If you haven't done this before, it will probably feel very uncomfortable the first few times you try it.

You may find that the harder you try, the more difficult things become. The key is to first accept the belief that there is more than one correct solution to most situations. As long as the solution you end up with is as good or better than the one you started with, you win.

Keep in mind that when a situation

throws you a curve, you don't need to reinvent the wheel, you just need to steer it differently. By accepting this belief and working with it, you not only get the project done, you also gain confidence that you can do it again.

## Gaining self confidence

In fact, gaining self-confidence may be the most important payoff.

There's another very important factor here—the human interaction factor. The more retentive and uptight you get, the more acid dumps into your stomach and the nastier you get to those around you. A jammed tape cart doesn't much care if you bounce it off a wall. People are a completely different matter.

Being self-confident and having pride in your work is good. Imposing your own personal disharmony on others is not good. If you detect a high resistance among people with whom you work, it's time to check for loose connections and values that are out of spec.

After you've achieved perfection yourself (yeah, right), watch out for situations in which others push your "hot buttons." The traffic manager at one of the stations I worked for was derailed very easily. Anything out of the expected sent her over the edge.

The first two times she came to me in an overly emotional state about a change in the schedule someone had requested, I joined right in and we both would go

into the program director and do a chorus of "The Sky Is Falling." The program director remained calm and unfazed by our performance, suggested a logical solution and continued on with her work. The third time the traffic manager came in for a refrain, I chose not to sing along and followed the program director's lead.

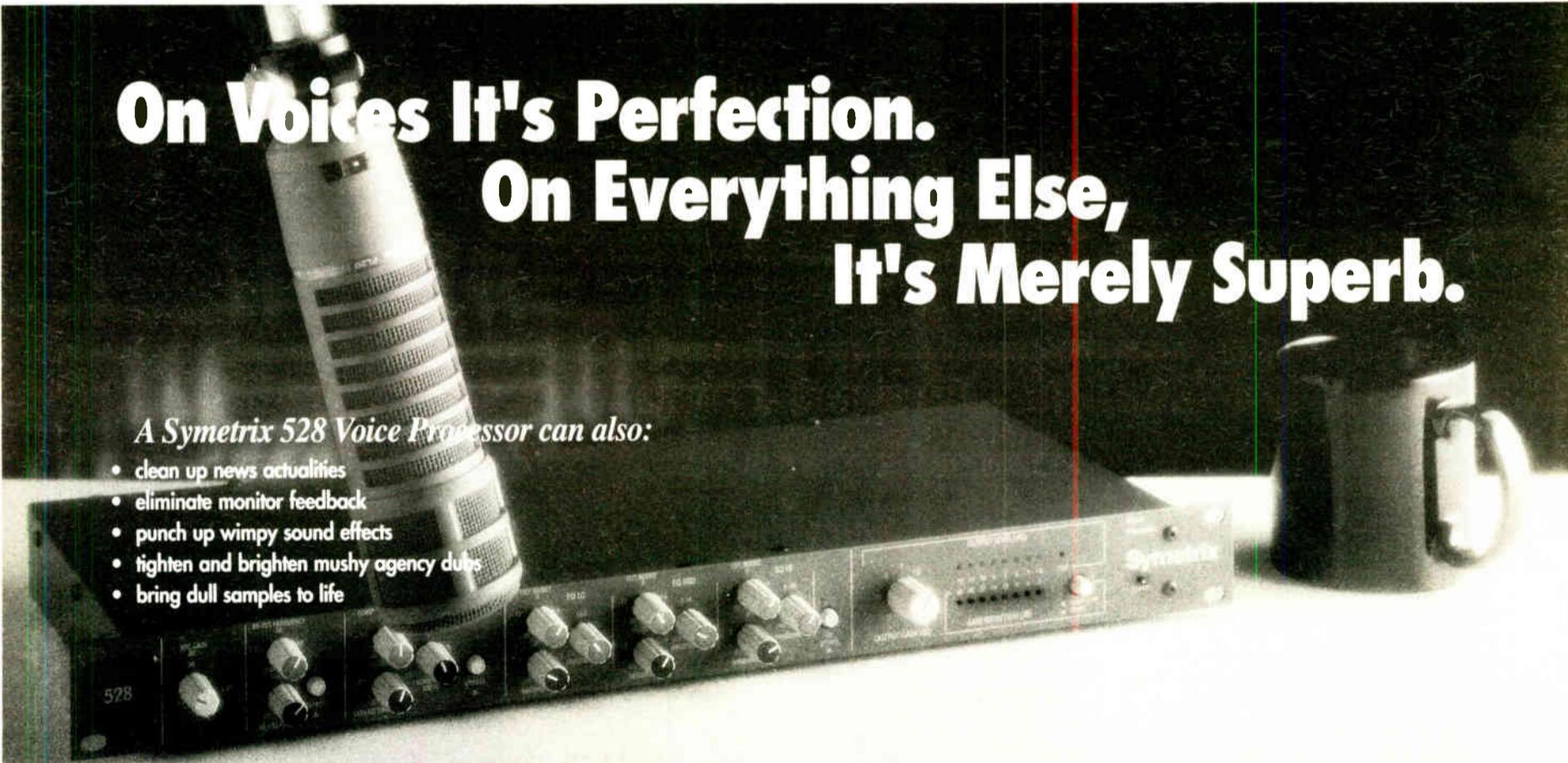
## Production Hot Buttons

Whether you're a suspender-wearing, button-down production director or a production rat with a more casual facade, it makes no difference. Each of us has our own very personal collection of Hot Buttons. They may be words, attitudes or situations—anything that sets us off. The more of them you find and the more of them you disconnect, the better off you will be.

Typical statements that push the production person's Hot Buttons are:

- "Just take this fact sheet (written on the back of a fast food napkin) and fill it out a bit. Oh yeah, it goes on the air this afternoon";
  - "The client says he/she wants more energy in the read";
  - "Geez, I'm sorry, the client gave me the wrong phone number. You'll have to recut the spot."
- More? Sure:
- "Well, the read was OK, but the client hates the music";
  - "The client says the music bed is too soft (or too loud)";
  - "The client says this is the same amount of copy they usually have, can't you read it any faster?"

(continued on page 30)



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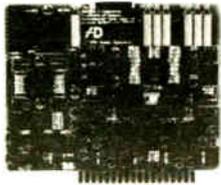
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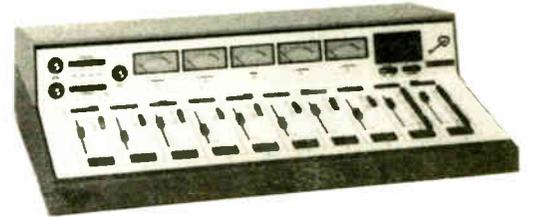
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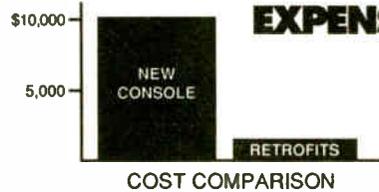
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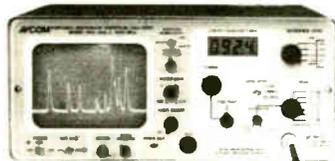


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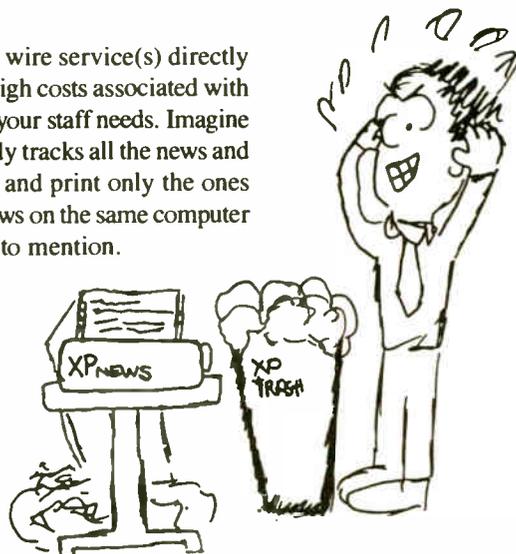
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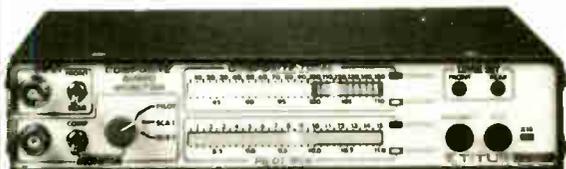
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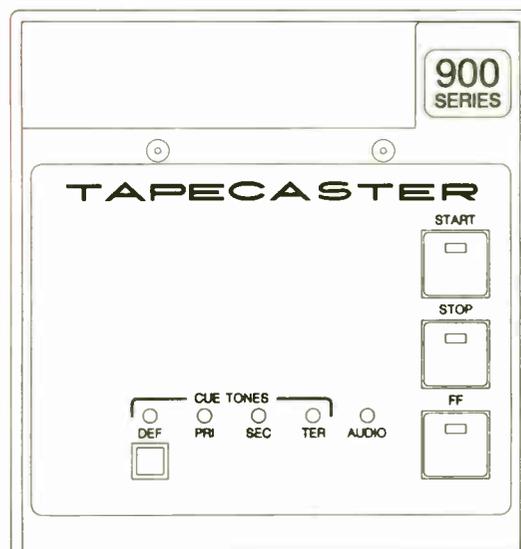
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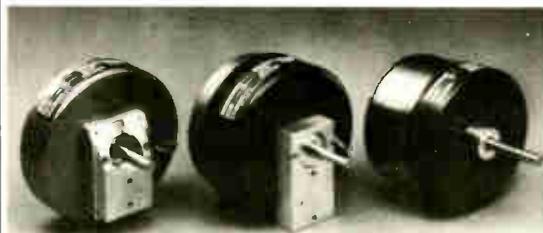
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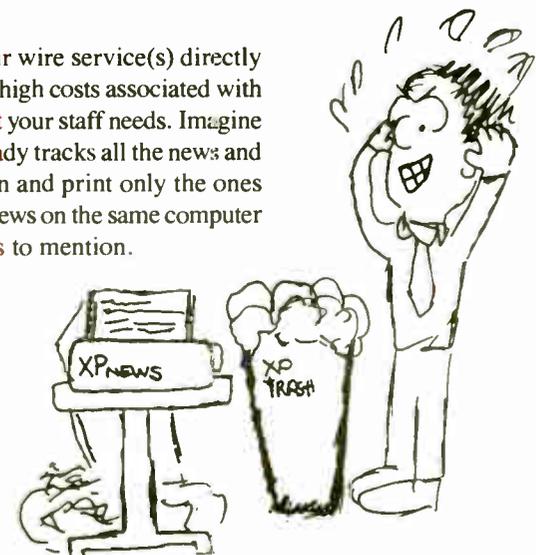
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# EBS Inquiry: A Little DAB'I Do Ya?

(continued from page 23)

a uniform technical system from among the several that already have been developed.

But the really interesting question in the EBS inquiry is one that is not even posed by the Commission. That is, what will the nitty-gritty technical specs of a digital EBS system look like—and more importantly, how will they fit into any DAB service that might be implemented in the foreseeable future?

It seems that this ought to be the first question that the Commission would ask. After all, it would make little sense to spend time and energy designing a digital EBS system that turns out to be incompatible with any

DAB system that happens to be adopted. And yet, the Commission's notice of inquiry is silent on this point.

## Possible explanations

There are a couple of possible explanations. First, the Commission may view its EBS inquiry as very preliminary and, in a way, merely supplementary to its ongoing consideration of DAB.

This would be consistent with the fact that the FCC issued a notice of inquiry, rather than a notice of proposed rulemaking. The FCC cannot adopt new rules without first issuing a notice of proposed rulemaking, so by issuing instead a notice of inquiry, the Commission has

built into the EBS proceeding a fair measure of administrative delay.

Second, the Commission may think that digital EBS can be implemented now, even before any DAB standards are decided. As noted, a number of EBS-like systems already have been developed and are in use, and it might be a relatively simple matter to superimpose one, some or all of them on the existing broadcast industry.

Any problems of compatibility with whatever DAB system may be adopted can then be addressed down the line—or possibly bypassed entirely by simply incorporating into the DAB system a full capacity for its own EBS.

Third, the FCC may wish to create the

impression that it is seeking to improve the EBS as quickly as possible. Any direct cross-reference between the EBS proposal and the much more controversial, much more complicated DAB proceeding would likely tie the two together and thus prevent action in the EBS area until DAB is ready to go—which is likely to be years from now.

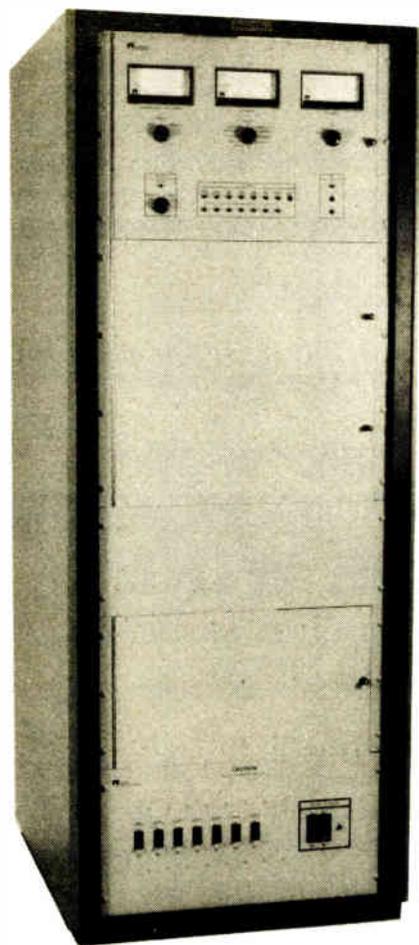
There may be still more explanations for the Commission's apparent reluctance to acknowledge at least some relationship between its EBS inquiry and the whole question of DAB. Whatever may be the case, however, the EBS inquiry certainly seems to reflect the Commission's commitment to digital communications.

You may wish to give serious thought to the questions the FCC has raised in its inquiry. If you want to file comments responsive to the Notice of Inquiry, they are due by Dec. 31, 1991. Reply comments are due by Feb. 14, 1992. If you have questions concerning the Notice, or if you would like a copy, you should contact 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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## Hot Button Removal

(continued from page 27)

In all of these cases, the problem stems from not having direct contact with the client. If these problems happen to you all the time, work toward a relationship with your account executives in which they are comfortable with the idea of you contacting the client for final approval.

Being on the line with your AE when the client is called is a good start. Once you have been recognized as someone who can be trusted with clients, everything gets easier. You take the load off the AE. You give the client a choice in what he or she wants. And, you combine all of this in a production that meets your standards and is less likely to end up back in your lap.

Catering to clients requires some special skills. Make sure you get all the copy points. Write them down and read them back to reduce errors. Ask the clients if they have a preference for music and "read." Be ready to determine the energy level of the "read" by reading a bit of what you have, or ad libbing something.

Ask for any concepts the clients may have and be open to helping them define what they mean if they can't verbalize them. If they're going for something you know absolutely won't work, be ready to explain why it won't work and offer an alternative that will.

By following through in this professional manner, you'll make the client happy and reduce your own amount of work. The client may also like working with you enough to want to pay you to make copies of the spot to run on other stations in the market.

If you have other production Hot Buttons, I'd like to hear from you. Meanwhile, keep those heads clean and get back to work.

Ty Ford has had most of his Hot Buttons surgically removed. His Hot Button Removal Support Group Hotline number is 301-889-6201 or 347-6635 via MCI Mail.

# Tracing the Path of FM Broadcast Translators

by Howard L. Enstrom

**MOUNT DORA, Fla.** The stature of tomorrow's translators will, in many cases, be marked by higher operating power, carefully designed radiation and respectability—all the result of the NAB's stirring over these black boxes.

A system that precisely illuminates a target without causing interference does so because knowledgeable decisions were made—about the frequency channel, antenna design, type of transmission line, site location and equipment power output.

Though many a 1 W and 10 W translator will continue operation, now that operating power is based on ERP, we can vary and control parameters that affect cost efficiency. A consultant does well to confer with his client about leasing expense.

## All radial directions

Suppose my frequency search and terrain study shows that a certain east of the Mississippi River translator can radiate 49 W non-directionally with no F(50,10) interference contour overlap of another service's protected contour. The antenna COR is less than 68 meters HAAT in all radial directions, so FCC antenna height/ERP requirements are met. Line efficiency is 83 percent. For a four-bay antenna with a power gain of 1.95, 30.5 W is needed from the equipment ( $30.5 \times 0.83 \times 1.95 = 49.36$ ). A translator rated for 40 W would be fine.

But wait—four bays use about 30 feet of tower space. How about three bays, having a power gain of 1.42, that use only 20 feet? You would have significantly reduced tower space without increasing equipment cost.

Sometimes, it is worth increasing equipment cost if tower leasing expense is cut. Or, maybe for budgetary reasons, do the reverse—whatever serves the client's best interest.

Since attainment of an ERP is not only antenna-, but also equipment-related, new and upgraded translators may need equipment that has only recently become available, such as the Jones J-340 variable 10 to 40 W single output, self-contained, rack-mount translator (actually, the unit is an up-powered J-316 or 317). We supply it with options such as special selectivity, a local modulation module or a satellite translator.

Coming after FCC type acceptance will be a Jones 3250 amplifier, seven inches high and rack-mounted. Its regulated output is 250 W for 10 W of drive, and 100 W for 1 W of drive. The circuit uses a single transistor, and is fan-cooled and protected with a thermal cutoff if compartment temperature rises excessively. Power output automatically reduces if an RF load's VSWR increases excessively.

## Tightened tolerance

By the way, the new FCC rules have tightened frequency tolerance for translators. So, mating an older J-316 or J-316 with a J-3250 could be out of compliance. New Jones translators use crystals with higher specs for frequency and temperature coefficient.

If "satellator" describes a satellite-fed translator, what should a microwave-fed

system be called? Anyway, a standard off-air translator can be modified for satellite feed by replacing the VHF to 10.7 MHz downconverter with a 10.7 MHz modulator. Jones satellite translators include in the module a stereo generator. Thus, the input signal can be either recovered left and right audio, mono or composite.

My answer to questions about code ID keyer equipment is this—a module can be included with new equipment or field-installed. The translator call sign, encoded at the factory, is automatically sent in telegraphic code by 30 percent AM modulation, selectable for either every 30 or 60 minutes. Translators don't hear it and repeater translators do not respond, because the ID is amplitude modulated.

Television Technology Corp. (TTC) also is adding to what has been a regular

## LOWPOWER LOWDOWN

product line of 1 and 10 W single and dual output translators and multiple output amplifiers. For some time now, TTC has produced the 100 W XL100A-FM and 300 W XL300A-FM amplifiers. They use a separate power supply, so the total assembly is rather bulky and heavy, best mounted in a cabinet.

I look to TTC to produce a single unit translator providing 10 and 100 W output in a more compact unit. Up to now, if 20 W was needed, it took a dual 10 W translator working into a combiner. A 10 to 100 W piece of equipment would fill a gaping need.

## Earth station

About a year ago, TTC introduced the Satellator Series of 1 W XL1MFM and 10 W XL10MFM equipment. Input signal processing is as with the Jones equipment, except that TTC's satellite translators do not have a built-in stereo generator. Thus, additional equipment may be needed, depending on what kind of signal is taken from the TVRO-type earth station.

We recently signed an agreement to add QEI to our product line. QEI does not produce FM translators at this time. But their product line of FCC Part 73 type-accepted FM exciters and amplifiers has earned a fine reputation, and under the new rules they are highly suitable for translator service. Exciters are 10 and 20 W, while amplifiers are 150, 300, 500 and 600 W rated output.

Not as well known is the BEXT HPT transmitter/translator. It has a built-in receiver that takes a primary signal to audio, then back to RF in the 1 to 20 W transmitter section. Frequencies are programmed with thumbwheel switches. Made in Italy, available in various configurations, the HPT's full specs are impressive. FCC type acceptance is not stated, only that the equipment "meets or exceeds all FCC and CCIR requirements."

...

Howard L. Enstrom is a broadcast consultant and president of FM Technology Associates (FMTA). He is an FM translator specialist, offering frequency search, engineering and application services. FMFA may be reached at 904-383-3682 or by fax: 904-383-4077.

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# Computer Programs on a Budget

by Barry Mishkind

**TUCSON, Ariz.** Over the past few months we've discussed quite a few computer programs. They've ranged from specialized applications of interest to broadcasters to well-known commercial products.

The cost of these programs covers a wide range. Some of the traffic and billing programs can easily run into thousands of dollars. At the other end of the scale, we've given away programs here in the column, programs that some of you have found useful.

This time, let's focus on what is perhaps

the largest group of programs available: shareware.

Basically, shareware is software you try before you buy. It is *not* free. The author puts the program out into the world and asks those using it to pay a small fee and register their use with him.

By dealing directly with the user, marketing costs are minimal. Usually, the author gives copies of his program to operators of computer BBSs and to some of the computer clubs in the country. The program then migrates from BBS to BBS, and becomes available to nearly anyone for the price of a local phone call.

The documentation and instructions are

included with the shareware. The user simply prints it out as needed on his own printer.

## KEYBOARD CONNECTION

As you can imagine, this greatly reduces the costs of supplying the programs. Frequent updates can be easily accomplished to fix bugs and to answer requests from users for more features.

There are shareware programs that can accomplish almost any task you might have in your facility. For example, you can find a needed utility, checkbook manager, graphics drawing program, database, games and much more.

I've even written this column with a shareware word processor, PC Write™, from QuickSoft (800-888-8088). In fact, over the years I've evaluated quite a few word processors, and PC Write is still my favorite, regardless of price.

As mentioned before, many of your local BBSs carry up-to-date versions of many shareware programs. If you don't see what you need, ask. Most SYSOPs have a library of programs that just won't necessarily fit on their hard drives.

Another source can be found in computer magazines. Look for the ads for computer clubs and businesses that will

sell you diskettes of shareware.

Still, no BBS or magazine ad can list all of the more than 6,000 programs available. On the other hand, PC-SIG in Sunnyvale, Calif., specializes in cataloging, tracking and supplying shareware.

PC-SIG (800-245-6717), the world's largest distributor of shareware and public domain utilities, publishes "Shareware Magazine" each month for more than 100,000 readers.

It also produces "The PC-SIG Encyclopedia of Shareware," a paperback that is updated every few months with the latest information on shareware. The "Encyclopedia" provides a listing of all available programs, as well as descriptions by program category. Each can be ordered through PC-SIG.

For those with insatiable appetites for programs of all descriptions, or BBS SYSOPs that want to provide their users the greatest variety of available shareware, PC-SIG now produces a CD-ROM version of the "Encyclopedia," complete with all the programs themselves.

The volume of material is stunning. According to Joe Byrd of PC-SIG, "The equivalent of more than 2,800 5.25-inch diskettes of programs has been put on the CR-ROM—over 6,000 programs." If that weren't enough, the "Shareware Encyclopedia" is on there, too, providing an index and information on the contents.

BBS SYSOPs will be especially pleased to know that the programs come "pre-zipped," ready for your users to access and quickly download. And since the CD-

(continued on page 41)



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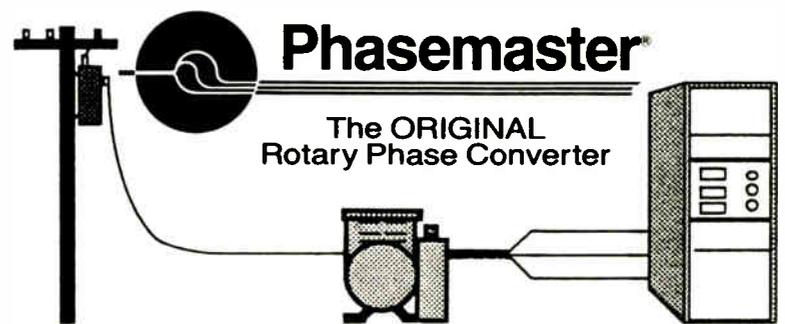
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# Smokey Performs a Miracle with KATP-FM

by Dee McVicker

**AMARILLO, Texas** Broadcast engineer Smokey King was busy installing KATP-FM's new on-air studio here when he suddenly heard voices. Outside, in the mall, just beyond the new studio's large double-pane glass window, someone was talking.

The worst, it seemed, had happened. After going to great lengths to isolate the studio against mall pedestrians, with extensive construction dividing the studio from the mall traffic, King was again faced with the Herculean task of isolating the station's classic rock format from the shuffling footsteps and conversations of Westgate Mall shoppers.

## FACILITIES SHOWCASE

Ironically, at odds with this seemingly impossible task was the station's new neon storefront display, which attracted mall passersby to the window and to the activity of KATP-FM announcers.

The station's storefront of black tile with colorful neon lighting—including a "rock 'n' roll" cat logo—was, in fact, designed for this very purpose by one of the station's announcers, Andy Chase.

"We wanted a real eye catcher," commented King, noting that KATP's arresting storefront certainly is not lacking in visibility.

To isolate the mall outside from the studio inside, Don King of Lubbock's KLBK-TV—whom Smokey King is not related to but calls "Uncle Don"—suggested more window dressing. Smokey King agreed and added to the double-pane studio window two more double panes of glass. It worked.

With this problem solved, King again turned his attention to the highly visible on-air studio. Open to pedestrian viewing, King's concerns were with the aesthetics of the studio as well as providing all the working space needed by the announcers.

Taking advantage of the studio's expansive space, Smokey King, with the help of Don King, designed the studio with a full wall of compact disc storage for KATP-FM's on-air CD library. Below the CD racks, he put the cabinet workspace that was requested by KATP's program director.

KATP's studio is not square, King explained; the front is cut at an angle to accommodate the angle on the storefront. Therefore, the cabinetry also was angled to fit the room. This, however, did not interfere with pedestrian visibility. As passersby look through the on-air window, he said, "they see all the CDs, plus the announcer. They look directly across the board."

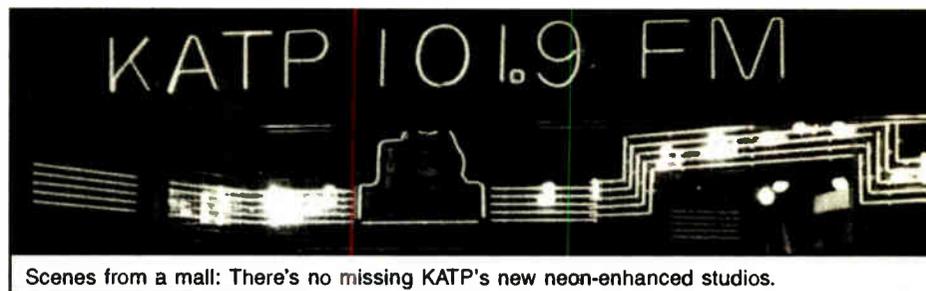
### Across the front

The console, an Arrakis that the station purchased not long before moving into the new mall facility, "comes out across the front at an angle with the front," King said.

This layout enabled King to hide control room electronics without blocking

access should he need to make a quick-fix while the studio is on the air. Access wood paneling under the console provides the entry to equipment for studio repairs.

Also within easy access are the on-air studio's three ITC Delta cart machines and three new Technics compact disc players. Airing the majority of its format directly from CD, with the commercial load primarily aired from cart, KATP-FM relies on two of the Technics players for on-air playback



Scenes from a mall: There's no missing KATP's new neon-enhanced studios.

and one as an on-line backup.

In addition, the station relies on a Henry Engineering Matchbox for balanced audio of the CD players. The Matchbox also proved helpful with another problem King discovered.

"We were having some problems with the CD players picking up the neon transformer (for KATP's storefront), but when I put the Matchbox in, that can-

celed it right out." Two Technics turntables also are in place in the studio, as well as Otari reel-to-reels.

Electing to compromise mall-to-studio visibility, King decided not to spotlight the equipment—or the announcer. "We keep the lights down in the control studio," he said, "so they can see (the announcer), but he isn't in a fish bowl."

(continued on page 41)

# 'WOLF!'

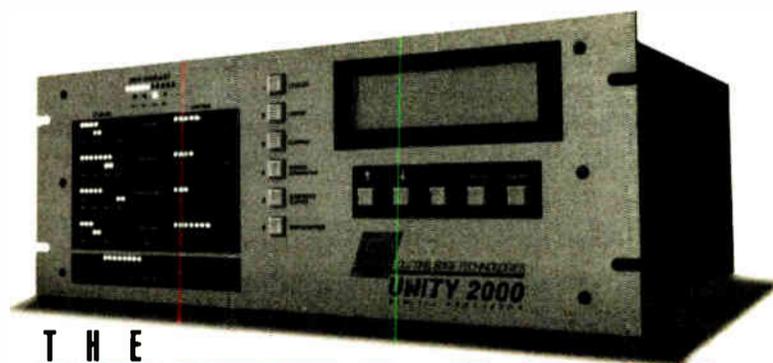
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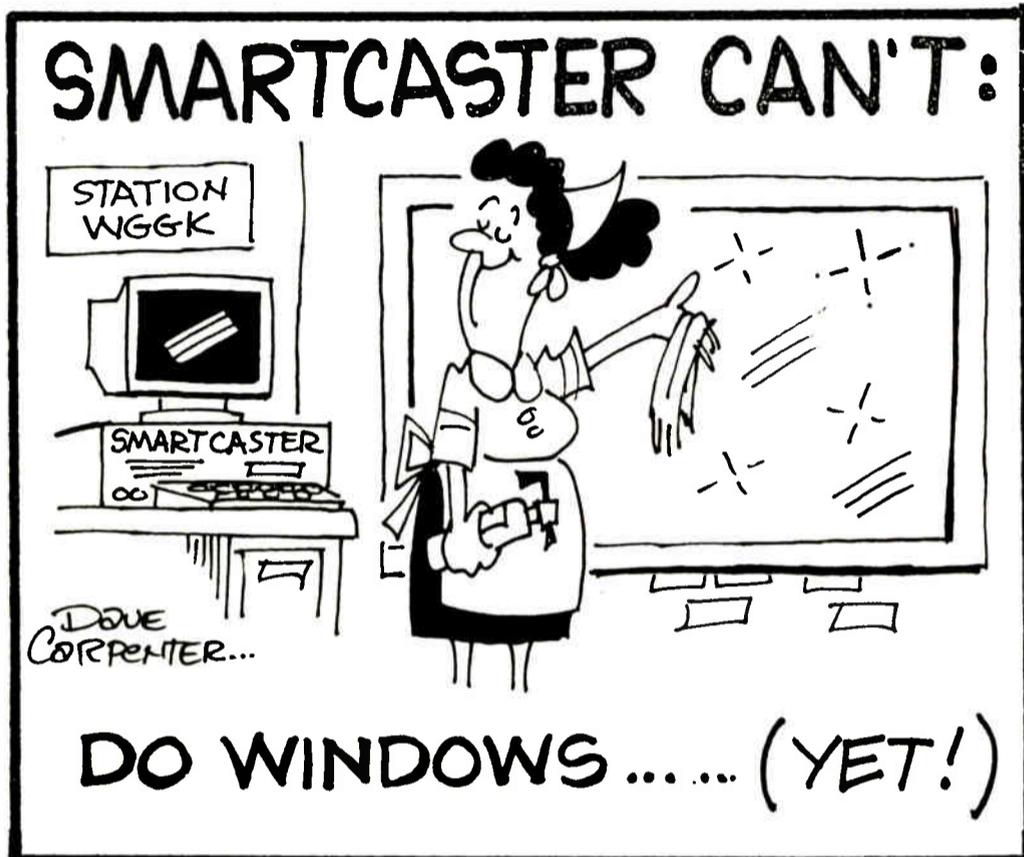
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# Maintenance of Drive Systems

by Tom Vernon

**HARRISBURG, Pa.** With the current state of the art in the industry, many engineers raised on digital might equate trouble-shooting speed problems in reel-to-reel decks and cart machines with checking and adjusting servo circuits.

True enough for most modern equipment, but what about that ITC 750 hanging around in the AM studio or those 20-year-old cart machines the news guys are still using?

Many older tape machines and turntables are still in service and need to be maintained—thus, the topic for this month's *Station Sketches*.

### Three types

For the sake of our discussion, mechanical drive systems may be divided into three types: direct drive, motor/flywheel and motor/idler wheel. Each will be described here, along with some thoughts on maintenance.

## STATION SKETCHES

The simplest system is direct drive, which is used in turntables, cart machines and reel-to-reel machines. Typically, a high torque synchronous motor is employed, with the shaft acting as the capstan. Advantages are simplicity, ease of maintenance, reliability and superior wow and flutter specifications.

Routine maintenance is confined to regular cleaning of the capstan and idler wheel surfaces to remove oxide build-ups, and occasionally checking the tension between the two. Regular wow and flutter checks will tell you when the motor is getting near the end of the line.

The only real disadvantage is the high cost of replacement sync motors. Failure mode of these devices is usually noisy and worn bearings. Only rarely do the windings open. Many tape machine manufacturers will give you credit for returning worn motors against the purchase price of a new one. Also, there are several small companies that specialize in motor rebuilding. Often they don't advertise and you must find out about them by word of mouth.

Older cart machines usually use the motor/flywheel scheme. A sync motor with a small pulley on the shaft drives a large flywheel via belt(s). These have the advantage of lower initial cost, but inferior wow and flutter specs. Because of the mass of the flywheel, instant start isn't possible. Heavily used machines often have the motors running continuously so the carts won't wow if they're inserted and started quickly.

### Rotational speed

Going back to basic physics in Figure 1, we can calculate the rotational speed of the flywheel by knowing the motor speed and size ratio between the pulleys. Thus, a 2,500 RPM motor with an 8:1 ratio would yield a flywheel velocity of 312.5 RPM.

In the real world, the belt thickness influences speed, increasing pulley diameter by as much as one-third the

thickness of the belt. If the original belt is replaced with a thicker substitute, the result will be slower speed. The "real world" diagram of pulley/speed ratios is illustrated in Figure 2.

Precision ground flat belts have more consistent speed characteristics than molded "O" rings. This is because changes in the thickness of the belt can cause speed changes.

As belts age, they stretch out, resulting in increased effective length and slower speed. Slippage also becomes a problem. Replacement belts should have the same inside diameter as the original when it was new, not as it is measured when taken out of service.

When servicing a unit that has several belts, it's best to replace all of them at once. Usually the time, trouble and labor costs of pulling a machine out of service far outweigh the cost of a few belts.

Also be sure to clean all pulley grooves and contact surfaces before installing new belts. If the machine has a motor speed control, playback a test tape and verify proper speed after replacing belts. The newer DVMs with a frequency counter function make this job a breeze.

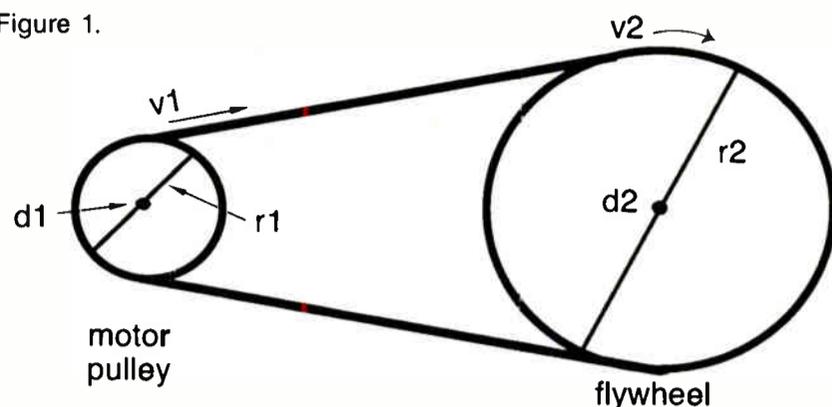
### Permanently lubricated

Machines should be lubricated as per manufacturer's instructions. Many newer motors have permanently lubricated bearings and can be damaged if an attempt is made to oil them. Some of the less expensive sync motors require periodic (six month) disassembly and soaking of felt washers with Wynn's Friction Proofing Oil. Flywheel thrust bearings should get an occasional dab of Lubriplate, and be adjusted for 1/16-inch end play.

Another popular drive method employs an idler wheel between the motor shaft and the rotating surface, as with

(continued on page 42)

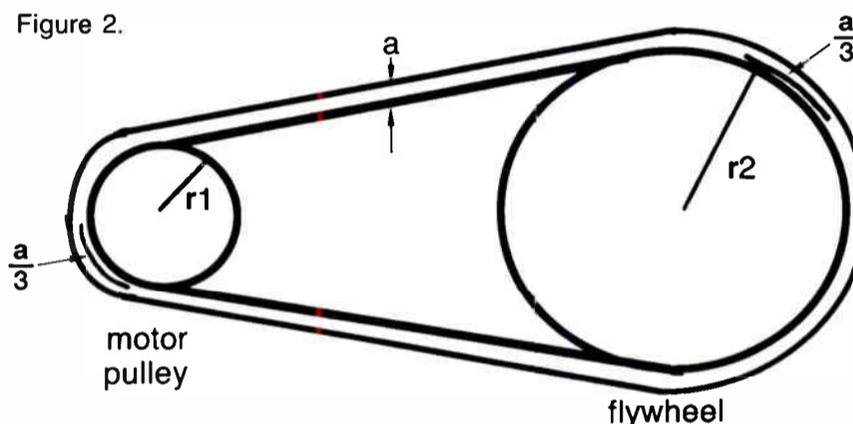
Figure 1.



Basic physics representation of pulley diameter to speed relationship, where  $V$ =rotational speed in RPM and  $d$ =diameter,  $r$ =radius.

$$\frac{d_2}{d_1} = \frac{V_1}{V_2} = \frac{r_2}{r_1}$$

Figure 2.



Real-world representation of motor pulley/speed relationship. (Note effect of belt thickness on calculations.)

$$\frac{r_2 + a/3}{r_1 + a/3} = \frac{V_1}{V_2}$$

## SCPC Satellite Receivers With Cost Effective Answers For Your Programming Needs

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**BALTIMORE** A lot of people envision the production gear market as a swinging pendulum. On one end of the swing users are buying lots of new toys and the manufacturers are having a hard time keeping up with the demand. Full deflection in the opposing direction means the manufacturers are offering deals on "aging technology" while they try to get top dollar for new toys so they can recoup the R&D costs as soon as possible. Unfortunately, this kind of simplistic text-book scenario seldom happens in real life.

In real life the market functions more like a bunch of long-tailed cats in a room full of amphetamine-juiced junkies on rocking chairs. From the cats' perspective, even if your tail was safe from the ravages of the rocker five seconds ago, there's no guarantee it will be safe by the time you finish reading this sentence. The force that drives this whole mess is competition. Both the manufacturers and the production people are constantly trying to maintain or better their market positions, without going broke.

#### The money thing

Money is the "grease" that lubricates the market. When money is tight, like now, the market heats up, becomes bloated with inventory and grinds to a stop. At some point, even the most attractive new toys remain on the shelf. As over-leveraged radio stations and recording facilities drop their rates, they force more stable operations to do the same.

From the manufacturers' perspective, it's a lousy time to be caught with lots of expensive new technology. Many of

# TECHNOLOGY BREAKTHROUGHS

NAB '91

Digital Editing

by Ty Ford

## Predicting the Future For Production Gear

them respond by eating the R&D cost of products that they can't move, and continuing to present newer even more advanced gear in an effort to get the market to buy. We are now at the point where the smart manufacturers have figured they need to wait this thing out.

Some will "re-invent" less expensive versions of the technology they have already developed. Having made the initial investment with their 480L, Lexicon is successfully making this maneuver with its LXP-1, LXP-5, LXP-15 and Model 300 digital multi-effects processors. In itself, keeping the R&D departments focused at refining existing technology is good for the market. In fact, it's a necessary function of a responsible marketplace.

Manufacturers with the deepest pockets will continue to absorb or scavenge new technology from undercapitalized companies. It's Darwinism

at its best. Of course just having deep pockets is not a guarantee for survival. "Big money" companies, while they can take more chances and sustain more mistakes, also run the risk of swallowing the wrong companies, or swallow-

or try to find work at one of the many TV stations where good audio is a seldom experienced afterthought.

In the near future you can expect more squabbles about data compression for digital audio. There will be at least three arenas. In the first, the arguments will be on whether or not any kind of data compression is acceptable. The second will busy itself by fighting over which of the existing compression methods should be the standard. In the midst of all this jaw-boning, manufacturers will continue to debut new technology with the hope that they can get enough product into the market to claim a de facto standard.

While all of that's going on, expect the sample rate versus data compression fracas among storage conservationists to raise an equal amount of stink.

There's a real danger here that people will be so distracted by the bickering and positioning that they'll forget that the original idea was to improve

**In real life the market functions more like a bunch of long-tailed cats in a room full of amphetamine-juiced junkies on rocking chairs.**

ing when they shouldn't. I'm sure most of the national radio and TV sales rep firms and the advertising agencies that went through their individual acquisition binges a few years back weren't expecting to purge afterwards, but they did.

#### Crowded field

If you're buying or selling production gear in today's market, you may have noticed the field is a lot more crowded. The addition of gear from the semi-pro and musical instrument (MI) markets have doubled the choices. For better or worse, I believe the trend will continue. As I've written before, your best defense is knowledge. If you refuse to embrace digital audio and computers, you might as well hang up your hat and retire right now. Either that

the quality of audio. At some point they'll have to stop arguing about specs and start listening.

#### Today's new toys

Look for data compression to be refined and accepted, especially in broadcast where the frequency response limits of 50 Hz to 15 kHz legitimize 32 kHz sample rates. Digital "cart machines" using 3.5-inch diskettes are a good transition away from analog cart machines. They give the operator something to pull out of a rack and stick into a machine—very important. Whether Sonifex's Discart, Fidelipac's Dynamax DCR 1000 or the 2.25-inch Sony Mini Disc will be milestone technology or just a flash in the pan remains to be seen.

Having a cheap recording medium will be extremely important. Radio stations and production houses are not likely to replace their cart machines until the cost of a disk drops to twenty dollars. As such, I don't expect many of the digital cart systems using expensive Bernoulli boxes or magneto-optical disks to make much of a dent in the cart market.

Manufacturers of mass digital storage systems for on-air operations will have to develop acceptable and affordable redundancy schemes for their systems before radio stations will be willing to give up their cart machines, reel-to-reel decks and CD players. While having a cart machine go down is inconvenient, a hard drive crash, a power supply failure, a CRT failure or any other failure in a centralized system is catastrophic.

Manufacturers need to understand that missing a spot on a sold-out Friday afternoon drive log means lost dollars. If the whole system goes down, you're dead. Even a 24 hour a day hotline with overnight express delivery won't do you any good.

Don't get me wrong. There are good uses for mass storage. Look for music libraries and other long-form audio archives to take advantage of CD-ROM's

(continued on page 38)

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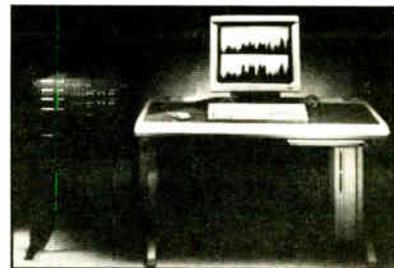
World Radio History

Editor's note: In this installment, RW completes its special Technology Breakthroughs series with a look at digital editing workstations and related products introduced at the NAB convention in Las Vegas this year. Look for more special product features from RW throughout the year.

# TECHNOLOGY BREAKTHROUGHS

NAB 91

DIGITAL EDITING

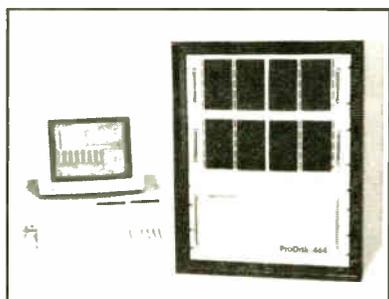


## Studer Dyaxis

Studer's Dyaxis upgrade features non-real-time sample frequency conversion for 128 different sample frequencies, and snap-shot automation. The Dyaxis also increased storage capability via 300 Mb per side magneto-optical drives for archiving.

The Dyaxis system is also available in a four-channel version (the 2+2), which allows for in-sync real-time overdubbing. Macmix software provides real-time EQ and level control via five-band parametric or graphic EQ per channel.

For more information, contact Sandra Hale at Studer Revox: 615-254-5651; fax: 615-256-7619; or circle Reader Service 88.



## Otari ProDisk 464

Otari recently acquired the N.Y. firm Digidesign and its Mac-based ProDisk 464. The ProDisk 464 records and plays back from four to 64 channels. Refinements of the system by Otari include faster operating speed, a larger RAM cache, a user-definable auto-save feature and a soon to be released DSP card with real-time level and EQ controls.

With an entry-level price of \$65K, the four-channel ProDisk 464 comes with 30 minutes per track minimum storage time, which may be expanded in 30 minute per track increments up to three hours per track.

The ProDisk uses open-ended architecture for full SCSI compatibility, and the unit also locks to SMPTE.

For more information, contact John Carey at Otari: 415-341-5900; fax: 415-341-7200; or circle Reader Service 49.

## Sonic Solutions Mini Editor

Sonic Solutions showed its multiple Mac-based recording and editing systems, including CD mastering, edit and sound for picture, NoNoise options and effects. The Mini Editor, Sonic Solution's entry-level system, features SMPTE-based digital recording and editing with variable crossfades and level control (\$8,750). The Sonic Expanded four-track editing system also allows background loading and unloading.

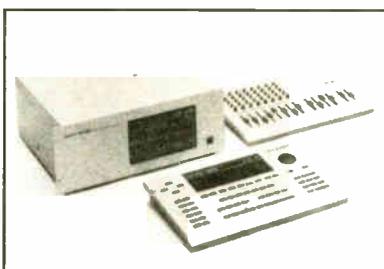
All systems are 20-bit linear PCM input and record up to twenty-four channels in groups of four. Track time varies from 108 minutes to 864 minutes at 44.1 kHz times the number of tracks.

For more information, contact Mary Sauer at Sonic Solutions: 415-394-8100; fax: 415-394-8099; or circle Reader Service 7.

## Waveframe AudioFrame

Upgrades to Waveframe's AudioFrame included a faster computer interface, simultaneous 32 input/output capability through a 64-channel buss, dedicated controls for all mixer functions, time compression, real-time EQ and MIDI recordable automation.

For more information, contact Courtney Spencer at Waveframe: 303-447-1572; fax: 303-447-2351; or circle Reader Service 67.



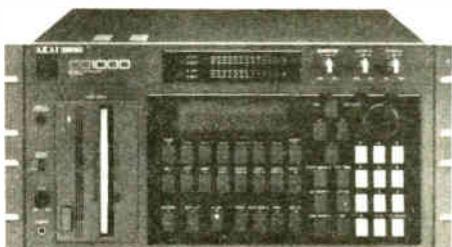
## Roland DM-80

Roland's DM-80 hard disk recorder is available in either four- or eight-track versions. The DM-80 features a built-in 24 bit digital mixer with two stage EQ, pan and individual level control. The basic 100 Mb four-track system with DM-80-R remote controller (\$7,500) provides 19 minutes of track time across four tracks at 44.1 kHz. The present system may be expanded to 500 Mb, allowing 90 minutes of 44.1 kHz recording.

Other options include the DM-80F eight-track EQ/pan/fader controller and Mac-based Track Manager software (\$1,695) for controlling and editing. The system is also configured to accept large-capacity memory devices—such as magneto optical disks—that can extend storage time to 12 hours.

Roland further supports the system with its own outboard digital EQ, reverb, delay and noise reduction devices.

For more information, contact Albert Dugas at Roland: 213-685-5141; fax: 213-726-8865; or circle Reader Service 42.



## Akai DD1000

The DD1000 magneto-optical recorder from Akai (\$13,500) uses removable magneto-optical disks, which offer 30 minutes of stereo per side. The DD1000 can work with a variety of input and output configurations. Although it can be operated by the controls on the front panel, the DL500 remote (\$1,000), the DL1000 remote (\$2,500) or remote via a Mac II with at least 2 Mb of RAM is suggested. Software for front panel emulation (DD FMac V1.0) and enhanced editing (DD QMac V1.0) runs \$695.

The DD1000's new quick-start DL 500 remote box lets you control the starts of 10 different elements. Each electronic "page" is like having 10 cart machines at your fingertips. Depending upon how you program the DD1000, successively fired-up audio bits will either cut off the preceding piece, or overlap it.

For more information, contact James Martin for Akai: 817-336-5114; fax: 817-870-1271; or circle Reader Service 126.

## Digidesign Sound Tools

Digidesign showed a collection of Mac-based software called Sound Tools. The two-track entry-level Sound Tools system (\$3,285) requires a Mac IIci with at least 4 Mb RAM, 8 Mb preferred.

There are three different I/O modules. The first is standard 16-bit A/D 16-bit with no oversampling at 32 kHz, 44.1 kHz and 48 kHz. Options are the bi-directional digital interface with 32 kHz, 44.1 kHz and 48 kHz sample rates, AES/EBU, SPDIF and DAT backup software (\$1,000); or the optional Pro I/O converter (\$3,000), providing delta sigma 64x oversampling at the input and 18-bit, 8x oversampling at the output through Apogee filters.

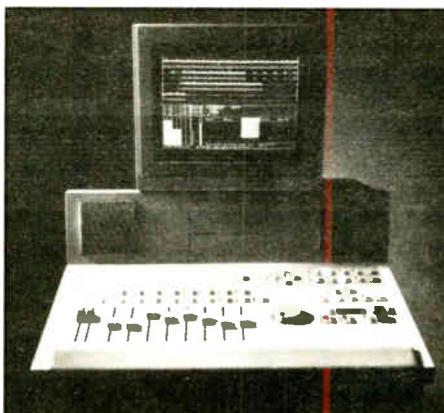
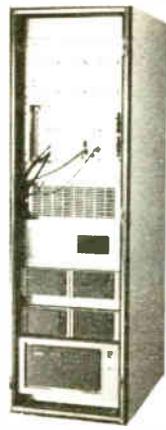
The basic 16-bit Sound Accelerator card features real-time five-band stereo graphic/parametric EQ, real-time compression/limiting/expansion/gate controls, sample rate conversion, pitch shift and time compression/expansion, all in real-time.

For more information, contact Suz Howells at Digidesign: 415-688-0600; fax: 415-327-0777; or circle Reader Service 91.

## Lexicon OPUS

Lexicon showed its CEPEX package with improved time compression, pitch change, vari-speed and sample rate conversion, all in stereo. The Opus console model of the system (not the "e" model), now has more extensive automation for fader, pan, sends, mutes and storage for different mixes.

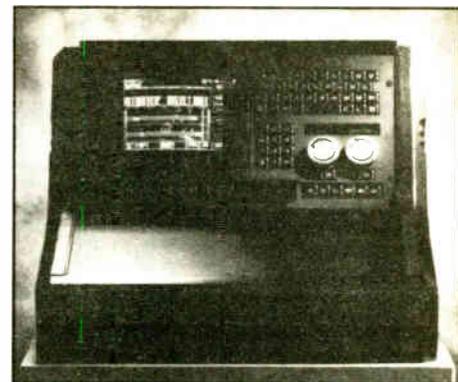
For more information, contact Will Eggleston at Lexicon: 617-736-0300, ext. 309; fax: 617-891-0340; or circle Reader Service 12.



## AKG DSE-7000 Modification

AKG has made its RAM-based DSE-7000 workstation more attractive by lowering the base price by \$9,000. The 4.4 minute entry-level system is now available for \$28,500. Additional RAM cards are available for up to 17.5 minutes.

For more information, contact Dave Roudebush at AKG: 415-351-3500; fax: 415-351-0500; or circle Reader Service 144.



## AMS AudioFile PLUS

AMS's AudioFile PLUS upgrade increases the number of outputs to 16 and the number of inputs to eight. The new D-8 8.14+ Issue 02 software for two-input AudioFile PLUS systems provides improved ADR pages, the ability to name a recording while in the record mode, easier defaults, faster event splicing, an improved event list filing system, as well as "compare" and "copy" disk facilities.

For more information, contact Charles Conte for AMS: 203-792-4997; fax: 203-792-7863, or circle Reader Service 33.

## Ediflex Software Changes

Both the Audiflex and Optiflex systems from Ediflex have had minor software changes. The Optiflex, positioned for the film/audio market, now records up to 32 channels simultaneously, and offers independent track slipping.

For more information, contact Tony Schmitz at Ediflex: 818-502-9100; fax: 818-502-0052; or circle Reader Service 103.

## DAR Soundstation II

The Soundstation II from Digital Audio Research has been upgraded to 18-bit, 16x oversampling in and out. Storage time is from 120 minutes to 24 hours with eight hours per rack. The system is now capable of real-time four-band EQ, time compression, digital vari-speed and auto-location jog/shuttle via touch screen control.

For more information, contact DAR at: 213-466-9151; or circle Reader Service 27.



### New England Digital Post Pro SD

New England Digital's Post Pro SD make-over consists of a faster Mac (IIfx), up to eight inputs and outputs, a DSP option for 20-bit A/Ds with 64x oversampling and 24-bit equalization and dynamics processing, SDIFM protocols for direct transfer from

# TECHNOLOGY BREAKTHROUGHS

NAB 91

Digital Editing

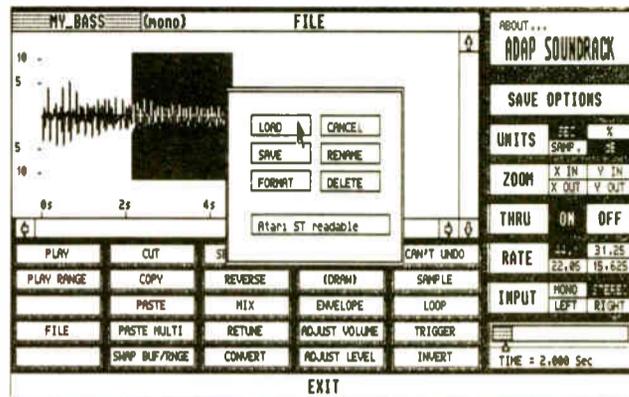
24- or 48-channel Sony machines, machine controls for Sony BVH/BVU and Ampex VPR3 machines, a librarian for cataloging on-line and off-line sounds, a 1 gigabyte magneto-optical storage drive, and Soundroid software for film style editing and Q sheet printing.

For more information, contact Ted Pine at New England Digital: 603-448-5870; fax: 603-448-3684; or circle Reader Service 89.

### Hybrid Arts ADAP II

The ADAP II from Hybrid Arts is a two-track hard drive recording and editing system with waveform editing utilities including EDIT for multitrack layering; DIGITAL RECORD for recording, editing and looping; MIDI for musical keyboard interface; TIMEPAGE time compression/expansion and CUE for SMPTE synchronization.

The basic turnkey



package includes a sampler-type MIDI keyboard mapping and playback function. The main rack consists of a 760 MB hard disk, an analog audio in/out module, and a DSP module that handles digital audio in/out and waveform processing.

Record and playback sample rates are 48, 44.1, 32, 31.2, 22.0 and 15.6 kHz. THD+N is less than 0.02 percent.

For more information, contact Dana Byrd at Hybrid Arts: 213-841-0340; fax: 213-841-0348; or circle Reader Service 2.



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### The Management Digital DJ

While not strictly speaking a digital editing workstation, the Digital DJ from The Management allows regular audio spots or short programs to be edited onto computer hard disk. Playback is totally random access.

There are three basic applications using the Digital DJ storage system: satellite programming via Sky Pilot, automation source replacement via Auto Pilot, and cart machine replacement via DJ Log. Newsroom and production applications are also available.

For more information, contact Adrian Charlton at The Management: 800-334-7823; fax: 817-624-9741; or circle Reader Service 150.

## Predicting the Future For Production Gear

(continued from page 36)

larger storage. Production music companies can now put their entire library on several of these and set up a password system. Although the entire library exists on the CD-ROM discs, the user can only access the parts of it that have been licensed and paid for.

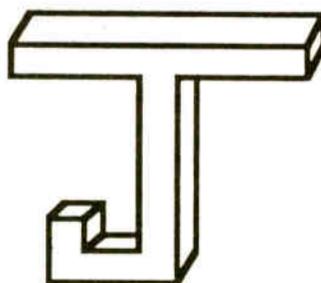
### And in the end

You have to look at the big picture. As bad as things may appear at the moment, we will adjust. (Notice I didn't

mention things would get better.) As that adjustment occurs, people will tend to forget how bad it was. Ten years from now they'll consider these times "The Good Old Days." Oops... there goes the phone. Probably another client with spots for me to cut.

■ ■ ■

*Ty Ford helps people with their production woes. Find a comfortable couch, lie down and call him to unburden yourself before he puts in a 900 number. Until then try 301-889-6201, or MCI mail 347-6635.*



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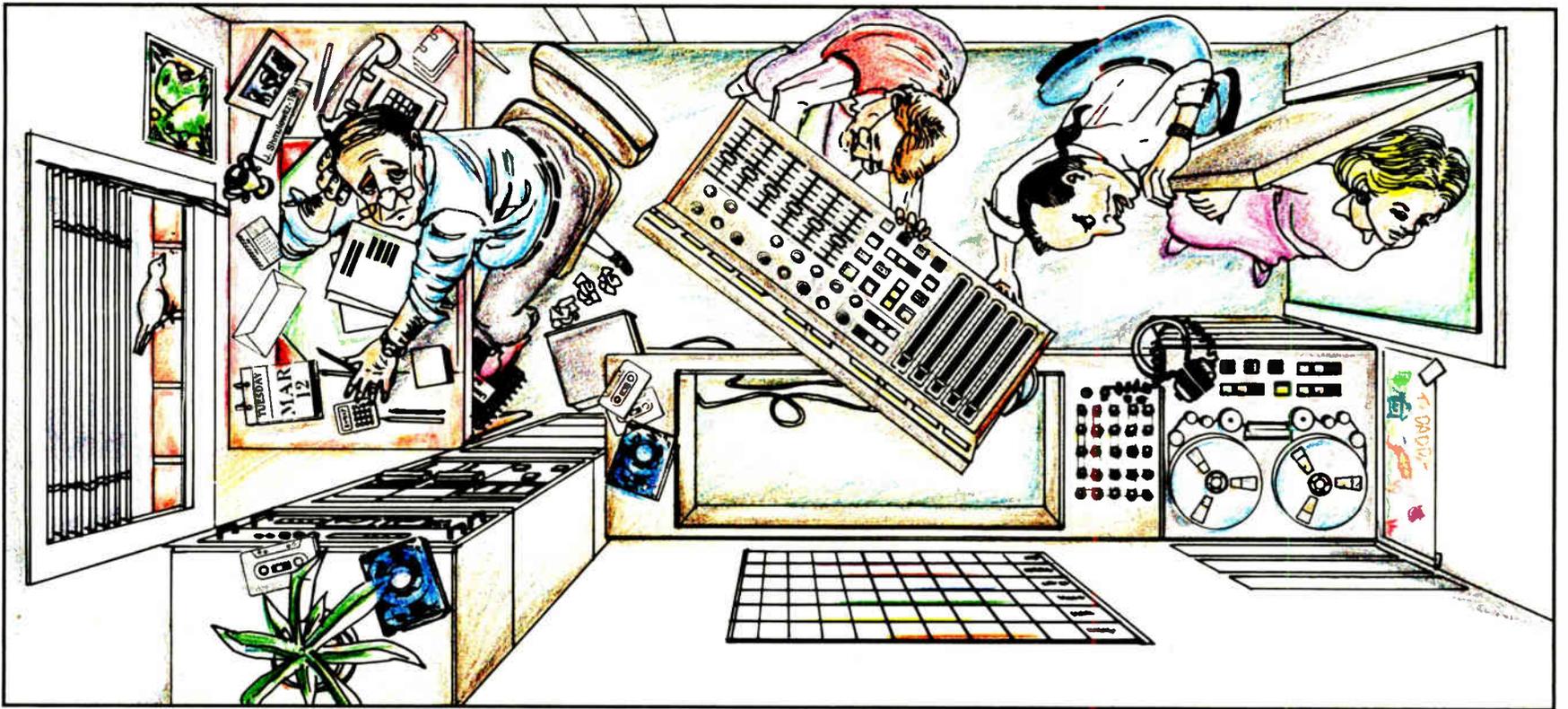
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# Selling Yourself with Letters

by John Cummuta

**DOWNERS GROVE, Ill.** Business to business letter writing is probably the most misunderstood form of communication in America today—well, second only to rap music.

In this column, we're going to examine letter writing as it relates to marketing, which makes most of the letters *sales* letters. I'll tell you what they are, how they're used in the marketing process and I'll wrap it up with techniques that make sales letters more effective and successful.

A sales letter is just that—selling in print. This is where most business letter writers begin to get off the track. They forget that even the president of ABC himself is only a man (at least, as of this writing). He goes home to a family, watches TV, eats the wrong kinds of food, yells at the Yankees and exhibits the same traits as any other American male.

Yet, instead of writing to a man, misinformed authors write to a "Business Person," using *business-ese* language.

The man or woman you're writing to at the station or group headquarters is the same person that you'd write to at their home address. So talk to them the same way you would if your letter would be read on their sofa at home.

Think of how you'd say it if you were sitting across the table from the same person. Would you say anything like, "Pursuant to your letter of the 15th and in accordance with company policies as enumerated in our document number blah, blah, blah . . . ?" Of course not. So don't say it that way in a letter.

The sales letter is the human-to-human bonding element. It should make a human-to-human connection.

You may remember from an earlier column the acronym AIDA. It stands for Awareness, Interest, Desire and Action; that's the process you must guide a prospect through to get them to make a buying decision.

Well, a sales letter can be the human element in each of these contacts. Your first letter is an Awareness letter—that is, a "prospecting" letter. In it you want to introduce yourself and stress the *benefits* you can provide to the reader. In the next letter—frequently in response to *their* response to your first letter—you are building interest or "educating" your prospect about the need for what you offer.

The next letter in the process might either be a "closing" attempt to get an appointment or to book a site survey. And following whatever service you provide, you'll want to include one or more thank you letters.

After that, you'll continue a series of "cross selling" letters that will trumpet the advantages of other things you can do for your new client. With those letters, because the relationship is already established, the language can be even less formal than earlier correspondences.

Some of the things I'll mention here are simply true. I'm not going to give elaborate explanations as to why they're true—they just are. Their effectiveness has been proven through decades of direct-mail copywriting.

First of all, there's your attitude. Don't sit down to write a business sales letter—write a love letter. If you have that kind of attitude as you compose, you'll stay on the

person-to-person course and you'll focus on communicating *benefits* to your reader. Next, let's look at style.

Indented paragraphs in a letter work

## ENGINEERING MANAGER

much better than flush left paragraphs. I don't care if you agree with me or not, because I'm right and I have volumes of evidence to prove it. The reasons include things like: it looks more personal and friendly, the indentation space graphically

pulls the reader's eye into the paragraph's first sentence and it's more in line with the natural movement of the eye. But the bottom line is that it simply works better. Take my word for it.

Contractions work better than uncontracted words. This is another element of the personalization focus. The closer your writing is to relatively good talking, the more effective it will be in a sales letter.

Using the word "you" and its derivations pulls the reader into the copy. Don't focus on yourself, other than to show how something you can provide is a benefit to the reader—which gives you another opportunity to put a "you"

in that sentence.

Short, punchy paragraphs work better than long ones. Sentence length should be varied. Intermix long, compound sentences with short, direct sentences. A sentence can be as short as a single word. Right?

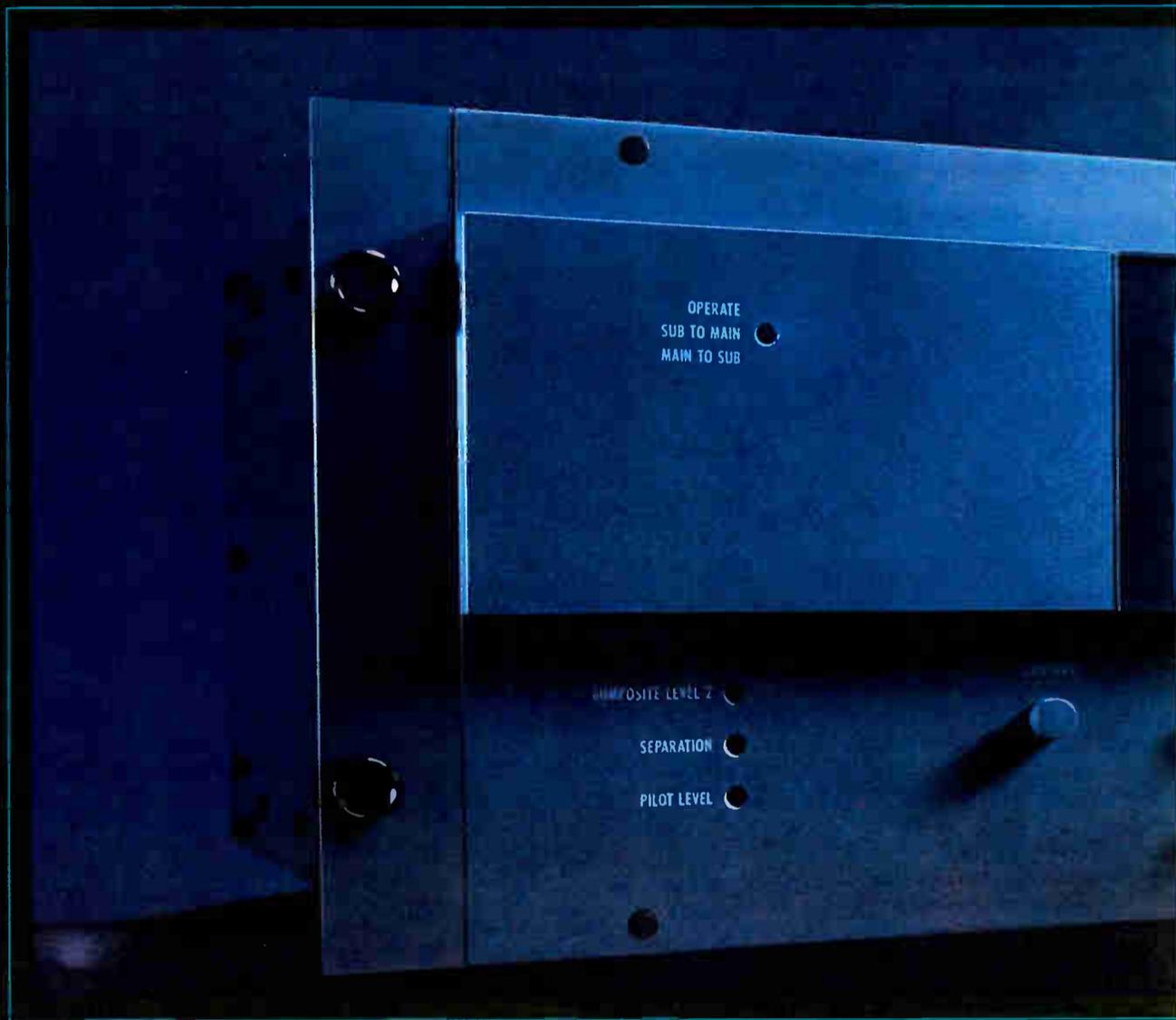
Reduce the use of prepositional phrases. In most cases, a prepositional phrase can be replaced by turning the object of the preposition into a possessive. For example, in the sentence, "I am the leader of the team," the prepositional phrase *of the team* could be replaced by changing the sentence to, "I am the *team's* leader."

The object of the preposition—team—was turned into a possessive, and the cumbersome phrase was eliminated.

Use shorter rather than longer words.

(continued on next page)

# DIGITAL AUDIO.



## OPTIMOD-FM

D I G I T A L

The power of digital propels the 8200 to new levels of performance and functionality. OPTIMOD-FM 8200 is a true digital audio processor—the audio is digitized and all control functions are digital.

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- ▶ **Programmability**—The automatic preset switching feature changes the 8200's processing on

# A Guide to Computer Programs on a Budget

(continued from page 32)

ROM is read-only, there is no need to worry about virus infections contaminating the programs.

The prices of CD-ROM readers have been coming down over the past several months. And some, like the new Tandy CD-ROM reader, are even able to play music CDs when you're not loading programs.

If you're among the millions who upgraded to DOS 5.0 over the last month, you're probably enjoying the benefits and yet, maybe you're wondering where all

the free space on your hard drive went. Perhaps I can help a bit.

First, check your hard drive for a directory named OLD.DOS.1. This is where the SETUP program moved all of your old DOS files. Originally, the idea was to give you a chance to "back out" if you didn't like DOS 5.0.

You can use the command "DELOLDOS" to automatically remove all the older DOS files, recovering as much as a megabyte or so of space.

Second, check your current DOS direc-

tory. You'll find it now has more than 2 megabytes of files in it. Yes, many of them can be deleted safely. Which ones?

To answer, I'm going to recommend you get a copy of "DOS 5 Demystified" by James Forney (Windcrest/McGraw-Hill, 1991). This friendly, informative book provides some super tips to get the most from DOS 5.0. In chapter 11, for one example, you'll find out how to cut more than a megabyte of files without hurting DOS.

If you're a Peter Norton fan, "Peter Norton's DOS 5 Guide" (Brady, 1991) is full of the sort of insight you expect from one of the best-known DOS doctors.

■ ■ ■

Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant in Tucson, Ariz. He can be reached at 602-296-3797, or 1:300/11 on Fidonet, or [barry@coyote.datalog.com](mailto:barry@coyote.datalog.com) on Internet.

# Smokey & The Miracle

(continued from page 33)

It's a bit of a tradeoff between the two."

In lieu of immediately purchasing new equipment for a multitrack production studio, the management at KATP-FM decided to move over its existing two-track. "I told management to hold off on upgrading to multitrack," King said. "We really want to explore computerized production."

## Production and on-air backup

In the meantime, KATP's staff was able to dedicate its secondary studio to production and on-air backup. Fitted around the two-track studio's 10-channel Autogram console are the two Otari MX5050 reel-to-reel recorders, ITC Delta cart machines, Technics turntables and a new Technics CD player.

After completing both studios and with move-in day nearing, King ran up against yet another problem. "The big deal was the carpeting; it did not pass fire inspection at the mall after we were ready to move in," related King. "It was fire resistant instead of what you'd call fire proof."

King spent almost a week considering the grim possibility of replacing all the carpeting in the new facility. In the final evaluation, however, the solution proved far less drastic. Using a spray to fire-proof the fire resistant carpeting, King was able to move KATP's staff into the new facility within a few days.

■ ■ ■

Dee McVicker is a free-lance writer and regular contributor to RW. She can be reached at 602-899-8916.

# Sell Yourself With Letters

(continued from previous page)

"Get" is better than "acquire," "do" is better than "accomplish" and so on.

Rules of grammar are first to be understood and secondly to be selectively broken. The purpose of your letter is to communicate. If grammatical rules don't get in the way, use them. If they obstruct your meaning, blow them away. The only grade you get on a sales letter is a sale or no sale.

It has been said that the art of writing is re-writing. I've found that to be all too true in my writing and I'm confident it will work the same for you. If you can afford to let a letter sit overnight, wait until the next day to do your re-writing. And remember, cutting things out of your copy will almost always improve it.

Finally, forget any rules about how many pages a business letter can be. It can be as long as it needs to be to say what you need to say. An ineffective and dull one-page letter is too long and a powerful, engaging 12-page letter may not be long enough. Just do what it takes to get the job done.

Well, there you have it. Successful sales letter writing in a nutshell. Maybe next month we'll do rap music.

■ ■ ■

John Cummuta is president of Advanced Marketing Concepts, a broadcast management and marketing consulting firm. He can be reached at 708-969-4400.

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# WORKBENCH

## Casting Light on LEDs

by John Bisset

**FAIRFAX, Va.** LEDs have become a cheap, yet very useful means of diagnosing failed equipment. They're found on a multitude of broadcast products, but when they are used to indicate both faults and normal conditions, a nightmare can result as you rush to get back on the air.

Under normal operating conditions, you could read the manual and determine if the LED is supposed to be lit or not; however, under the stresses of getting the station back up and running, the engineer

give you a go/no go indication.

A box of reinforcements costs less than a dollar at stationery or drug stores. Using this type of alerting system can be useful for contract engineers who only see a certain make of transmitter every month or so—not enough to get really familiar with it. The LED indicators on satellite systems also make great candidates.

\*\*\*

Marty Sacks and his engineering crew at Greater Media's WGAY-FM came up with a great (and inexpensive) way to correct an overly sensitive plate breaker on their RCA-BTF-ZOE1 FM transmitter (see Figure 1).

If someone brushed up against the breaker, it would flip off. Replacements were costly, especially since this one had a "hair trigger." The hinged metal cover was fabricated at a local sheet metal shop for a fraction of the cost of a replacement breaker. The hinge allows the cover to be raised quickly, for easy access to the plate breaker. The guys (and gals) at WGAY-FM

can be reached at 301-587-4900.

Users of RCA-series transmitters, like Marty Sacks, are familiar with the "meter lamps" which, when they burn out or get intermittent, will shut the transmitter off. With all due respect to the design engineers at RCA, placing the complete operation of a transmitter in the hands of a little incandescent lamp doesn't seem quite right.

Many engineers have yanked the cir-

cuitry altogether and replaced it with a Bird Watcher or equivalent. Still many other engineers don't have that luxury, and must rely on the meter lamps. Though the filaments of the bulbs used in the meter lamps will usually last a while,

time it was developed, it was, perhaps, a neat idea.

Nowadays, with the engineering budget focused on low-maintenance or no-maintenance equipment, the design concept may be questioned.

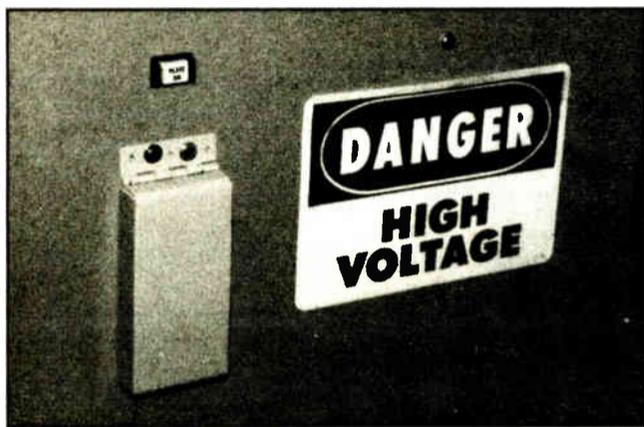
\*\*\*

Our freebie for this issue is a Power Supply Engineering Handbook published by Computer Products' Power Division. Power conversion is this company's business; the firm provides both general purpose AC/DC power supplies as well as converters. In the back of the book is a section on the principles of power conversion.

Not only does this chapter give a thorough discussion on linear supplies, but it also discusses switching power supplies and converters. The handbook is rounded out with an interesting applications note section. And as I said, you can't beat the cost—it's free. Simply contact the Power Conversion Division of Computer Products at 800-624-8999, extension 123, or circle **Reader Service 142**.

\*\*\*

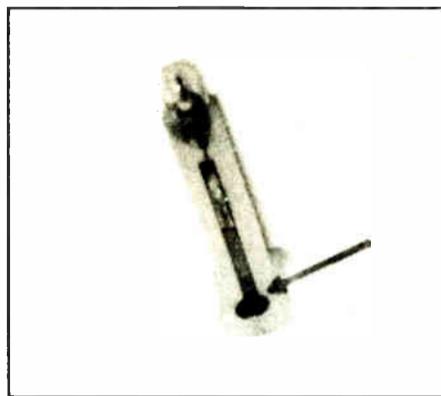
John Bisset, a principal with Multiphase Consulting, a contract engineering company, can be reached at 703-379-1665.



An inexpensive metal cover affixed to the front of this transmitter power supply prevents accidental tripping of the breaker by bumping into it.

needs a quick and reliable system of interpreting the LEDs.

One suggestion involves placing notebook page reinforcements on the smoked plastic cover. The reinforcements are placed so that the LED will shine through the center hole of the reinforcement. Use a separate reinforcement for each LED that is supposed to be lit under normal operation. Now, a quick glance at the center of the reinforcement circle will



To prevent meter lamp failure due to corroded or oxidized contacts, solder the grommet and the brass strip together.

a more common problem is intermittent loss of carrier due to an oxide buildup where the brass strip meets the brass grommet.

A great solution is to apply a tiny bit of solder to this point, ensuring a good connection between the grommet (which transfers the voltage to the lamp) and the brass strip (to which the bulb is soldered—see Figure 2).

I received this tip from a now retired TV transmitter engineer, who had eight of these type meters with their corresponding lamps on an RCA TV transmitter. (And we radio engineers think our lives are made miserable with only two of these meters.)

For those of you who haven't the slightest idea what we're referring to, RCA used a type of photocell alarm system in many of its transmitters to warn of either VSWR or under-power conditions. The meter lamp provided a light for the photocell circuitry. As a failsafe, if the lamp burned out, your transmitter would drop. At the

## Upkeep of Older Gear

(continued from page 35)

older turntables. Most of those turntables drove the outside rim of the platter with the idler wheel, although one manufacturer drove the inside rim to give better rumble characteristics.

In either case, maintenance involves weekly cleaning of all drive surfaces. Rim drive turntables have adjustment screws that provide a trade-off between instant start and reasonable rumble characteristics.

Sometimes the speed shift lever of the turntable is left engaged and the idler wheel is pressed against the motor shaft. This will deform the surface and produce an audible thumping when the machine is next used. Running the turntable for a while may get rid of the indentation, depending on the severity and type of idler wheel.

Better quality idler wheels are made of silicon rubber or some other good memory material. Lower cost wheels are made of neoprene, and have poor memory characteristics. It may be necessary to sand neoprene wheels to get rid of indentations.

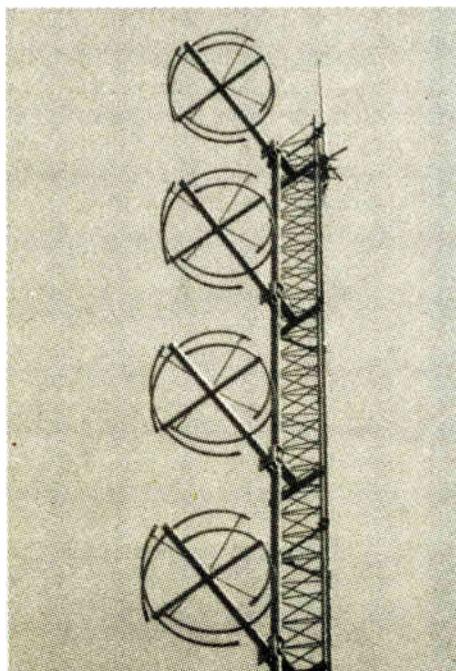
Rubber parts may be damaged by some types of head cleaners. The best overall cleaner for heads and rubber is mineral spirits. It takes longer to dry than aerosol products, but won't harm anything.

If you need replacement idlers or other rubber parts for obsolete machines, don't despair. Some companies, such as PRB, will remanufacture parts if you can provide an original.

\*\*\*

Tom Vernon, a regular RW columnist, divides his time between broadcast consulting, computers and instructional technology. He can be reached at 717-367-5595.

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## AMPLIFIERS

### Want to Sell

Marti PGM-20 line amp, \$40. P Wells, KJQY San Diego, 619-238-1037.

McIntosh 250 pwr amp, excel cond, BO. Pinetucket Rcrding, 205-826-0390.

McIntosh MC-60 (2), 60 W mono pwr amp, tube type, \$800/pair. D Kronquist, D&D Prod, 7028 W 70th Ave, Armda CO 80003. 303-425-6851.

CBS Labs dual 1x8 audio DA, \$200. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

Dyna ST-70, pair, w/tube preamp PAT-2, \$400; all mint NAD 2140, as new, \$225. R Nelson, Tropical Brcdstng, 14093 SW 142 St, Miami, FL 33186.

Bogen Challenger 6-chnl amp, gd cond, \$75; Gates M6108 mon amp, gd cond, \$50; Henry Eng Match Box, excel cond, \$100; Lauderdale DA-8 4x2x2 dist amp, vgc, \$175. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

CBS Labs 1602 stereo DA, 8 outputs/chnl, \$150. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Crown MT1200 pwr amp, 1200 W, bridge mono, excel cond, \$750 ea+shipping. Philip, Big Red Sound, 172-28 Henley Rd, Jamaica NY 11432. 718-523-2815.

### 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.

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.

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

## ANTENNAS & TOWERS

### Want to Sell

Shively 6810 1-bay 10 kW FM antenna w/radome, tuned to 92.7 MHz, excel cond, used 7 months, \$900. M Gollub, WMJS, POB 547, Prince Frederick MD 20178. 301-535-2201.

ERI G8CPS-6AC-3, (5) bays on 102.1 MHz, \$1600/bay. J Maples, WMYU-FM, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

Hughey & Phillips A-2 lighting system incl beacon, obstruction light, 350' conduit, wire & controls, \$2250. P Lierman, KCSP, 601 W Collins Dr, Casper WY 82601. 307-265-5414.

1-5/8" coax, 425', gd cond, no leaks; 250' 100-pair phone line cable. K Grice, KMZE FM, 2728 Williams Ave Box D, Woodward OK 73801. 405-256-3692.

Xmission line parts selection, 3-1/8", new & used, coaxial switches, ELLs, bullets, couplers, over 200' of xmission line on spool, call for list. B Valerius, KCCZ TV-4, 1305 N Airport Rd, Cedar City UT 84720. 601-586-5938.

Rohn 55G, 310', lighting & guy wire, 4.5 yrs old, avail 9/91. B Williams, WBLG-FM, POB 900, Bowling Green KY 42102. 502-843-0107.

Celwave ECFM-2, 2-bay educ, tuned to 94.5, \$600 incl shipping in US. J Alsip, KSCQ, Box 1528, Silver City NM 88002. 505-538-3396.

ERI CP-3 bay, suitable for Class A, tuned to 103.1, retunable, \$250; Gates ATU boxes (2), 3'x3'x3' aluminum w/inner & outer door for pole/eference mounting, w/feedline clamp & ammeter switch assembly, \$200 ea. F McCoy, 2118 W Warner, Chicago IL 60618. 312-712-3529.

Set of (8) guy wires, can be used for AM/FM 300' tower, approx 1/4" diameter, w/insulators, like new, \$650. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

RCA MI-19089 3-1/8" 90° swivel mitre elbows, (1) unused w/double flanges & hardware, (1) used but excel cond, \$250/both. R Lambert, 520 Sharpe Rd, Columbia SC 29203. 803-754-2932.

Used 3-1/8" xmission line components: dielectric thru-line section; to N adapters; bullets & 48" line section; various solder flanges; female Helix flange. J Bisset, Multiphase, 703-379-1665.

Jampro JHCP 6-bay FM brdcast antenna, tuned to 100.3, 20 yrs old, gd cond, recently removed, BO; ERI G5 4-bay FM antenna, on 100.3, used less than 6 mths, excel cond, BO. B Harris, KXLT, 5350 S Roslyn St #210, Englewood CO 80111. 303-741-5654.

Celwave CP-1000 2-bay, 2 kW antenna, missing harness, tuned to 107.1, can sell sep as (2) 1 kW single bays, BO. J Galanes, WAVI, POB 25016, St Croix VI 00824. 809-773-3693.

Stainless Tower GST-500, 500', 6' face, tradeout for dismantling. W Baxter, WRVM FM, POB 212, Suring WI 54174. 414-842-2639.

ERI 4-bay circ polarized high pwr antenna, tuned to 105.3, gd cond, bullets should be replaced, please call. C Loughry, WFRB, RD2 Box 37, Frostburg MD 21532. 301-689-8877.

Utility G-480 440' tower, 30" face, (2) sections less than 5 yrs old, new guys & insulators, side lights, beacon, base insulator, all but (2) 20' sections in gd cond, on ground, please call. C Loughry, WFRB, RD2 Box 373, Frostburg MD 21532. 301-689-8871.

Belden cable: 8449, 8790, 8422, 9750, 8448, 8663, 8627, various lengths, new, \$1100/all or will sell separately, you ship; (4) Andrew 78ARF, 3" helix connectors, never used, \$300 ea/\$1100 all. R Kerbawy, WTNJ FM, Box 1127, Beckley WV 25802. 304-877-5592.

Celwave CFM-LP-3 FM antenna, 3 bay w/deicers, tuned to 104.5, excel cond, \$2000. J Jetzer, WXER, 414-893-1045.

Dummy loads, FM oil cooled, several to choose from, 1, 2.5, 5 kW; Also 75 kW AM, 4 port motorized RF switch, 3-1/8", 76 port patch panel 3-1/8". Goodrich Ent, 11435 Manderson St, Omaha NE 68164. 402-493-1886.

### Want to Buy

431' tower, 80/90' face, complete w/lights. J Aguilar, XEKMx, Avila Camacho 137, Guadalajara, Jalisco Mexico. 36-570-384.

FM antenna, 10-bay, high pwr, 94.7. T Noordyk, WSHN, Box 190, Fremont MI 49412. 616-924-4700.

ERI rototiller antenna, 6 or more bay, on or near 93.3 & 95.5; tower, 500' tall, standing/on ground; feedline also needed. R Wachter, KNSX, FAX: 314-921-2122.

## AUDIO PRODUCTION

### Want to Sell

Valley People pwr rack w/(2) Grain Brain limiters & (2) Kepex expanders, \$1150/BO; (2) dbx 160, balanced. B Walker, Soundscapes, 501-661-1765.

Sony PCM-501 ES digital audio processor. D Stortz, KFuo, 85 Founders Ln, St Louis MO 63105.

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303-482-9254

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Shure SE-30 3-input mixer/gated compressor, w/rack mounts, gd cond, \$150. J Addie, WFMT, 303 E Wacker, Chicago IL 60601. 312-565-5033.

Lexicon Prime Time digital delay, (2) delay taps, w/EQ, VCO, hold & extended memory board, excel cond, \$300; Orban de-esser, 3 indepen chnl in 1 rack, gd cond, \$100. J Addie, WFMT, 303 E Wacker, Chicago IL 60601. 312-565-5033.

Tone processor (2), 25 Hz, \$375. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Dolby 361 SR & A type NR stereo pair w/cards for SR & A, work fine, \$2200/pair; BSR/dbx stereo tape hiss reducer, RCA inputs, variable low pass filter dynamically dependent on program content, \$49. R McMillen, 503-239-6070.

dbx 128 Type II NR w/comp & expander, \$150+shipping. Philip, Big Red Sound, 172-28 Henley Rd, Jamaica NY 11432. 718-523-2815.

Eventide BD980 stereo delay, 15 kHz, excel cond, \$3500; Orban 222A stereo enhancer, excel cond, \$500; Tascam RS20 spring reverb, excel cond, \$100. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

### Want to Buy

Ham radio operators looking for surplus audio processors, mixers & mics, as well as other inexpensive gear that could help bdct 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

SMC DP-2, (4) Carousels, (4) reel decks, new SMC Otari deck, all assoc equip, BO; SMC 450-800 nearly new Carousel, BO; SMC DT-4 card encoding data terminal w/CRT, BO. C Springer, KSEC, POB 890, Lamar CO 81052. 719-336-2206.

Conex CG25 tone encoder, excel cond, \$200; Conex CG25-R tone encoder, excel cond, \$225; Gates time pulse module, gd cond, \$100; Gates ATC logging encoder, gd cond, \$125; Schafer 903 automaton system incl (4) R-R, (3) Carousels, used, \$4000; (3) Sonomag 250 cart Carousels, gd cond, \$200 ea; (2) Sonomag TS-25 tone decoder, vgc, \$200 ea. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

**Complete Automation System** for satellite network, (2) 48-tray Instacarts, format Sentry with software. G. Katz, KCEZ, POB 7568, Chico, CA 95927. 919-342-2200.

SMC 450 Carousel (3), gd cond; triple deck cart player; MSP-1 programmer & control head; 350 Carousel for parts; SMC tone gen. J Galanes, WAVI, POB 25016, St Croix VI 00824. 809-773-3693.

SMC DAS 6/12 digital audio switcher, (2) SMC chnl 4 programmers, (2) Magnavox computer mon 60, SMC MSP-12, (3) mono SMC Carousels, racks, cables, etc. BO. P Berger, WNAM/WUSW, POB 707, Neenah WI 54957. 414-727-2040.

MEI Satmaster 1000 event satellite programmer & (2) SMC 452 stereo Carousels, manuals, cables, recently removed, \$6000+shipping. R Kerbawy, WTNJ FM, Box 1127, Beckley WV 25802. 304-877-5592.

### Want to Buy

Cetec 7000 Level 1 or 2 system left-end rack w/mon panel, card cages, pwr supply, doors, terminal w/CPU, SIO, RTC, RAM, ROM, PIO & VEL boards, min memory of 3680, universal source cards & more. D Williams, Lincoln Cnty Brdcsrs, 1103 Utah Ave, Libby MT 59923. 406-293-6234.

## BUSINESS OPPORTUNITIES

### Want to Sell

Prior owner/operator w/22 yrs exper will build your AM/FM station, facility construct to hiring/training staff, upgrades, turnarounds, will consider equity. R Ritchey, 512-828-9252.

## CAMERAS (VIDEO)

### Want to Sell

Panasonic AK-30 (2), w/brdcast grade Plumbicons, gd cond, BO. D Brennan, Brennan Entrprs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Panasonic AG-450 S-VHS camcorder (2), new cond, all access, \$1200 ea firm+UPS. R Larson, Larson Prod, 3 Braden St, PI ME 04769. 207-764-3770.

### Want to Buy

GE PE-2S horiz color orthicon, manuals, lenses, pwr supply chassis in camera head; any B&W GE studio camera. B Gentry, KAZIVY, 622 Plymouth Ave, Mattydale NY 13211. 315-455-7257.

## CART MACHINES

### Want to Sell

Tapecaster 700P (2), (1) w/new motor, (1) w/new relay board, gd cond, \$250 ea. A Ishkanhan, 9723 Riggs Rd, Adelphi MD 20783. 301/439-7222.

UMC 11-113 mono repro, 3 tones, \$325; (2) ABCO wire cart racks on floor stands, hold 500 carts, \$175 ea; set LEL alignment gauges for Ampro cart decks, \$15. P Wells, KJQY San Diego, 619-238-1037.

ITC 99B stereo w/ELSA, \$2800. B Downs, KTSR, Box 3248, Bryan TX 77805. 409-846-1150.

Gates Criterion I stereo P only, gd cond, \$75. E Reihl, 1715 Illinois Rd, Northbrook IL 60062. 708-272-7125.

ITC Premium series stereo R/P (2), mint cond. J Phillips, WZOM, 408 Clinton, Defiance OH 43512. 419-782-8591.

ITC Delta Stereo PR99 stereo P (8), (1) 99-B R/P stereo, vgc, \$7000/all. D Solinske, WSUN, 877 Executive Cntr Dr W, St Pete FL 33702. 813-576-1073.

Telex 36 deck, uses NAB carts, rack mount, 4-trk mono, new in box, no electronics, \$150; Viking 500, 12 V NAB tape player, 4-trk stereo, w/PB amp, like new, \$50. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Cartridge tape winder, works, as-is, no manual, timer broken, \$60 incl UPS ground. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

Spotmaster 500C PB cart machine, works, as-is, no manual, \$300 incl UPS ground. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

BE eraser/splice finder, Audicord DL stereo recorder, Otari CTM10 stereo R/P, never used, BO, like new equip, used only in limited lab testing. S Martin, 609-235-3900.

BE Cartwinder w/over 200 Fidelipac carts for parts, gd cond, BO. M Ring, WTNV AM/FM, 134 Mallin St, Watertown NY 13601. 315-288-0790.

Misc cart players incl: ATC, BE, Collins, Gates, Harris, Spotmaster, Tapecaster, some for parts, call for details. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

## CASSETTE & REEL-TO-REEL RECORDERS

### Want to Sell

Scully 280B 2-trk stereo, \$1700; 4-trk 1/2" w/dbx NR, \$2750; FT w/tension control, \$1200; FT w/tension control & servo motor, \$1350; all excel cond & in Ruslang consoles. J Addie, WFMT, 303 E Wacker, Chicago IL 60601. 312-565-5033.

MCI JH-110B FT stereo for 14" reels, in metal rollaround cabinet, \$2075/trade for computer. P Wells, KJQY San Diego, 619-238-1037.

Ampex 600, 601, 602, (10) units, (2) for parts, BO. V Baker, POB 889, Blacksburg VA 24063. 703-552-4252.

Ampex 440-B stereo audio tape rcrdr, in Ruslang console, excel cond, \$1500/BO; Studer C-37, tube stereo, never used, in Studer console, BO. R York, Jewel Records, 1594 Kinney Ave, Cincinnati OH 45231. 513-522-9336.

Scully 284-B 8-trk recorder, \$5000. H Sewell, Oakridge, 2001 Elton Rd, Ft Worth TX 76117. 817-838-8001.

Otari ARS1000, new in box. J Phillips, WZOM, 408 Clinton, Defiance OH 43512. 419-782-8591.

Telex 6120 stereo cassette duplicator, 1x3, \$2500. Katherine, Linden Inc, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

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**CASSETTE . . . WTS**

Sony TC-650 1/4-trk stereo deck with remote, good condition, \$375. D Meyer, Meyer Prod, 7425 Sepulveda #33, Van Nuys CA 91405. 816-785-2324.

Ampex 601 1/4" tube-type, 1/2-trk in Samsonite luggage case, working, \$700/BO. T Heathwood, Heritage Radio Classics, POB 16, Boston MA 02167. 617-969-9966.

Broadcast Supply Rax 100 cradle mounts (3) for MK 5050II, used 6 months, \$40. B Lord, Lord Broadcasting, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Otari 5050B 1/2-trk, new, \$2500/BO. P Accardi, Evangelistic Ministries, 1521 Upper Fords Pond Rd, Clarks Summit PA 18411. 717-587-2382.

**HEAD RELAPPING/REPLACEMENT**  
All tape and film formats  
30 years experience



350 N. Eric Drive  
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708-358-4622

Revox A-77 stereo R-R, \$250; Revox A-700 stereo R-R in cabinet, \$300. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Ampex AG-440B 1" 8-trk console, good condition, BO. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. After 3PM: 214-271-7625.

Sony TC105-A (3), (2) working, (1) for parts, \$50/all+shipping; Marantz PMD 200, for parts, \$10+shipping, P Mueller, KUTA-AM, N Hwy 191 G-1, Blanding UT 84511. 801-678-2261.

Denon DRM2 (4), (3) w/new motor & idler arm, microphone inputs, good condition, all working, \$75 ea/BO or \$250/all+shipping; Uher R-R, DKN I/Os, cables, \$100/BO. B Strapko, 708-830-0701.

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Nashville, TN. 37203 (615) 244-6892

Teac/Tascam 35-2 & 35-2B R-R 2-trk rcrdrs, (1) w/dbx, recently refurbished, with attractive, custom, side-by-side console, excellent condition, \$1700/BO+shipping. W Ahlberg, Davis Glick Prod, 11846 Ventura Blvd #306, Studio City CA 91604. 818-509-9100.

Misc R-Rs incl: Ampex, B&H, Omnilab, Revox, Scully, Teac, call for models & prices; Goldstar port cassette recorders, vgc, \$15. B Williamson, WWWK/WELV, Ellenville, NY. 914-856-2941.

Ampex 602 FT mon, portable case, ave cond, \$60 UPS paid; Ampex AG500 FT mono, portable case, gd cond, \$150 UPS paid. W Arnett, WBAT, Box 839, Marion IN 48952. 317-664-6239.

**Want to Buy**

R-Rs & parts: Ranger Tone, Berlant, Ampex, etc, incl heads & manuals. M Zucaro, Voice & Video, 5038 Ruffner Rd, San Diego CA 92111. 619-271-8294.

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

Otari 4-trk in gd cond. J Laprad, Sunspots Prod, Box 403 W Side Station, Worcester MA 01602. 508-755-0732.

MCI/Sony capstan & reel motors, any cond., recdg heads, 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**

Sony CDK-006 CD juke boxes (2), interfaced to Sentry Systems FS-12C Format Sentry, w/spare interface, documentation, software, cabling, no computer, \$2500 ea; Format Sentry, \$2500; sell together or sep. R Sherman, WKBM, 32401 S Rt 53, Wilmington IL 60481. 815-476-5855.

Technics SL-P1200 brdcst CD player, cue to music, cue wheel, oversampling D/A, excel cond, \$400. J Addie, WFMT, 303 E Wacker, Chicago IL 60601. 312-565-5033.

Adult contemporary library w/2200 songs on CD & cart, incl 93 Golddiscs & 230 misc CDs, add'l 170 songs dubbed on Scotchcart IIs, \$7500; country library w/1500 songs on 66 CD Golddiscs & 500 add'l Scotchcart IIs, \$6000; both used 6 months. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98402. 206-631-2374.

**COMPUTERS**

**Want to Sell**

Amiga 2500, 3 meg RAM, 40 meg hard, IBM Bridge Board, stereo mon, Super Gen brdcst genlock, incl \$3000 of brdcst software, mint cond, \$3800; Tamron Foto-vix, xtra lens, mint cond, \$1250; Whellit Cart w/smooth fluid head, excel cond, \$400. T Noordyk, WSHN, Box 190, Fremont MI 49412. 616-924-4700.

Tallgrass TG3135 external 35 meg hard drive & 45 meg tape back-up, software, interlace card, manuals, \$500. S Kozak, 351 Pinewood, Bay Village OH 44140. 216-871-5897.

Okidata Laserline 6 laser printer, emulates HP Laserjet, utility software, manuals, \$300+shipping. V Gray, 6840 Sterling, Raytown MO 64133. 816-358-8929.

Wang 2200 PC Business System for use w/Computer Concepts Broadcast System, BO. M Ring, WTNM AM/FM, 134 Mallin St, Watertown NY 13601. 315-288-0790.

**CONSOLES**

**Want to Sell**

MCI/Sony JH110-C-8 8-trk 1" factory console w/Auto Locator III & manual, excel cond, \$2000, you ship. R Leonard, Voices, 212-935-9820.

RCA 6B6, tube-type, dual chnl, w/tubes & manuals, can be used in stereo, \$1000/BO. T Heathwood, Heritage Radio Classics, POB 16, Boston MA 02167. 617-969-9966.

Tapco Catalina C-12 mixer, 12x2x2, \$525; Fostex 450 8-chnl mixer, \$650. Katherine, Linden Inc, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

Sony MX-20, 8 in/4 out mixing board, gd cond, no cover, \$425. D Meyer, Meyer Prod, 7425 Sepulveda #33, Van Nuys CA 91405. 818-785-2324.

Pacific Recorders ABX-26 prewired complete prod room w/furniture by PRE, \$36,000; Pacific Recorders BMX18 prewired complete control room w/furniture by PRE, \$25,000; call for details. D Solinske, WSUN, 877 Executive Cntr Dr W, St Pete FL 33702. 813-576-1073.

Autogram AC-6 stereo console, never used, mint cond, \$3500. Wayne, Broadcasters Unlimited, 903-581-0606.

JBL 7510 automated mic mixers, rack mount, (1) w/8 inputs, (1) w/12 inputs. S Kozak, 351 Pinewood, Bay Village OH 44140. 216-871-5897.

Gates Ambassador 5-chnl w/(4) xtra chnls, used, \$300; Gates Yard II mono 8-chnl, vgc, \$500; Prokit audio mixer, 6-chnl, used, \$75; Shure, M68 mixer, vgc, \$100; Sony MX14 6-chnl mixer, gd cond, \$30; Sony MX650 6-chnl mixer, gd cond, \$50; Sparta S-15 mixer, used, \$25. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

Collins 8081-1 portable console w/TT, all transistor, never used, like new, BO. J Anderson, WKCU/WXRZ, 2192 Hwy 72 E, Corinth MS 38834.

RCA 6B6 tube-type 2-chnl, functions wrkg, grt old board, \$800+shipping/BO. T Heathwood, Heritage Radio Classics, POB 16, Boston MA 02167. 617-969-9966.

Russco 505S stereo 5-chnl board w/10 inputs, cue & mon systems, \$600. J Laprad, Sunspots Prod, Box 403 W Side Station, Worcester MA 01602. 508-755-0732.

Pyramid PR8900 mixers (2), grt cond, \$300/BO. J Galanses, WAVI, POB 25016, St Croix VI 00824. 809-773-3693.

Radio Systems ESA-10 w/manuals & copy stand, \$4500; BE 5S150 w/manual, \$1500. T Pless, WHVY, 112 Main, Annapolis MD 21401. 301-626-0103.

**Want to Buy**

Autogram AC-8A or Harris 80 8-chnl. J Aguilar, XEKM, Avila Camacho 137, Guadalajara, Jalisco Mexico. 36-570-384.

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

**DISCO & SOUND EQUIPMENT**

**Want to Sell**

Casio 510 stereo keyboard, gd cond, \$300; Fisher reverb, (2) amps w/(3) springs ea, \$125 ea; Echo Plate #2, 4-6'; gd CF, \$500/trade. H Sewell, Oakridge, 2001 Elton Rd, Ft Worth TX 76117. 817-838-8001.

Peavey MB-1 mid-bass cabinets, \$600/pair; Peavey MB-2 mid-bass cabinets, \$300/pair; Peavey 4FH-2 bass cabinets, \$600/pair; Eastern Acoustic Works 2x15 bottoms w/JBLs, \$800/pair; Eastern Acoustic Works PA cabinets w/(2) 15", (1) 12" & (1) 2" compression drivers, \$1500 ea/(4) for \$5000. B Wilson, 212 S Side Ave, Campbellsville KY 42718. 502-789-1505.

Community Zoid mid-range enclosures, \$150 ea empty; Allen & Heath 24x9 mon board w/case, \$2200; (8) Community monitors, hold 12" & 1" compression driver, \$700; Crown DC-300A, \$450; Peavey MK4 24-chnl board, \$1500; Genie 24' super lifts for light trussing, \$1600/pair. B Wilson, 212 S Side Ave, Campbellsville KY 42718. 502-789-1505.

Dukane 3A235 1/3 octave sound reinforcement syst EQ (2), \$250 ea; UREI 530 stereo octave EQ, \$250. S Kozak, 351 Pinewood, Bay Village OH 44140. 216-871-5897.

Klipsch horns in road cases, pair of spkrs, 4 pieces, will handle 300 W/chnl, excel cond, BO. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. After 3PM: 214-271-7625.

Roland SRV-2000 midi digital reverb, mint, \$475; pair UREI 809A studio time align mon, \$1250; Valley People Dyna-mite compressor, 2 chnls, \$395. P Accardi, Evangelistic Ministries, 1521 Upper Fords Pond Rd, Clarks Summit PA 18411. 717-587-2382.

Shure M67 remote audio mixer, balanced terminal post output, adjustable metering & Shure M68 4-chnl 1-aux mixer w/balanced I/O, (2) QRK 3-speed TT w/tone arm & cartridge, \$250. J Brown, CAV Corp, POB 3471, Charlottesville VA 22903. 804-979-0402.

RCF/Altec 3-way PA system, all horn loaded, 18" bass, 15" mid compression horns, sell separately, \$800; BES 255 Mark II 3-way bipolar home mons, 4" x 22" x 32", orig box, \$400+shipping. Philip, Big Red Sound, 172-28 Henley Rd, Jamaica NY 11432. 716-523-2815.

Furman RV-1, 1-space rack mount spring-type reverb w/limiter, tone controls, unbal 1/4" I/O, excel cond w/manual, \$110. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

JBL 4350 w/crossover 5234A, new cones, \$2100; JBL 4343, new cones, \$1500; Altec 604A w/time align crossover, \$750. R Nelson, Tropical Brdcsting, 14093 SW 142 St, Miami, FL 33186.

**FINANCIAL SERVICES**

**Want to Sell**

**LEASING AVAILABLE ON USED TRANSMITTERS**  
AMERICAN BROADCAST FINANCIAL CORPORATION  
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**LIMITERS**

**Want to Sell**

CRL FM-2, SEP-800 stereo 4-band compressor, SMP-800 stereo modulation processor, stereo prep processor, BO. C Springer, KSEC, POB 890, Lamar CO 81052. 719-336-2206.

Orban 418A stereo limiter, excel cond, \$375. M Gollub, WMJS, POB 547, Prince Frederick MD 20178. 301-535-2201.

CRL SGC-800 2-band stereo AGC w/Dynafex; CRL SEC-800 4-band stereo comp/limiter; CRL SMP-900A AM stereo matrix processor; all equip brand new, incl manuals & custom modification instruction list & parts. Shannon, WENS, 7201 E Hillsborough Ave, Tampa FL 33610. 813-620-9100.

Howe Phase Chaser w/manual, \$600. B Downs, KTSR, Box 3248, Bryan TX 77805. 409-846-1150.

Gates Solid Statesman, \$275. P Wells, KJQY San Diego, 619-238-1037.

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

CRL complete 3-piece AM processor, AM-4 APP40, SEC400A, PMC300A. G Knop, 803-497-0460.

Orban Optimod 8000A w/Chris Hood audio mods & manuals, sounds grt, \$1700. S Schweiger, WXLO, 146 Worcester Ctr, Worcester MA 01608. 508-752-1045.

CBS 411 Stereo Volumax, vgc, \$300; CRL PMC300 AM limiter, vgc, \$400; (2) Dorrrough DAP-610 triband processor, vgc, \$1250; Elcom Bauer Level Guard AGC gain controller, gd cond, \$150; Harris MSP-90 AGC/limiter, gd cond, \$500; Inovonics 705 stereo gen w/FMX, excel cond, \$1000; many more, call for details. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

**Want to Buy**

Orban Optimod 9100A. J Aguilar, XEKM, Avila Camacho 137, Guadalajara, Jalisco Mexico. 36-570-384.

EXR EXIV exciter, buy/trade. B Walker, Soundscapes, 501-661-1765.

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

**MICROPHONES**

**Want to Sell**

Shure/Telex W1520/58 wireless handheld w/SM58 mic (2), 177.8 & 193.8 MHz, brand new, \$500 ea; (4) Turner 253 desk page/2-way mics, brand new, \$35 ea; Turner +2 transistorized desk 2-way mic, little use, \$25. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Sony ECM-50 lavalier mic, \$50. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

AKG 414B ULS condenser, shock mount, new, \$995. P Accardi, Evangelistic Ministries, 1521 Upper Fords Pond Rd, Clarks Summit PA 18411. 717-587-2382.

RCA 77-DX vintage ribbon mic, excel cond, BO. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. After 3PM: 214-271-7625.

**PHONE: 703-998-7600 FAX: 703-998-2966**



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ask for Kathleen

**MICROPHONES . . . WTS**

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

Sony ECM-50 lavalier mic, \$50. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Saba stereo mic, vgc, \$10; Shure 565SD, vgc, \$50. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

Neumann TLM 170 mics, rare pair of consecutively serial numbered mics, \$3350/pair. R McMillen, 503-239-6070.

RCA/Altec/Telefunken: RCA 44-BX, 77-D, BK-5, KU3A 10,0001, SK-46, WE 639, Altec M-11 system, Altec M30 tube mic, Altec M49 & M50, (2) absolutely mint Telefunken U47's, will trade for other high quality mics & equipment. Tracy Eaves, 615-821-6099 (evenings).

**Want to Buy**

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

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. 818-761-9831.

RCA 44 & 77 mics, any cond. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. After 3PM: 214-271-7625.

Desk mount flex mic arm, heavy duty, & shock mount for heavy RCA mic. T Heathwood, Heritage Radio Classics, POB 16, Boston MA 02167. 617-969-9966.

Neumann U-67 pwr supply, cable connectors, shockmount, will pay cash/trade other vintage mics. W Kremer, 301 SW 16th St, Ft Lauderdale FL 33315. 305-524-5652.

**MISCELLANEOUS**

**Want to Sell**

Audico manual cassette loader (3), \$800 ea/\$2150 all. Katherine, Linden Inc, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

Trillium Panther II 10-line 32-phone system, w/20 phones, DSS & manuals, 3 yrs old, \$3800. B Downs, KTSR, Box 3248, Bryan TX 77805. 409-846-1150.

Elafior elevated floor, 1382 sq ft, 2'x2' squares for studio, all hardware incl, gd cond, \$1200+shipping. K Eyerman, Trell Brdcasting, POB 18181, Columbus OH 43216.

Gentner FBTRB prewire bay (loupas), (8) \$225; Gentner GEC-FB-100 Flexilock, SIE-MF2250, (50) \$10; Jim Long digital Dyaxis 320 MEG, w/Apple IICX, for digital editing, used 6 mnths, \$7500. B Lord, Lord Brdcastg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Jobo CPE-2 small/indiv color film & print photo processor, access, Jobolift, \$450/BO; Edison Standard B cylinder phonograph, 1905 model, plays 2 & 4 min cylinders, works fine, w/H & C reproducers, BO; Toy/Omega 45E 4x5 view camera, f6.8 210mm lens, many access, gd cond, BO. V Gray, 6840 Sterling, Raytown MO 64133. 816-358-8929.

**COMREX RENTALS**  
1, 2 and 3-Line Systems  
Call Steve for details  
**Silver Lake Audio**  
(516) 623-6114

Symetrix T-101 telephone interface, \$250; Audio Digital TC4 digital delay unit, \$800. T Pless, WHVY, 112 Main, Annapolis MD 21401. 301-626-0103.

AM dummy load, 1 kW, typical of those inside Gates BC-1G & H series xmtrs, BO+shipping. D Kelley, KISZ-FM, POB 740, Cortez CO 81321. 303-565-1212.

WE patch panel (12), T/R/S normalled, 6 rows, 24 jacks/row, 19" x 7", wire wrap or solder connections, \$35/ea+shipping. R Kerbawy, WTNJ FM, Box 1127, Beckley WV 25802. 304-877-5592.

McMartin TG-2 EBS encoder, vgc, \$125; Ford mono AM/FM car radio, vgc, \$15; Gates on-air light, gd cond, \$40; Spotmaster cart winder, gd cond, \$100; (2) WE KS19645-L2 recorder coupler, gd cond, \$50; various racks; call for details. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

Telex Audiocom IF-1 interface unit, interfaces headset intercom system w/2, 3 or 4 wire communications systems, excel cond w/manual, \$150. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

Blackbourn 1200 (363), black vinyl page for 3-ring binder holds 4 cassettes w/o boxes, compl sale preferred, \$250+shipping. B Strapko, 708-830-0701.

Lead screw for Presto 6N cutter, 120 lines; Edital 1" block for splicing tape; Audiohead alignment tape 7.5-15 ips 1/4" tape; Dynakit PAS II pre-amp. Mr. Oliver, 212-874-7660 in afternoons.

Gramplan cutter head, 1D feedback (tandberg); patch bays (4) 24 inputs single, also patch cords; Edital block for recorders 1". Mr. Oliver, 212-874-7660 in afternoons.

Cannon plugs, 3 prong, male & female, new tubes & resistors cheap; Lafayette TE22 audio gen; Sencore transistor & diode tester; manuals for Ampex, Puotec, others. Mr. Oliver, 212-874-7660 in afternoons.

**Want to Buy**

Naval observatory clock, brown case, cream face, used by ABC radio & affiliates in the '40s/'50s, REI light flashes with reset. T Heathwood, Heritage Radio, POB 16, Boston MA 02167. 617-969-9966.

Broadcasting yearbooks, 40s & 50s, must be vgc; programming digest LPs from 70s; WLS silver dollar survey LPs from 60s; John Rider textbooks-no manuals. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

Western Union Naval Observ clock. T Heathwood, Heritage Radio Classics, POB 16, Boston MA 02167. 617-969-9966.

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

**MONITORS**

**Want to Sell**

BE AS-10 AM stereo C-Quam mon w/manuals & boxes. Shannon, WENS, 7201 E Hillsborough Ave, Tampa FL 33610. 813-620-9100.

Belar FMM-2, FMS-2, SCM-2, SCA, stereo & RF amp, purchased '86. J Phillips, WZOM, 408 Clinton, Defiance OH 43512. 419-782-8591.

Harris STM-1B AM stereo mon, C-Quam, excel cond, BO. B Bailey, KJEF, POB 1248, Jennings LA 70546. 318-824-2934.

McMartin 3000A digital freq mon, never worked properly, gd for parts, as-is w/manual, \$50 incl UPS ground. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

General Radio 1931-A AM mon, wrkg when removed, \$45+shipping; Motorola DS9660 Conalrad mon, as is, you ship, \$30. P Mueller, KUTA-AM, N Hwy 191 G-1, Blanding UT 84511. 801-678-2261.

HP 500A freq mon, used, \$100; McMartin 3005 freq mon, gd cond, \$200; McMartin AMR1 AM fixed freq tuner, gd cond, \$125; HP 335B FM mod/freq mon, gd cond, \$275; Belar RFA-1 FM RF amp, new, \$400; many more, call for details. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

**Want to Buy**

Any older McMartin mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

**MOVIE PROD EQUIP**

**Want to Sell**

Neumade Super X 16mm rewinder w/foot pedal, \$375. Katherine, Linden Inc, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

**Want to Buy**

Arriflex, Bolex, CP, Eclair & Mitchell cameras, lenses & access; film sound equip, esp Stellavox rcrdrs & access; old film magazines, literature, etc; SMPTE Journals; old copies ACS & others like The Filmmaker. H Biller, 108 Hamilton Ave, Silver Spring MD 20901. 301-565-2798.

**RECEIVERS & TRANSCEIVERS**

**Want to Sell**

Ford '86 car radio, AM/FM stereo, w/factory connectors, never used, no cassette, \$90 incl UPS ground. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

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

High quality micro-miniature 67 kHz SCA decoder, about 1" square, prewired and ready to install, \$15. D Jackway, Background Music Eng, 5742 Fair oak, Springfield MO 65810. 417-881-1846.

Drake ESR2240 satellite rcvr, tunable over 24 chnls, w/subcarrier audio, adjustable AV outputs, meter tuning, \$500; Arunta SSP-312 satellite audio, stereo processor, \$200; CA Amplifier CFK-100 dual hybrid feedhorn w/polarotor, Gardner C Band LNB, Norsat Ku Band LNB, \$250. J Brown, CAV Corp, POB 3471, Charlottesville VA 22903. 804-979-0402.

**Want to Buy**

Technics 3T9030 FM tuner. J Ramsey, WWUH, Univ of Hartford, W Hartford CT 06117. 203-243-4703.

**REMOTE & MICROWAVE EQUIP**

**Want to Sell**

Shure ST6000 teleconference unit, can connect mixer to telephone line for call-ins, \$350. Alan, Calvary Baptist Church, 1380 Valley Forge Rd, Lansdale PA 19448. 215-368-4444.

Moseley TRC-15AW studio & xmtr remote cntrl, gd cond, \$500/BO. R Cowell, KNTR, POB 308, Ferndale WA 98248.

Gates RDC 10 studio only remote, used, \$150; Marti HRC-8A 950 combiner, excel cond, \$100; Marti SCHR8H STL subcarrier rcvr, excel cond, \$225; (2) Moseley TRW-15 wire remote, gd cond, \$500. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

Moseley TRC-15AR 15-chnl remote control, 110 kHz/67 kHz w/spare board, gd cond, must sell, \$450/BO. J Ramsey, WWUH, Univ of Hartford, W Hartford CT 06117. 203-243-4703.

Micro Controls RCR-9/RCT-9 9-chnl remote control, 6 yrs old, gd cond, \$1500. R Swan, WROY/WRUL, POB 400, Carmi IL 62821.

Wegener 1602 & 1601 mainframes w/these cards: 1621, 1645, 1646, 1606-21, 1683-08 & 1605-12, used for SMN; also, TFT 7610 xmtr remote w/relay panel, needs some work. J Galanses, WA-VI, POB 25016, St Croix VI 00824. 809-773-3693.

MA-COM MA12XC 12 GHz portable/fixd microwave system, w/xmtr, receiver & portable horn antennas, \$800. N Borenstein, 5406 Hayes St, Hollywood FL 33021. 305-961-7747.

Mark P-972 6' parabolis grid for 944-952 MHz STL, (2) avail 10/91, BO+shipping. D Kelley, KISZ-FM, POB 740, Cortez CO 81321. 303-565-1212.

Comrex LX-T & LX-R telephone freq extender, transmit & receive units, excel cond, \$200 ea/BO. D Gander, KDUZ/KKJR, Box 10, Hutchinson MN 55350. 612-587-2140.

**Want to Buy**

Moseley STL system for FM. T Noor-dyk, WSHN, Box 190, Fremont MI 49412. 616-924-4700.

Marti RPT-40 xmtr, freq 148-172 MHz, (1) RX R30/150. J Aguilar, XEKMX, Avila Camacho 137, Guadaluajara, Jalisco Mexico. 36-570-384.

**SATELLITE EQUIPMENT**

**Want to Sell**

Scientific-Atlanta 7550 satellite, Unistar ACCI format, 18 mnths old, receiver, BO; Scientific-Atlanta DAT receiver (2), 7.5 kHz 2-chnl cards, (1) brand new, (1) used, BO; ABC network decoder, grt cond, BO. J Curtis, KFRO/KLSO, POB 4299, Longview TX 76606. 903-663-3700.

**STATIONS**

**Want to Sell**

AM & FM radio stations for sales in Central Arkansas, selling or part, some financing. 501-376-0880 week days, 501-470-1525 nights/weekends.

2500 W AM near Huntsville, ALA. Studio & properties included, \$175,000. Call Doyle Hadden, 407-365-7832.

FM w/C1 upgrade. Texas Panhandle, \$95,000 cash or best offer. Includes antenna, tower & transmitter for upgrade. M Jones, 314-431-1216.

Subchannel available & tower space for rent by station serving 3 markets in E & W IL, Grade A signal, new 1000' tower w/100,000 W H & V, new xmtr, call for rates. S Bridges, KFNN, 3218 Mulberry Ave, Muscatine IA 52761. 319-263-2442.

## EMPLOYMENT

To place ads in this section, use the ActionGram form. To respond to box numbers, write Radio World, PO Box 1214, Falls Church, VA 22041, Attn:\_\_\_\_\_

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Modern/new rock PD, fresh from successful AM turnaround, early 20s. Bree, POB 10247, Pittsburgh PA 15232.

Recent college grad w/4 yrs tech exper in college radio seeking commercial station pos in Rockland Cnty/NYC. D Gablas, 914-735-6844.

Versatile 5 yr pro seeks stable sports dir/sales/anncr pos w/midwest station, PBP, sales, prod, news, will relocate. Robert, 319-652-6640.

Detail-oriented indiv, exper w/brdcast eng, remote recording, audio prod & equip repair seeking staff/per diem pos at NYC/CT facility. D Coe, 5 Peveril Rd #3, Stamford CT 06902. 203-965-8340.

Helicopter pilot seeks traffic reporter pos in major market or ENG, member AFTRA, w/CBS O&O 11 yrs as eng, can supply Bell 47G on lease back. G Knop, 803-497-0460.

Quality air talent wants to work for your winning team, 6 yrs exper incl programming, prod, copy & script writing, voices, etc. Randy, 704-596-4864.

Attention getting talk radio, full spectrum personality. H Friedman, 512-445-5453.

Recent grad w/degree in comm/radio/audio prod, exper & ambitious about all aspects of brdcasting. Tina, 26 Mace Pl, Lynn MA 01902. 617-599-1582.

25+ exper in all phases of radio, sm & med markets, seeking station mngt pos in FL or S GA. B Sutton, POB 1065, Hobe Sound FL 33475.

AM/FM or Combo wanted. No money down or equity position desired. Turnarounds or distressed OK. Anywhere in US. Will make it worth your time! B Simonson, 208 Blake, Galesburg MI 49053. 616-665-7140.

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### STATIONS . . . WTS

Class A FM in SW NM, 2.5 yrs on air, grt equip, close to trout fishing & wilderness, profitable now, \$175,000. John, KSCQ, Box 1528, Silver City NM 88062. 505-538-3396.

Financial assistance needed for new Class A FM in WY, 3-county coverage, consider investor/partner, need 35K to complete. J Dunker, Box 34, Fort Bridger WY 82933. 307-782-3481.

Non DA daytime, DA night, 50 kW, lw dial pos, 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 after 5 PM.

Complete Broadcast facility set up for Talk, News, & music. All late high quality equip. 14'x30'; 2 axle mobile studio, less than 5 yrs old. Ideal for export (mono) or for new use in any market. 503-774-0459.

### Want to Buy

Exper brdcstr looking for FM/AM station w/little or no money down, prefer New England or southeast. L Haber, 617-246-5634.

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#### Want to Sell

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Circle 82 On Reader Service Card

### STEREO GENERATORS

#### Want to Sell

CCA SG-1D stereo gen. \$125. M Gollub, WMJS, POB 547, Prince Frederick MD 20178. 301-535-2201.

#### Want to Buy

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

### SWITCHERS (VIDEO)

#### Want to Sell

JVC KM2000U switcher, 8 inputs, DSK, RGB chroma keyer, 13 wipes, auto transition, \$4000. H Larson, Matrix TV, 615 Tank Farm Rd, San Luis Obispo CA 93401. 805-544-2445.

### TAPES/CARTS & REELS

#### Want to Sell

Scotchcart II (400), all/part, \$2.50 ea; (400) Audipak carts, \$1.50 ea. B Downs, KTSR, Box 3248, Bryan TX 77805. 409-846-1150.

Scotchcart II (700), 4.5 & 5.5 min woldies format, \$1.75 ea/\$1100 all; (3) A-Line 200 space cart racks, \$90 ea/\$250 all. J Urbiel, WIOB/WNRS, 3001 Brassow Rd, Salline MI 48176. 313-662-2881.

Pepper-Tanner & TM Prod library records, variety avail. P Wells, KJQY San Diego, 619-238-1037.

Scotch 176 10" reels (34), 2500'x1/4", used once, \$125/BO. D Pulwers, Daves Price Audio, 310 N Howard St, Alexandria VA 22304. 703-751-9346.

### TAX DEDUCT EQUIP

NP educ TV service needs video equip incl 3/4" editing system, monitors, vector-scope, charac gen, time base corrector, lights & more, tax deductible receipts given. H Johnson, 3rd Ward TV, 8926 Daffodil, Houston TX 77063. 713-266-5300.

Educ station needs rack-mount working cart player; 10-15 W Gates/Harris FM exciter, comp input; rack-mount EQ; 78 RPM TT; IBM compat computers; down link; will pay shipping. A Hagler, KMUD, 973 Redwood Dr, Garberville CA 95440. 707-923-2513.

Monte Vista Christian School, would appreciate any donations of used TV broadcast equipment. T Quinn, 408-475-0423.

Eng student desiring donation of old bdcst 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

UREI 452A waveform, xmission measuring set, w/audio oscillator & voltmeter, \$150. R McDaniel, KJRG/KOEZ, Box 567, Newton KS 67114. 316-283-5150.

B&K 1405 oscilloscope, \$100; Loftech TS-1 oscillator/DB meter/freq counter, \$175. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

HP 200AB/330B audio oscillator & distortion meter, work well, BO/trade for late model Leader distortion meter. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

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B&B B/B-AM2B phascope, used 6 mnths, \$900. B Lord, Lord Brdcstg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

B&W 210 tone oscillator, gd cond, \$75; B&W 410 distortion analyzer, gd cond, \$100; Gates M3625 gain set, vgc, \$100; Heath 1G-72 audio gen, gd cond, \$30; Heath V7A VTVM, gd cond, \$25; Leader 3060D storage oscilloscope, new, \$3000; many more, call for details. B Williamson, WWWK/WELV, Ellenville, NY. 914-858-2941.

### TRANSMITTERS

#### Want to Sell

CSI FM1K, w/Moseley STL & 1600 remote control RF antenna relay, very clean. J Phillips, WZOM, 408 Clinton, Defiance OH 43512. 419-782-8591.

Molded replacement rectifiers for most transmitters. Upgrade kits for older equipment. Reasonable prices, any quantities. Dealers welcome. Call Plastics Technology Inc. with your requirements. 205-633-6277.

Harris STX-1B AM stereo exciter, C-QUAM, excel cond, BO. B Bailey, KJEF, POB 1248, Jennings LA 70546. 318-824-2934.

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Charlotte, VT 05445

Nautel AMPFET, 2.5 kW AM on 1200 kHz, used 10 hrs as back-up, w/some spare parts & all manuals, \$20,000. S Christenson, WDCR-AM, 1227 DePrado Blvd # 202, Cape Coral FL 33990. 813-574-1200.



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### TRANSMITTERS . . . WTS

**B-300**, new 300 W RF amp w/harmonic filter & remote control. C Springer, KSEC, POB #90, Lamar CO 81052. 719-336-2206.

**CSI 25,000 25 kW AM** xmt, tuned to 1200 kHz, like new, \$30,000, you ship; **CSI T-1000A 1 kW AM** xmt, tuned to 1480 kHz, vgc, \$7000, you ship. G Arroyo, W/ONQ, 2483 John Young Pkwy, Orlando FL 32804. 407-687-9345.

**Gates TE-3 SS FM** exciter, w/external composite interface adapter for use w/composite STL or Optimod/external stereo gen, incl 67 kHz SCA gen, works OK, vgc, w/manual; **Sparta 680 SS FM** exciter, w/composite input, excel cond, works OK, w/manual. H Ginsberg, WMEE/WQHK, 2915 Maples Rd, Ft Wayne IN 46816. 219-447-5511.

**CSI 1K FM** xmt, clean; **Orban FM** xmt, '85, FM modulation pkg, STL, remote control. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-782-8591.

**Kahn STR-77 AM** stereo exciter, grt cond, tuned to 900 kHz, BO. J Bisset, Multiphase, Falls Church VA. 703-379-1665.

**CSI FM1K**, w/Moseley STL & 1600 remote control RF antenna relay, very clean. J Phillips, WZOM, 408 Clinton, Defiance OH 43512. 419-782-8591.

**CCA AM10000**, 10 kW, gd cond, ready to ship; **Harris FM25K w/MX-15** exciter, 7 yrs old, excel cond. R Baker, Box 426, Fairburn GA 30213. 404-964-3530.

**Continental 816R-3B 25 kW FM** xmt w/802A exciter, all manuals & compl spare parts kit, has less than 200 hrs, can easily be tuned, \$47,500 FOB St Paul. D Thompson, Minnesota Public Radio, 612-290-1599.

**Sparta 701 1 kW AM** xmt, tuned to 1190 kHz, vgc, \$6000, you ship; **RCA BTA-10U2 10 kW AM** xmt, tuned to 1220 kHz, vgc, \$15,000, you ship/trade for console & STL equip. G Arroyo, W/ONQ, 2483 John Young Pkwy, Orlando FL 32804. 407-687-9345.

**BE AX-10 AM** stereo C-QUAM exciter, dip-switch selectable to any freq, new cond w/manuals & boxes. Shannon, WENS, 7201 E Hillsborough Ave, Tampa FL 33610. 813-820-9100.

**High voltage xformer (2)**, 1 kW, 200-240 PRI, 3200 SEC. (1) never used, \$500; (1) used, \$200. B Spitzer, KKLS, Box 460, Rapid City SD 57701. 605-343-6161.

**Wilkinson FME10** exciter, recently factory overhauled, as-is w/manual, on 106.3 MHz, can be retuned, \$850 incl UPS ground; **CCA FM10D** exciter, for parts, as-is, manual, \$75/BO; **Ratron Centri-max CX33H3G** blower for CCA/CSI xmts, never used, excel cond, \$915 incl UPS ground. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

**Gates 994-4703-003 & 994-5066-001** motor drive for older AM xmt, as is, BO+shipping. R Kerbawy, WTNJ FM, Box 1127, Beckley WV 25802. 304-877-5592.

**Bext** has some show units at sale price. Full 2 yr warranty, like new. Exciters, amplifiers, STL's. First come first served only. Call for details. Bext, 619-239-8462.

**McMartin B-910 FM** exciter's. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

**Gates/Harris FM-2.5H3**, Gd cond, 1975 mdl w/spares. Phone 816-635-5959

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### Want to Buy

**UHF low band, chnl 17**, any pwr from 2 kW up. S Kafka, KTVG-TV, 941 O St #902, Lincoln NE 68508. 402-476-6000.

**TTC XL10 FM** xmt. G Wilson, KMSU, Box 153, Mankato MN 56002. 507-389-5678.

**FM xmt**, 300 W to 1 kW, w/w/out exciter. F Hollon, Rt 1 Box 72, Plymouth IL 62367. 217-392-2340.

**Versacount V-322** manual, copies fine. E Mitchell, Star 105, 12201 Merit #930, Dallas TX 75251. 214-716-7800.

**Harris Collins 828E-1 5 kW**; **Harris MW-5A 5 kW AM**; **Cont MW-315R-1** antenna tuning unit; **Kintronics LTJ-5B**. J Aguilar, XEKM, Avila Camacho 137, Guadaluajara, Jalisco Mexico. 36-570-384.

**FM xmt**, 25 kW. T Noordyk, WSHN, Box 190, Fremont MI 49412. 616-924-4700.

**CCA FM40** exciter pwr supply circuit board/pwr supply module, doesn't have to work; parts for 1 kW antenna tuning box, plunger, caps, coils. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

**We Buy STL's & Exciters 414-482-2638**

**FM xmt**, 4 kW-5 kW, prefer late model in excel cond. T Pelowset, Wolverine Radio, POB 1844, Midland MI 48640. 517-631-5583.

**CCA, Harris, BE**, 4-5 kW FM, '86 or newer. J David, KMPL/KSTC, POB 907, 11435 Manderson, Omaha NE 68164. 402-493-1886.

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

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# NAB Radio '91 Convention Preview

## The City by the Bay Plays Host to NAB

by Alex Zavistovich

**SAN FRANCISCO** Soft economic conditions over the past year have affected broadcasters and equipment manufacturers alike. Even the National Association of Broadcasters' Radio 1991 convention—to be held Sept. 11-14 at the Moscone Convention Center here—may be feeling the effects.

Characterized by steady growth in the past, the NAB fall radio show is holding its own this year, although early reports indicate that certain indicators such as convention pre-registration are down.

NAB spokesperson Susan Grossberg declined to release actual pre-registration figures for Radio 1991. She noted, however, that numbers are "down from last year, but about the same as 1989."

At press time, Jennifer Nance, the NAB's manager of exhibit sales and operations, said there were "over 160 exhibitors and over 35,000 square feet of exhibit space sold. And they (exhibitors) are still coming in." Final sales of floor space "may get close to 40,000 square feet," Nance predicted, pointing out that sales are "about even with this time last year."

Nance said that a trend this year is toward "more syndicators" on the exhibit floor, which she suggested may be a response to recent hard economic times.

But economic uncertainties will not diminish the events scheduled for the show, which include technical seminars, awards presentations and the traditional display of radio-related products and services.

### Programming versus technology

The Radio 1991 exhibit hall will be open Thursday, Sept. 12 and Friday, Sept. 13 from 10:00 a.m. to 6:00 p.m.; on Saturday, the last day of the show, the hall will be open from 9:00 a.m. to 1:00 p.m.

As in past years, some manufacturers have claimed that the NAB's fall radio show is oriented more toward programming than technology and have decided not to participate. Others, however, look at the show as a chance to throw the spotlight on products that might be overlooked during the spring convention.

One company that exhibited at Radio '90 but opted not to participate in this year's radio convention is Energy-Onix, a manufacturer of transmitters. Ernie Belanger, Energy-Onix's VP of marketing, said his company chose to skip the Radio '91 show in favor of the combined SBE/Texas Broadcasters show in Houston in October.

"A majority of attendees at the (NAB) radio show traditionally are non-technical," Belanger explained. "We felt, being an RF manufacturer, that we would be better served by going to the SBE Texas show."

Belanger also said that the impact of the fall show would be greater if the NAB's conventions were more focused—television in the spring, radio in the fall.

"Until the NAB finally makes a decision to separate the spring and fall shows—have the spring show be a television-only show and put 100 percent emphasis on radio in the fall show—they will never truly get the bulk of the radio broadcasters at the radio show," he said.

Broadcast Supply West's VP of Marketing, Tim Schwieger, however, said that the show is still important for his company to attend.

"BSW has always enjoyed the fall radio show," Schwieger said. "It gives us the opportunity to introduce equipment that on-air personnel and production staff people utilize, rather than the equipment we exhibit at the spring show, which is more technically-oriented," he added.

NAB's Nance disagreed with the notion that the radio show's makeup is programming-oriented, and that equipment exhibitors may be passing over the show. "All the big names are still there," she said.

### Sessions and tours

Radio 1991 attendees can expect a slate of technically-oriented sessions, and can participate in a tour of stations in the San Francisco market.

Kicking things off, FCC Commissioner Sherrie Marshall will deliver remarks in a presentation titled "Digital Audio Broadcasting: Sound of the Future," on Wednesday at 4:15 p.m.

Among the technical seminars scheduled for the convention is the 23rd directional antenna seminar Wednesday and Thursday from 8:00 a.m. to 5:00 p.m.



The NAB's 1991 Radio Show will be held at the Moscone Convention Center in San Francisco.

The fourth digital radio station seminar will be held on Friday from 9:00 a.m. to 5:00 p.m. It will include both digital storage technology, and an overview of digital audio broadcasting with presentations by each DAB system proponent.

Other technical seminars include panel discussions on transitions to DAB; new FCC technical regulations and station responsibilities; new technology for AM and FM radio; regulations for FM translators and a discussion of the "AMax" certification for improved AM receivers.

Three management sessions on legal and regulatory issues will also be held. On Thursday, a session on "Improving AM and FM Station Facilities—A Manager's Primer" will be held, as will "FCC Enforcement—Avoiding Station Fines in the 1990s." On Saturday from 9:00 a.m. to 11:00 a.m. will be a "Regulatory Roundup," in which questions from the audience will be addressed.

Throughout the convention, tours of some of the Bay Area's radio stations will

also be offered. Tours include KGO, KNEW/KSAN, KMEL, KDFC, KFSO/KYA, KRQR, KFRC-AM/FM, KNBR and KFOG.

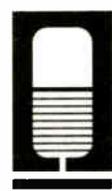
### Other highlights

The Crystal Radio Awards Luncheon, sponsored by Associated Press Broadcast Services, will be held on Thursday at 12:00 noon. NAB President and CEO Edward Fritts will deliver opening remarks, and 10 awards will be presented to local radio stations for outstanding contributions to community service.

New York Governor Mario Cuomo will deliver the management keynote address on Friday at 10:30 a.m. Quincy Jones, producer and president of Quincy Jones Entertainment Company, will deliver the programming keynote address on Saturday at 12:15 p.m.

The Marconi Radio Awards Show and Buffet Dance Party, sponsored by The Interep Radio Store, will be held Saturday at 5:30 p.m.

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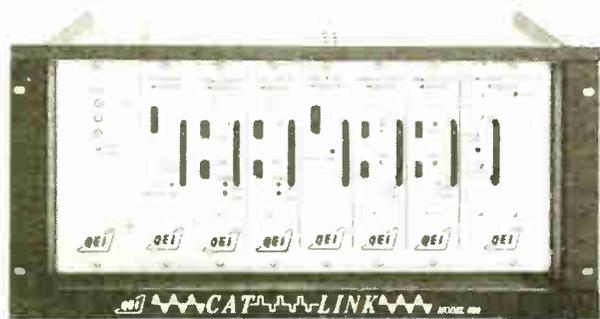
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## DAB's Proponents Plan System Demos

by Judith Gross

**SAN FRANCISCO** There may be some raised voices and disagreements, but probably no new DAB hardware at the NAB's Radio 1991 convention to be held here, Sept. 11-14.

A mobile demonstration of the European-developed Eureka 147 system was ensured about six weeks before the convention was to take place, even though the sparse Eureka 147 equipment is heavily committed to a German electronics show just days before the San Francisco gathering.

Although the Bay area is noted for its persistent and severe multipath problems, the mobile capability of U.S.-developed systems is still in development.

Meanwhile, Convention-goers who expect to hear or see DAB in operation at L-band will come away from the show disappointed as well. Although continuous carrier tests of L-band are proceeding in Canada, no DAB L-band equipment currently exists.

#### Second bus demo

"We're planning a Eureka demonstration similar to the one at the spring convention in Las Vegas," said Michael Rau, NAB Senior VP of Science & Technology.

Eureka 147 again will be demonstrated at a frequency of approximately 450 MHz.

Rau said the demo would include another bus tour, this time with more multipath available, to show how Eureka makes positive use of signal delays to enhance a signal.

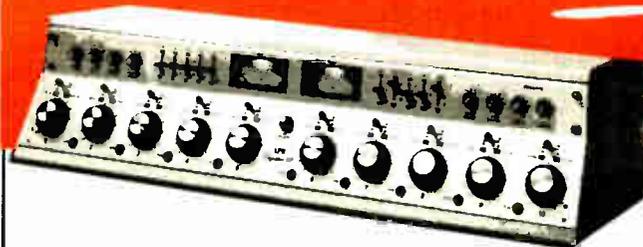
**Although continuous carrier tests of L-band are proceeding, no DAB L-band equipment currently exists.**

The Eureka bus demo held at the NAB convention was unable to show multipath canceling in any dramatic way and was criticized by many who took the tour. Critics said that the benefits of DAB over the FM analog signal were difficult to detect.

Rau noted that despite a large consumer electronics gathering in Berlin just days before Radio 1991, the NAB was able to convince Eureka 147 partners to send some equipment to San Francisco.

"The CCETT is building another Eureka encoder specifically for the San Francisco demo," Rau said. (continued on page 54)

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# Sessions Cover Range of Topics



by Charles Taylor

**SAN FRANCISCO** A day-long seminar promising to enlighten the uninformed on digital radio is just one of the technology sessions planned for the Radio 1991 show here Sept. 11 to 14.

Other scheduled sessions and seminars will cover everything from upgrading AM and FM facilities to maintaining compliance with FCC technical regulations. Question and answer sessions typically conclude each panel discussion.

The fourth Digital Radio Station Seminar, from 9 a.m. to 5 p.m. Friday, Sept. 13, will offer presentations on equipment and software for digital audio storage and distribution. In the afternoon, discussions will focus on digital audio broadcasting (DAB), with presentations by each of the DAB system proponents.

A panel with officials of each DAB system will close the day's agenda.

Also on Friday, "Join the AMax Team" will attempt to convince attendees of the importance of promoting improved AM receivers. AM receivers that meet certain specifications may bear the AMax logo. The program is sponsored by NAB and the Electronic Industries Association (EIA).

The 23rd AM Directional Antenna Seminar will be held Wed., Sept. 11 and Thurs., Sept. 12, from 8 a.m. to 5 p.m.

discussed in "FM Translators—Decoding the New Regulations."

A session on new technology for

**... seminars will cover everything from upgrading AM and FM facilities to maintaining compliance with FCC technical regulations.**

The program will cover field strength measurements, adjustments and maintenance, using a Smith chart, ground systems, pattern shape and impedance.

"Radio Broadcast Data System" (RBDS) will explore a new technology that allows FM listeners to tune into stations by format and to receive electronic message displays on their radios. RDS equipment is being manufactured by such companies as Rohde & Schwarz and Modulation Sciences; Sage Alerting is promoting the equipment as an alternative to traditional EBS gear.

U.S. standards for RBDS currently are in the works and this session, scheduled Thursday, Sept. 12, will introduce engineers to the new technology.

On Sat., Sept. 14, from 9 to 10:10 a.m., new translator classifications that will tighten FCC abuse regulations will be

AM and FM Radio will take place Sat., Sept. 14, from 10:30 to 11:40 a.m. Can new AM/FM developments improve the

technical performance of your station? What do they mean to your bottom line? These questions and more will be discussed.

New FCC technical regulations and the responsibilities of such will be addressed Friday, Sept. 13, 3 to 4:10 p.m. The panel will be devoted to bringing attendees up to speed with the FCC's most highly enforced technical regulations.

For information on the programs, contact Janet Elliott at NAB at 202-429-5346; fax: 202-775-3520.

## Radio 1991 Schedule at a Glance

### Wednesday, September 11

- 9 a.m.-12 p.m. .... Radio Station Tours
- 12:45-1:15 p.m. .... Sneak Preview for Newcomers
- 4:15-5:30 p.m. .... DAB Remarks by FCC Commissioner Sherrie Marshall
- 6-9 p.m. .... Reception sponsored by Westwood One

### Thursday, September 12

- 8 a.m.-5 p.m. .... AM Directional Antenna Seminar
- 10 a.m.-6 p.m. .... Exhibit Floor Open
- 10:30-11:40 a.m. .... DAB: How Will It Affect You?
- 12-1:45 p.m. .... Crystal Radio Awards Luncheon
- 2-3:10 p.m. .... FCC Enforcement: Avoiding Fines in the '90s
- 2-3:10 p.m. .... Gain Extra Income by Leasing Space on Your Tower
- 3:30-4:40 p.m. .... Small Market Sales Strategies
- 4:30-6 p.m. .... Exhibit Hall Carnival

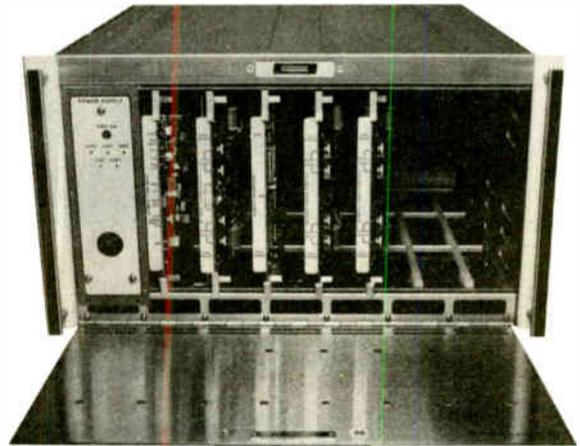
### Friday, September 13

- 10 a.m.-6 p.m. .... Exhibit Floor Open
- 9 a.m.-5 p.m. .... 4th Digital Radio Station Seminar
- 9 a.m.-10:10 a.m. .... Defeat Technical Project Fears
- 11:50-1 p.m. .... Join the "AMax" Team
- 3-4:10 p.m. .... New FCC Technical Regulations and Your Responsibilities
- 4:30-6 p.m. .... Programming & Production Showcase/Party

### Saturday, September 14

- 9 a.m.-1 p.m. .... Exhibit Floor Open
- 9 a.m.-10:10 a.m. .... FM Translators: Decoding the New Regulations
- 10:30-11:40 a.m. .... New Technology for AM and FM Radio
- 10:30 a.m.-12 p.m. .... Exhibit Brunch sponsored by Arbitron Co.
- 1:30-2:40 p.m. .... Radio Theatre Workshop
- 3-4:10 p.m. .... Transitions to DAB
- 5:30-11 p.m. .... Marconi Radio Awards Show

Convention schedule is subject to change and a materials fee may be added to some sessions. Check with NAB for details.



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World Radio History

# Super Tuner Demo Anticipated

by John Gatski

**WASHINGTON** It's been three years since the NAB promised a high performance AM stereo/FM stereo "super tuner."

Guess what? It still is not ready for production, but it may be getting close, according to the NAB and the super tuner's manufacturer, Denon.

NAB Senior VP of Science and Technology Michael Rau said that NAB hopes to have a tuner to demonstrate at the Radio 1991 show in San Francisco, Sept. 11-14.

Rau also said that production models could be ready by the fall. "If we stay on schedule, we could have them in production by October," Rau said.

The NAB's mild uncertainty about delivery stems from the amount of time required by Denon to evaluate changes that need to be made to the working prototype, according to Denon of America President Bob Heiblim.

Denon had a finished working prototype in early summer, but it was sent to Japan to be evaluated for consideration of additional modifications. The NAB wants to add an external antenna con-

nection, Heiblim said.

The NAB/EIA joint agreement to promote an improved AM certification mark (AMax) for receivers prompted the association to request the antenna connec-

tion, Heiblim said. The NAB/EIA joint agreement to promote an improved AM certification mark (AMax) for receivers prompted the association to request the antenna connec-

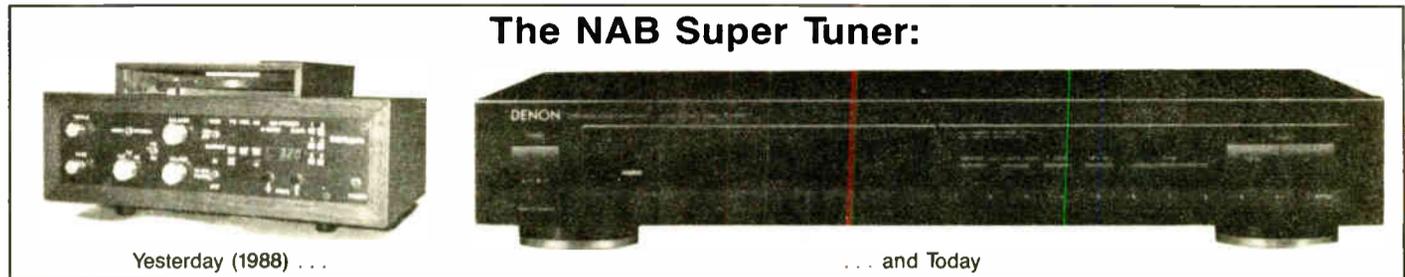
tion, Heiblim said. The NAB/EIA joint agreement to promote an improved AM certification mark (AMax) for receivers prompted the association to request the antenna connec-

prototype, NAB members said the AM sound was very good and the noise blanking was exceptional.

The tuner will retail for about \$500, putting it in the price range of audiophile tuners, according to Heiblim.

The NAB plans to target member stations to buy the tuners, Rau said.

So far, the NAB has spent about \$75,000 on the "super tuner" project, he added.



tion, Rau explained.

Heiblim said an AM antenna connection requires additional engineering evaluation, and the prototype was sent back to determine whether the feature can be accommodated with minimal alteration.

The NRSC-spec prototype tuner, which is based on Denon's TU-660 NRSC AM/FM stereo tuner, will have AM stereo (C-QUAM), noise blanking, FMX, wide/narrow bandwidth switches, expanded AM band and, according to Heiblim, a frequency response greater

## San Francisco Market Focuses on Efficiency

by Pamela Watkins

**SAN FRANCISCO** The future trend for San Francisco radio reads like a pre-planned fortune cookie, according to market analysts: To be successful in the San Francisco market, you must become more efficient in product delivery, marketing and programming—profits will follow.

The San Francisco radio market has heard the call and has taken up the march toward this efficiency. Coupled with focused marketing, unique niche program-

ing and digital technology, San Francisco radio has created its own style, and the city is expecting radio to be the star of the 1990s.

Stations are already gearing to go digital, CEs said. Several good digital systems have hit the marketplace, and San Francisco radio is gradually making the transition.

In discussing changes at his station, KGO-AM CE Bruce Schirmer said, "I think that it has gotten to the point where we're going to jump on it, revamp our production facilities and turn them into a digital-type operation."

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### MARKET UPDATE

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(continued on page 54)

**SO, JUST WHO USES TELOS ANYWAY ?**

**A**

CNN, WHDH, KRBE, WQUE, NBC TALKNET, WNYC, KXRX, WLTT, KFOG, WKQL, DISNEY/MGM, WWW, KUSA, WCAU, KPLZ, WKYC, HOME TEAM SPORTS, WNVZ, ABC TV, WHK, KDWB, WPGC, KVIL, WZOU, NHK-JAPAN, WOR, KLB, WAMU, CBS-TV, WMJI, KILT, NJ101, WXTU, ESPN, WOWO, KBCO, WPLJ, KIKK, WMCA, KGO, WYNY, BET, WWDC, CNBC, KSHE, WIND, KPCC, WHFS, KUPL, WBBM, SATELLITE MUSIC NETWORK, WOAI, KCAL, WIBC, KFI, WYSP, NBC RADIO NETWORK, WMZQ, KZAP, WNCX, KHYI, WTKN, MIDWEST RADIO NETWORK, WLWL, KGON, WQXI, ASSOCIATED PRESS RADIO, WVOR, KISW, WIP, NBC TV, WYNF, KJR, WKLS, KSAN, WLAC, NATIONAL PUBLIC RADIO, WPRO, KNEW, WRIF, KRLD, WMAL, CHRISTIAN FINANCIAL CONCEPTS, WMAQ, KRON, WWW, KMGC, WRKO, KRIV, WRC, AT&T TECHNOLOGIES, WLW, KABC, WOFX, KSTP, WPHR, UTAH STATE SPORTS RADIO NETWORK, WNYC, KTAR, WAPW, KLCC, WABC, WGUC, KLIF, WBAP, KZLA, WETA, BUSINESS RADIO NETWORK, WGAR, KTXQ, WNCN, KMEL, WERE, WCCO, KSFM, WENS, PIRATE RADIO, WFOX, KMEL, WCMF, KPRC, WEZB, KTNQ, WFAN, WFBQ, KTKS, WGCI, KPBS, WLTE, BONNEVILLE SATELLITE NETWORK, WCBS, KPWR, WHYY, KRXY, WBZZ, WAKR, KPLX, WAVA, WJR, WHTZ ...

AND HUNDREDS MORE. THANK YOU

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CLEVELAND, OH 44114  
(216) 241-7225  
FAX: (216) 241-4103

# DAB Proponents Plan for Demos

(continued from page 50) Francisco show," Rau said. He noted that there will also be a Eureka booth inside the convention hall, but that the multipath simulator shown in Las Vegas will not be at the booth.

## Other systems uncertain

The only other DAB system that displayed hardware at the spring convention was USA Digital, or Project Acorn. Gannett, CBS, Group W, Stanford Research and others working on the project were hoping to have a mobile demo of the system in San Francisco.

Gannett's Paul Donahue noted that researchers want to take a "prudent course" in unveiling the technology, and do not want to show a system until it's ready to be implemented.

He said that those behind the project would be meeting in early August to determine what kind of showing to have at Radio 1991.

But just before that meeting, at a Radio Operators' Caucus in Washington, D.C., CBS Radio Manager Nancy Widman said that a mobile demo at the September convention would cost about \$900,000 and that CBS was feeling "lonely and broke" being one of the few supplying development funds for the in-band DAB system. She asked if other station groups would consider contributing dollars.

## Talking about it

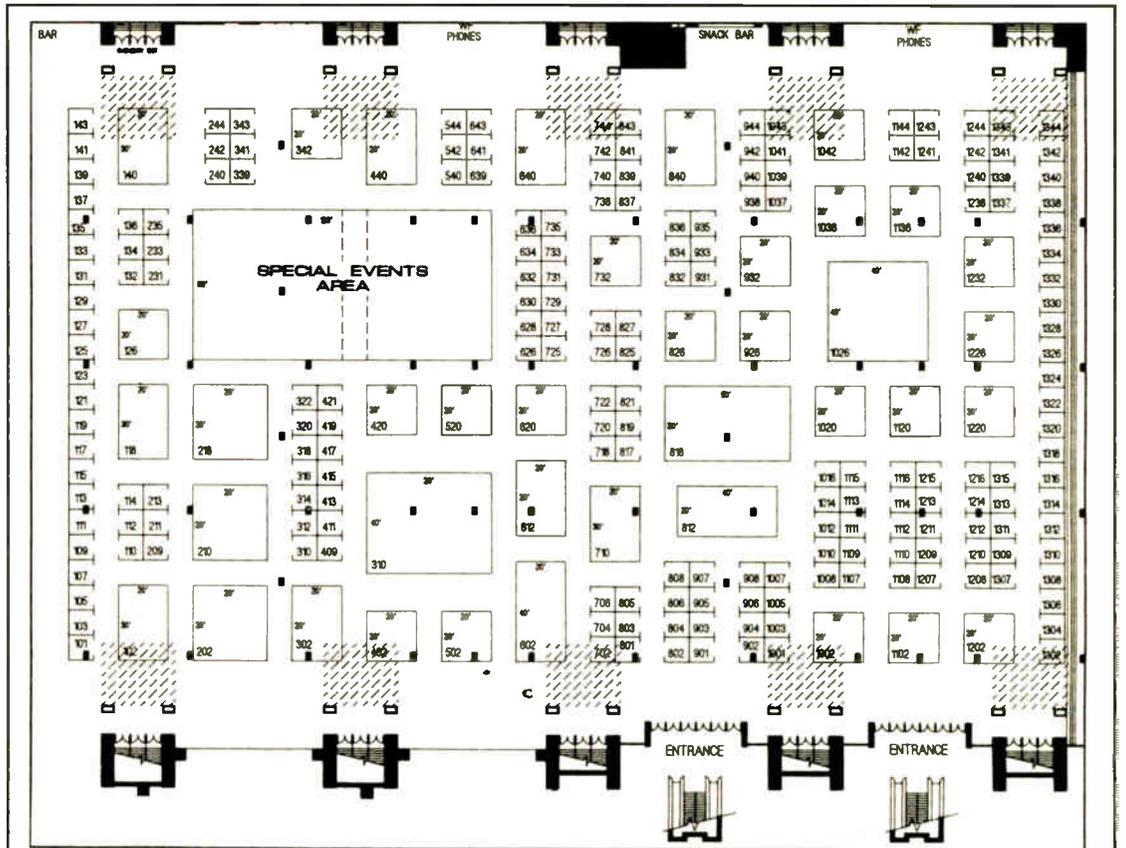
DAB will be hot on the lips of convention-goers in at least four convention sessions. The first of these is on Wednesday, Septem-

ber 11, when FCC Commissioner Sherrie Marshall addresses DAB in special remarks followed by a panel discussion.

"Transitions to DAB" is the subject of another panel discussion on Saturday, September 14, while the 4th Digital Radio Station Seminar will devote a large amount of time to the subject on Friday, September 13.

But one seminar which has controversy virtually built into it will take place on Thursday, September 12. It is innocently named "Digital Audio Broadcasting: How Will It Affect You?" but features vocal opponents to the NAB's DAB policies.

The opponents are Randy Odeneal of Sconnix Broadcasting, Arthur Kern of American-Media and Ron Strother of Strother Communications. The NAB will be represented by DAB Task Force Chairman Alan Box and the NAB's Rau.



Radio 1991 Exhibit Floor

Making sense of a trade show can be a nightmare unless you plan your route ahead of time. Use this floor chart along with the Exhibitor Directory on the following pages as your guide to companies you'll want to visit. Numbers refer to

exhibitor booths—although they were accurate at press time, they are subject to change.

Chart reprinted from NAB convention materials.

# San Francisco Focuses on Efficiency

(continued from page 53) but in a more focused manner. Jim Colton, program manager at KCBS-AM, explained that because KCBS is an all-news station (it changed eight months ago from news/information), it advertises during KRON-TV's one minute news updates six times a day.

"Television will become once again a major focus of radio advertising, but it will be specific in nature. Radio is looking for specific programming elements to put our message on television

to reach our potential listeners—no more mass campaigns," Colton said.

Interactive radio has two functions for the San Francisco market, according to several stations: increasing a station's database for targeted marketing and increasing programming to the heavy listener.

At K101, a listener line was set up specifically to accommodate the listener who wanted to voice an opinion about programs or enter contests. From this communication, the lis-

tener was added to the database; marketing and programming the station has been geared to this type of listener, K101's Bailey said.

## Back to the future

KITS has even gone "back to the future" to exploit 1940s-style radio. During the daily morning show, it has a live audience of 10-25 people. Programming consists of live comics from local comedy clubs and "fun," irreverent chatter, according to the station's programming department.

Other format mixes abound in the eclectic San Francisco market. Some examples are: KGO-AM's talk/news format; KKSF-FM's format of British hits that are unheard in the U.S.; KJAZ-FM's jazz for "all ages"; and KFRC-AM's classical/MOR format, to name a few.

Although the U.S. has been in a recession the past year, San Francisco radio has nudged past the national average in revenue. According to Andrew McClure, president of the media consulting firm William A. Exline, Inc., San Francisco radio in 1991 is growing at a rate of 5.9 percent over 1990 compared to the national average growth rate of four percent.

"Even though 1991 seems to be growing less than in other years," McClure said, "it still has increased over 1990." McClure also noted that "San Francisco, in a matter of 10 years, has gone from \$100 million in entire market revenue to \$200 million."

There are some notes of economic stress regarding the overall selling value of radio stations in and around San Francisco—a trend reflected nationwide, station brokers reported.

No longer are potential buyers willing to pay exorbitant amounts for floundering stations with poor revenues and ailing formats with the expectation of getting their investment back through appreciation. Today, the appreciation potential is flat.

"Therefore, it is a buyer's market," McClure said. "Buyers no longer want to pay millions for fixer-uppers. Stations must already be efficient and in the black."

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# Exhibitor Directory

Company Booth

**A**

**Accu-Weather, Inc. 702**

On Display: AccuCall 900™ service bureau 900 telephone line. Provides InstaSports™ sports scoreboard; UltraWeather 2001™ with time, current conditions and forecasts for 2,001 cities.

Also: Accu-Weather commercial weather service. Forecasts and presentations customized to various styles and formats. 619 W. College Ave. State College, Pa. 16801  
Contact: Sheldon Levine  
Phone: 814-237-0309  
Fax: 814-238-1339

**AFCCE 1330 TBA**

AFCCE is an association of communications consulting engineers practicing before the FCC and related federal agencies. c/o Lohnes & Culver 1156 15th St., N.W., Suite 606 Washington, D.C. 20005  
Contact: Robert Culver  
Phone: 202-296-2725  
Fax: 202-296-2727

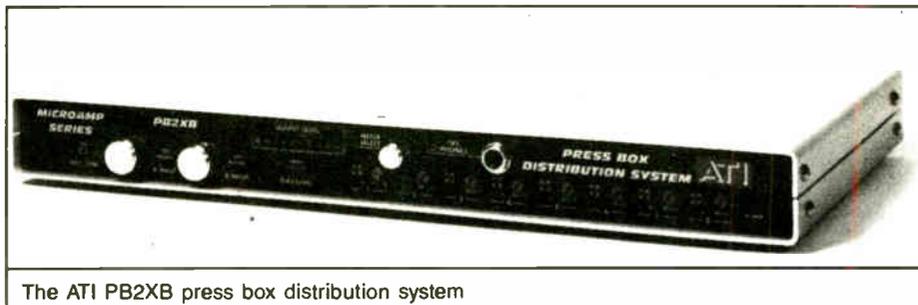
**AKG/Orban/dbx/BSS, Inc. 202**

On Display: The Orban Digital Optimod-FM model 8200, third generation of combined compressor, limiter, stereo generator for FM signal processing. Also: Full array of Orban studio products, broad selection of AKG microphones and headphones, and the

**Alesis Corp. 1238**

On Display: ADAT eight-track digital audio tape recorder, D-4 digital rack-mount drum sound module.

Also: Quadverb 20K bandwidth simultaneous digital effects processor; Midiverb III



The AT1 PB2XB press box distribution system

16-bit digital effects processor; Microverb III 16-bit reverb and delay; and 1622 monolithic integrated surface 16-channel mixer. 3630 Holdrege Ave., Los Angeles, Calif. 90016  
Contact: Allen Wald  
Phone: 213-467-8000  
Fax: 213-836-9192

**Associated Press Broadcast Services 818**

On Display: AP News Wires—AP Headlines, AP NewsPower, APTV Wire, AP Specialty Wires; AP Audio Services—AP Network News, Texas AP Network, New Jersey Sound; and AP Computer Software—AP NewsDesk, AP NewsDesk/LAN. 1825 K St. NW, Washington, D.C. 20006  
Contact: Evelyn Cassidy  
Phone: 202-955-7243  
Fax: 202-736-1107

**Audio Technologies, Inc. (ATI) 636**

On Display: HD1000 expandable multi-output headphone amplifier system; PB2x8 press box distribution system and MXM mix minus adapter. PB2x8 offers two mic/line inputs switchable and

mixable into any of eight balanced outputs.

Also: Vanguard series of six-, eight- and twelve-mixer dual stereo on-air consoles, MicroAmp and Encore series audio amplifiers, Emph'a Sizer microphone processor and VU800 studio metering system. 328 W. Maple Ave. Horsham, Pa. 19044  
Contact: Ed Mullin  
Phone: 215-443-0330  
Fax: 215-443-0394

**audiopak, Inc. 728**

On Display: NAB-type endless-loop audio broadcast cartridges: A-2 for general purpose recordings of spots, commercials, music, etc.; AA-3 for stereo-phased AM/FM broadcasts; and AA-4 for digital source recording.

Also: Lubricated tape formulations 605, 613, and 614. 1680 Tyson Dr., Winchester, Va. 22601  
Contact: Gordon Stafford  
Phone: 703-667-8125  
Fax: 703-667-6379

**auditronics, inc. 809**

On Display: The new 800 Series console. Features include: all faders precisely stereo-balanced and VCA controlled, highest possible reliability without routine maintenance, specifications compatible with digital technology and DAB.

The basic 800 Series supports 3 stereo output buses and 2 monaural mix-minus buses. An internal "voice/music" busing structure is provided for separate processing. Two sources are selectable on each input, and a "smart" two-line telephone input module, utilizing the mix-minus bus, is available. 3750 Old Getwell Rd., Memphis, Tenn. 38118  
Contact: Murray Shields  
Phone: 901-362-1350  
Fax: 901-365-8629



Burk Technology's ARC-16 remote control

DSE 7000 digital editing workstation. Full line of dbx signal processors and model 363 two-channel noise gate. Also, the BSS FCS-960 dual one-third octave graphic equalizer and DPR-901 dynamic equalizer. 1525 Alvarado St. San Leandro, Calif. 94577  
Contact: David Roudebush  
Phone: 415-351-3500  
Fax: 415-351-0500

**Arrakis Systems, Inc. 112**

2619 Midpoint Dr. Fort Collins, Colo. 80525  
Contact: Mike Palmer  
Phone: 303-224-2248

**Audio Precision 1320**

On Display: System One and Portable One audio test sets. The System One PC-based sets test analog and digital audio directly, complete with automated performance limits testing and graphic results.

The Portable One is a portable test set for bench, field and studio use. It includes instruments for 12 different measurement functions, combined in a single case. P.O. Box 2209 Beaverton, Ore. 97075  
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Phone: 503-627-0832  
Fax: 503-641-8906

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**B**

**BSS Audio** 202  
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**Berry Best Services Ltd.** 733  
1990 M St., NW, Suite 740  
Washington, D.C. 20036  
Contact: Randy Berry  
Phone: 202-293-4964

**Bradley Broadcast** 639  
On Display: The Telos Systems family of

**Burk Technology** 1315  
On Display: AutoPilot™ transmitter control option for use with ARC-16, permitting full automatic facility control.

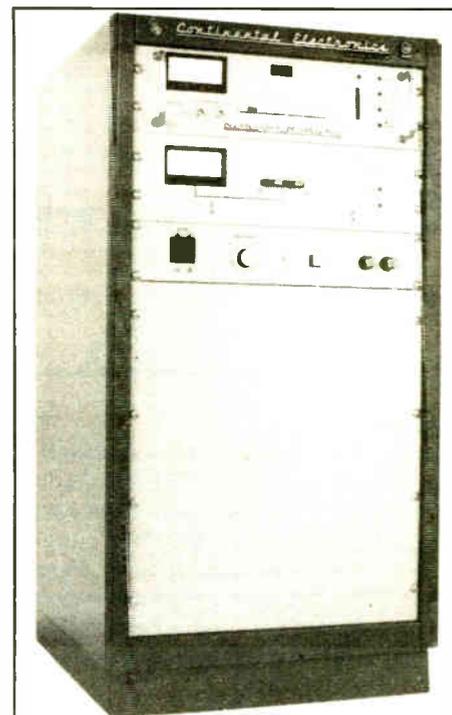
Also: Transmitter remote control systems including off-premises speech and computer access. Model ARC-16 supports control of studio devices as well as for EBS, automation, STL, security, etc.  
7 Lomar Dr., Pepperell, Mass. 01463  
Contact: Peter Burk  
Phone: 508-433-8877  
Fax: 508-433-8981

**CRL—Circuit Research Labs** 1107  
On Display: Real Time Event Sequencer, an event controller that controls one of eight outputs or one of 255 outputs (BCD). Over 200 events can be programmed in a seven-day clock format. Program information is displayed on a back-lit LCD front panel display.  
Also: A complete line of audio processing equipment for AM, FM and shortwave applications; Dynafex single-ended noise reduction systems; SCA and FM stereo generators.  
2522 W. Geneva Dr.  
Tempe, Ariz. 85282  
Contact: William Ammons  
Phone: 800-535-7648  
Fax: 602-438-8227

**Columbine Systems, Inc.** 304  
On Display: Unified System Release 2.0 software including Sales Analysis, simplified Copy, enhanced Central Sales Office, and Projection and Skim reports.  
1707 Cole Blvd.  
Golden, Colo. 80401  
Contact: Diane Sabo  
Phone: 303-237-4000  
Fax: 303-237-0085

**Computer Concepts Corp.** 1102  
On Display: Digital Commercial System (DCS), a PC-based product that allows recording to hard disk and instantaneous on-the-air playback of commercials, liners, jingles, etc. Can be integrated with other Computer Concepts business software.  
8375 Melrose Drive  
Lenexa, Kan. 66214  
Contact: Donna Greeling  
Phone: 913-541-0900  
Fax: 913-541-0169

**Comrex Corp.** 520  
On Display: The Comrex Talk Console—a complete talk show studio in one package. Digital audio codecs for high quality, full duplex audio on 56 or 64 kbps digital circuits.  
Also: Frequency extenders for up to 8 kHz audio on dial telephone lines; telephone hybrids and couplers.  
65 Nonset Path  
Acton, Mass. 01720  
Contact: Lynn Distler  
Phone: 508-263-1800  
Fax: 508-635-0401



The 813A series transmitter from Continental Electronics

**ComStream Corp.** 1312  
On Display: Audio Broadcast Receiver (ABR), providing CD-quality digital audio reception via satellite. Proprietary compression algorithm reduces bandwidth needed for digital audio via satellite.  
Also: CDA201 digital audio card for transmission or reception of 15 kHz stereo or 7.5 kHz mono CD-quality audio.  
10180 Barnes Canyon Rd.  
San Diego, Calif. 92121  
Contact: Bruce Rowe  
Phone: 619-458-1800  
Fax: 619-453-8953

**Concept Productions** 720  
On Display: CAPSAT (computer assisted programming for satellite stations); and DAF (Digital Audio File), which replaces analog carts with hard disk storage.  
Also: CAPS (Computer Assisted Programming Systems), stores music on DAT or CD, spots on digital hard Disk; full random access of all music and spots.  
1224 Coloma Way  
Roseville, Calif. 95661  
Contact: Dick Wagner  
Phone: 916-782-7754  
Fax: 916-786-8304



Comrex Multiline System Model 3XP Encoder

digital telephone interface equipment; Unity 2000 FM processor from Cutting Edge Technologies; and Call Screen Manager software for talk show production from Capstone.

8101 Cessna Ave.  
Gaithersburg, Md. 20879  
Contact: Neil Glassman  
Phone: 301-948-0650  
Fax: 301-330-7198

**Broadcast Electronics, Inc.** 218  
On Display: CORE 2000 Program Controller; AudioVAULT hard disk-based mass audio storage system; Air Trak 90 linear on-air console; the BE series of FM transmitters and cartridge machines; and the BE van.

4100 North 24th St.  
P.O. Box 3606  
Quincy, Ill. 62301  
Contact: Tim Bealar  
Phone: 217-224-9600  
Fax: 217-224-9607

**Broadcasters General Store** 318  
On Display: Akai DD-1000 digital editing system; Miwltronic tele interfaces and Automute.

Also: Cutting Edge Unity 2000 audio processor, Telos digital telephone hybrid, Cellcast cellular mixers, California Digital DigiMod, Sine Systems News Director.  
2480 SE 52nd St.  
Ocala, Fla. 32671  
Contact: Chris Shute  
Phone: 904-622-9058  
Fax: 904-629-7000

**Broadcast Supply West** 826  
On Display: Cutting Edge Unity 2000; Saffire 1 digital audio storage/automation system; Studer Dyaxis digital workstation; 360 Systems DigiCart digital cart machine; and consoles from Audiotronics and Audio-Arts.  
7012 27th St. West  
Tacoma, Wash. 98466  
Contact: Tim Schwiager  
Phone: 800-426-8434  
Fax: 206-565-8114

**C**

**CBSI—Custom Business Systems** 612  
On Display: InterAcct, an advanced interactive general ledger, accounts payable and budgeting system for broadcasters, featuring multi-station and multi-corporate capabilities.

Also: Classic and Elite traffic/billing systems, which integrate traffic, program log, accounts receivable, automatic co-op invoicing, copywriting, sales analysis and sales management functions. CustomMusic music library system and Classic Music Management System also to be shown.  
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**Continental Electronics Corp. 801**

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Contact: Steve Claterbaugh  
Phone: 214-381-7161  
Fax: 214-381-4949

**Dalet Digital Media Systems 1114**

6 Rue Cail  
Paris ZZ 75010 France  
Contact: David Amsalem

**Dataworld 421**

On Display: Three-second terrain data; FM and LPTV detailed interference studies; enhancement of mapping services, detailed coverage maps, population and power density maps, terrain shadow-

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Phone: 201-575-7810  
Fax: 201-808-1608

**Dielectric Communications 1007**

On Display: TCB cavity-backed circularly polarized antenna for FM. Features center mount cross dipole element and parasitic to excite a circular cavity.

Also: Line of FM products including ring and panel antennas, combiners, filters, switches, transmission line, and custom multi-station applications.  
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Raymond, Maine 04071  
Contact: Colleen Mitchell  
Phone: 207-655-4555  
Fax: 207-655-4669

**E**

**Econco 1112**

On Display: Rebuilt power transmitting tubes used in new generation transmitters. Also, rebuilt power transmitting tubes and klystrons.  
1318 Commerce Ave.  
Woodland, Calif. 95695  
Contact: Debbie Storz  
Phone: 916-662-7553  
Fax: 916-666-7760

**Electronics Research Inc. 126**

On Display: Medium power FM panel antenna system, affording multistation simultaneous broadcast applications, with power handling capabilities to 150 kW per system. Lambda antenna mounting sections with reduced wind and weight loads.

Also: FM omni and directional antenna systems, master antenna systems, filters, antenna support structures, con



Gentner's Optical Encoder, Prizm and Lazer (from top)

**Corporate Computer Systems 240**

On Display: CDQ-2000 stereo audio coder/decoder with MUSICAM compression; Micro 66i international 7.5 kHz universal codec for use on any switched digital network, including ISDN, switched 56 or leased circuits.

Also: Micro 56 and Micro 64 7.5 kHz audio codec with improved analog circuitry.  
33 W. Main St.  
Holmdel, N.J. 07733  
Contact: David Lin  
Phone: 908-946-3800  
Fax: 908-946-7167

ing maps; received signal level maps; advanced presentation graphics.

Also: AM, FM, LPTV directories, wireless cable, allocation and interference studies, population counting, flag service of FCC releases, terrain elevation retrieval programs, AM groundwave calculations, unused call-sign listings, AM daytime channel studies.  
P.O. Box 30730  
Bethesda, Md. 20824  
Contact: John L. Neff  
Phone: 800-368-5754  
Fax: 301-656-5341

**Denon America Inc. 938**

On Display: Auto Track Selector feature for DN-970FA CD cart player. Special code label placed on cartridge by PD determines which track will cue up in the CD player and which one won't.

**Dolby Laboratories 1307**

On Display: DP5500 Series DSTL™—a 950 MHz digital STL with two audio channels and two auxiliary channels using less than 300 kHz of RF spectrum.

Also: Model 500 series with Dolby AC-2 digital audio coding technology for two audio channels at 128 kbps per channel; and Model 363, with two channels of Dolby SR and/or A-type noise reduction for tape recorders, carts, STLs and satellite transmissions.  
100 Potrero Ave., San Francisco, Calif. 94103  
Contact: Kevin Tam  
Phone: 415-558-0200  
Fax: 415-863-1373

sulting engineering services, field engineering services and filters and installation service.  
108 Market St.  
Newburgh, Ind. 47630  
Contact: David Davies  
Phone: 812-853-3318  
Fax: 812-858-5706

**F**

**Fidelipac Corp. 417**

On Display: Dynamax DCR-1000 series of digital audio cart recorders and reproducers, using standard 3.5-inch computer floppy disks. Sampling rate of 32 kHz enables 4 Mbyte disk to hold 102 seconds of stereo or 204 seconds of mono audio.

Also: Dynamax CTR-90 series records and reproducers; erasers/splice detectors; Audiomax and Dynamax tape cartridges; studio warning lights and bulk recording tape. Broadcast Audio division to show modular audio consoles or on-air and production studios.  
P.O. Box 808  
Moorestown, N.J. 08057  
Contact: John Tiedeck  
Phone: 609-235-3900  
Fax: 609-235-7779

**G**

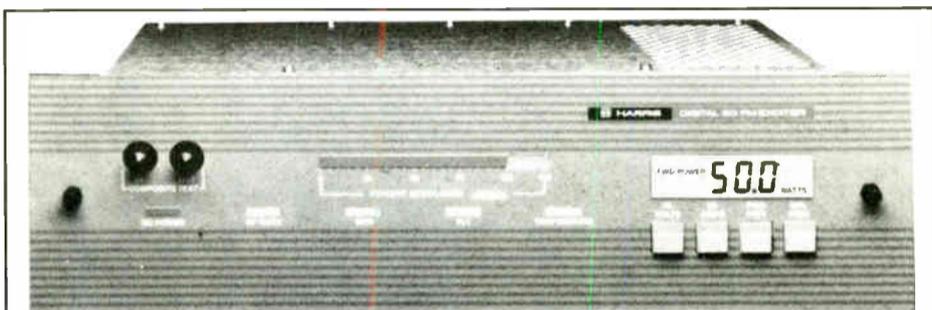
**Gentner Electronics Corp. 1314**

On Display: EFT-3100 7.5 kHz frequency extender over three telephone lines; Lazer digital limiter/stereo generator; Prizm digital audio processor; DAWN digital audio workstation network—LAN-based central control system.

Also: Digital Hybrid II, an auto-nulling telephone interface; and VRC-2000 voice-synthesized transmitter remote control.  
1825 Research Way  
Salt Lake City, Utah 84119  
Contact: Charles Leonhardt  
Phone: 801-975-7200  
Fax: 801-977 0087

**D**

dbx 202  
See AKG/Orban/dbx/BSS



Harris Digital 50, 50 Watt digital solid state FM exciter



FP410 Mixer shown actual size.

# Forget It.

□ Its MaxBus limits the number of activated microphones to one per talker.

□ And its Last Mic Lock-On keeps the most recently activated microphone open until a newly activated microphone takes its place.

With Shure IntelliMix, you'll get a "seamless" mix that's as close to perfect as you'll find. Providing the cleanest, clearest sound you've ever heard from a portable mixer. And freeing you from the tedious

task of turning microphones on and off.

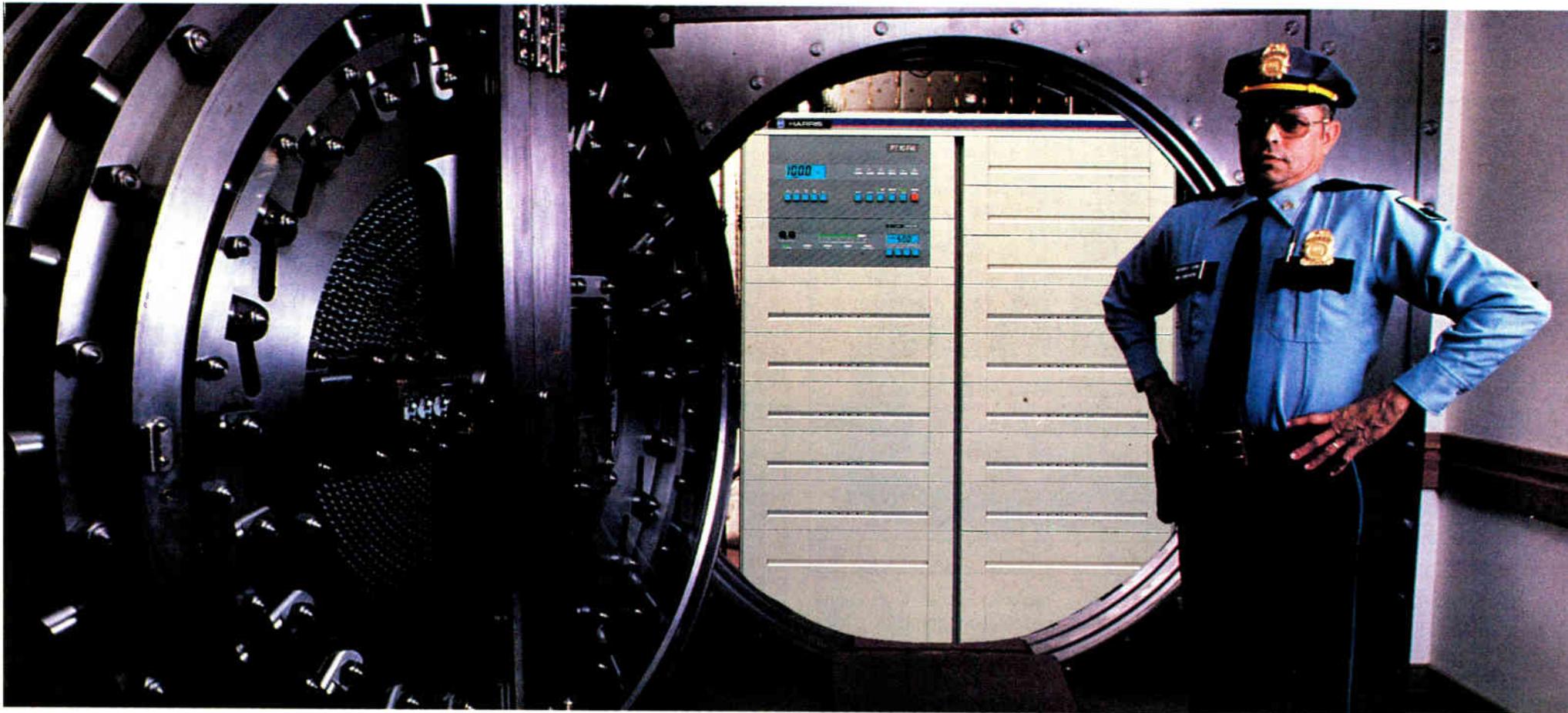
For a closer look at the world's first portable automatic mixer, call for more information including the article "Why Use An Automatic Mixer?"

We think you'll agree: The Shure FP410 is automatically a classic.

Call 1-800-25-SHURE. The Sound Of The Professionals®..Worldwide.



# Now FM reliability is solid as platinum.



## Introducing Platinum Series™ 100% Solid State FM Transmitters. From the RF Technology leader—Harris.

### Solid dependability

With Platinum Series FM transmitters, costly down-time is a thing of the past. Harris engineers have eliminated the risk of tube failure and the expense of tube replacement, using multiple FET output devices in parallel redundant configurations—the same RF technology that's made Platinum VHF transmitters best sellers in TV. Hot-pluggable Platinum solid state modules can be interchanged while the transmitter stays on the air. In the event of an AC power interruption, Platinum's solid state PA returns to air immediately when power is restored. There's no more waiting for filaments to warm or power supplies to settle. The low voltage, easy-to-service design also includes fault protection and monitoring systems of unprecedented capability.

### Operational simplicity

Until now, maintaining signal quality meant constant attention and fine-tuning. But no longer. Harris Platinum solid state transmitters require no tuning, loading or matching, none of the delicate adjustments that are part of keeping a tube final PA on the air. Operating Platinum FM is just about as simple as pushing the "on" button. Routine maintenance has been simplified as well. In fact, Platinum FM's scheduled maintenance requirements are 90% less than a typical tube transmitter. Consider how much that will save year after year!

### Superior signal quality

Platinum transmitters achieve a new level of FM performance—one your listeners will definitely notice. Uncompromised bandwidth produces the lowest syn-

chronous AM noise of any FM transmitter. In fact, Platinum FM transmitters actually surpass CDs in many areas of audio performance. Equipped with our breakthrough Digital 50 FM Exciter or the field-proven Harris THE-1, a Platinum transmitter will give your station the best-sounding signal on the dial.

### Invest in your future

Call Harris Allied toll free at 1-800-622-0022 for more information on today's most important new idea in FM broadcasting—the Platinum Series. Harris Platinum transmitters from 2 to 10kW are ready now to help you set new standards of reliability, simplicity and performance.



Harris Allied Broadcast Equipment  
RF Products  
P.O. Box 4290  
Quincy, IL USA 62305-4290  
Tel (800) 622-0022  
Fax (217) 224-1439

© 1991 Harris Corporation

**GE American Communications, Inc. 832**  
 On Display: Total program delivery services for broadcasters via satellite, including digital audio and SCPC network programming, SCPC for data applications, and satellite newsgathering.  
 Four Research Way  
 Princeton, N.J. 08540  
 Contact: Frederick Cain  
 Phone: 609-987-4000  
 Fax: 609-987-4517

**H**

**Halland Broadcast Services 415**  
 On Display: Halland, a division of Henry Engineering, will show its CD music libraries "The Seventies" (545 songs on 30 CDs, digitally remastered), and "Rock 'n' Roll Graffiti" (1,229 songs on 50 CDs, digitally remastered).  
 1289 E. Alsota Ave.  
 Glendora, Calif. 91740  
 Contact: Steve Steinberg  
 Phone: 818-963-6300  
 Fax: 818-963-2070

**Harris Allied Broadcast Equipment 420**  
 On Display: Harris Platinum™ series solid state FM transmitter; Harris Digital 50 FM exciter; Audiometrics CD10 cartridge player and Arrakis DigiLink hard disk system.  
 Also: Studio equipment including the AKG DSE-7000 digital audio workstation; and MacroMedia's Audisk™ digital audio storage and automation system.  
 P.O. Box 4290  
 Quincy, Ill. 62305  
 Contact: Martha Rapp  
 Phone: 217-222-8200  
 Fax: 217-224-1439

**Booth numbers are subject to change. Check NAB program for details.**

**Henry Engineering 415**  
 On Display: Dig-Announce digital message storage unit for use with phone line; TwinMic dual-channel (stereo) high performance mic preamp.  
 Also: Fast Trac automatic dubbing system; TwinMatch dual stereo level and impedance converter for CD players; Micromixer four-input stereo line-level mixer; USDA mini DA with two inputs, four outputs, in stereo or mono; Matchbox level & impedance converter; Telecart II telephone coupler, interfaces cart machine with phone line for message playback.  
 503 Key Vista Dr.  
 Sierra Madre, Calif. 91024  
 Contact: Hank Landsberg  
 Phone: 818-355-3656  
 Fax: 818-355-0077

**IDB Communications Group 502**  
 On Display: Transmission and distribution services for radio programming via satellite and fiber optics. Digital audio between U.S. and London, paris, Moscow, Tokyo, Sydney and West Germany.  
 10525 W. Washington Blvd.

2425 S. Main St.  
 Bloomington, Ill. 61702  
 Contact: Bruce Helling  
 Phone: 309-828-1381  
 Fax: 309-828-1386

**J**

**Jampro Antennas Inc. 903**  
 On Display: JBBP balanced pene-



The Moseley DSP 6000E digital encoder (top) and decoder

Culver City, Calif. 90232  
 Contact: Beth Morris  
 Phone: 213-870-9000  
 Fax: 213-838-6374

**IGM Communications 620**  
 4041 Home Rd.  
 Bellingham, Wash. 98226  
 Contact: Rick Sawyer  
 Phone: 206-733-4567

**Inovonics, Inc. 343**  
 On Display: The Sentinel, an all-mode station monitor receiver with comprehensive audio diagnostics. Twelve separate parameters of the program signal are displayed simultaneously.  
 Also: Model 222 AM pre-emphasis/low pass processor; Model 250 programmable multiband processor for AM, FM or TV; Model 255 "Spectral Loading" stereo broadcast audio processor; Model 705 FM/FMX™ stereo generator and Model 706 FM/FMX™ digital synthesis stereo generator.  
 1305 Fair Ave.  
 Santa Cruz, Calif. 95060  
 Contact: Joe Murphy  
 Phone: 408-458-0552  
 Fax: 408-458-0554

**International Tapetronics Corp. (ITC) 231**  
 On Display: The DigiForm digital audio operating platform, a hard disk system offering five different operating modes, including digital cartridge machine, satellite automation, program automation, live-assist and traffic/accounting/ billing interface.  
 Also: The ITC Series 1, Delta and 99B Series audio tape cartridge machines, ESL V eraser/ splice locator, ITC Cart II broadcast cartridge, and the ITC Audio Switcher.

**K**

**Killer Music/Killer Tracks 706**  
 On Display: Production music library comprised of over 40 CDs, updated each year with an additional 10 CDs of all new material.  
 6528 Sunset Blvd.  
 Hollywood, Calif. 90028  
 Contact: Ann Burke  
 Phone: 800-877-0078  
 Fax: 213-957-4470

**M**

**The Management TBA**  
 On Display: Digital DJ hard disk storage and playback systems with live assist, automation and satellite control capabilities.  
 Also: EZ Log traffic and billing system; Simple Log and Super Log software for traffic, billing and program log functions.  
 P.O. Box 1-36457  
 Ft. Worth, Texas 76136  
 Contact: Adrian Charlton  
 Phone: 817-625-9761  
 Fax: 817-624-9741

**Marti Electronics 738**  
 On Display: Marti PA72 six-foot parabolic antenna; Plan A, Radio Survival in the '90s—a comprehensive plan for linking stations together.  
 Also: STL-10 system for mono or stereo; RPU systems for remote broadcast and ENG; repeater systems for STL and RPU; bi-directional microwave systems for multistation interconnect.  
 P.O. Box 661  
 Cleburne, Texas 76031  
 Contact: Dan Rau  
 Phone: 817-645-9163  
 FAX: 817-641-3869

trator, broadband sidemount antenna for FM & TV; JHD UHF broadband panel.  
 Also: JHPC high power FM penetrator; JMPC medium power FM penetrator; JSDP cavity backed spiral dipole; JBPF bandpass filter; JCR corner reflector; and JTC full FM bank spiral antenna.  
 6939 Power Inn Rd.  
 Sacramento, Calif. 95828  
 Contact: Alex Perchevitch  
 Phone: 916-383-1177  
 Fax: 916-383-1182

**AS-101 Audio Switcher**

10 stereo in  
 1 stereo out

- Illuminated and legendable control buttons
- Instant or overlap switching
- Front panel accessible level controls
- Options include: RS-232 interface, remote control, relay-follow-switch outputs
- Network proven quality and reliability!

P.O. Box 1342 Bellingham, WA 98227  
 (206) 734-4323 (206) 676-4822 (FAX) **Conex Electro-Systems, Inc**

*All it needs is you!*

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- Catch Up On DAB
- Check Out Format Forums

Radio 1991  
 SAN FRANCISCO  
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 National Association of BROADCASTERS

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# STOP AT THIS SPOT..

...and take advantage of this sensational new program that will save your station hundreds to thousands of dollars!

**RAMKO RESEARCH is introducing a new product line and marketing strategy that will enable you to enjoy new station equipment of uncompromised quality at amazingly low cost.**

**Examples:** An 8 mixer stereo/mono on air console for only \$2,204; or a 12 mixer console for only \$84/month; or a dual 1 x 4 audio DA at an unheard of \$171! And there are 91 different broadcast products (over 600 variations) in our line from preamps to audio DAs thru full switching systems: all available with super discounts and/or monthly mini financing.

### What microprocessors did for computers, RAMKO's doing for broadcast.

Over three years ago we led a trend that told us broadcasting was headed for some very rough times. With this premise, we set out to develop a product line that capitalized on all the latest technology to provide performance & quality exceeding any broadcast requirements and, deliver a dramatic cost advantage. The xL SERIES is the result of this intensive product development program with pricing, performance & quality that will put all other manufacturers on the and get you off of it.

☛ **27 1/2% DISCOUNT**  
PAYMENT WITH ORDER

☛ **25% DISCOUNT**  
NET 30 DAYS

☛ **20% DISCOUNT**  
LEASING FROM 1 TO 5 YEARS

☛ **20% REBATE**  
LEASING FROM 1 TO 5 YEARS

### With 91 products you're bound to many other items to improve your stations performance & your bottom line

**MIXERS** --- Portable, battery operated **CONSOLES** --- Mini production/news room **CONSOLES** --- Studio 4,6,8,12 channels **AMPLIFIERS** --- Audio interfacing/consumer matching **AMPLIFIERS** --- Audio power **SWITCHERS** --- Audio switching, routing, & mixing **PREAMPLIFIERS** --- Turntable **AMPLIFIERS** --- Line level **AMPLIFIERS** --- Microphone **AMPLIFIERS** --- Modular distribution/special function **AMPLIFIERS** --- Audio distribution **MIXERS** --- Studio & sound systems

### Put us on the ●. Call TOLL free today (800) 678-1357, for your free information package & product literature.

Then compare prices, features and performance with anything else on the market. And, we are so confident of our products quality, everything is offered with a 2 year warranty, 2 week free trial period plus, we'll ● you UPS ground charges both ways if you are not wholly satisfied for any reason!

### Don't delay as this is the only ● where you will see this offer advertised and is for a limited time only.

This is part of a world wide marketing test and, although RAMKO reserves the right to extend this offer, the discounts and financing options outlined herein are for a **limited time and are scheduled to end July 15, 1991.**

**TOLL FREE (800) 678-1357**  
**FOR ADDITIONAL INFORMATION**  
**& LEASE QUOTES.**

**OR FAX: (916) 635-0907**

3501-4 SUNRISE BLVD.,  
RANCHO CORDOVA, CA 95742



Winner of the 1990 Arthur Anderson *fast track* 25 award for the 25 fastest growing companies in Northern Calif.

#### EXAMPLE #1

**MODEL: xL4S/8M:** Dual 1 x 4 audio DA. XLR in & barrier strip out. Balanced in & out.

● Payment with order  
LIST PRICE \$.....\$236  
YOUR COST.....\$171.10

● 3 year lease w/20% discount  
LIST PRICE \$.....\$236  
MONTHLY PAYMENT...\$6.87  
(Minimum \$1,500 package required)



#### EXAMPLE #2

**MODEL: xL12/1S:** Twelve mixer, 31 input, stereo/mono broadcast console.

● Payment with order  
LIST PRICE \$.....\$4,043  
YOUR COST.....\$2,931.18

● 5 year lease w/20% discount  
LIST PRICE \$.....\$4,043  
MONTHLY PAYMENT...\$84.09



#### EXAMPLE #3

**MODEL: DC38-10S:** Ten mixer, 40 input, dual channel out, stereo/mono broadcast console w/ alpha numeric & custom backlit readouts.

● Payment with order  
LIST PRICE \$.....\$6,831  
YOUR COST.....\$4,952.48

● 5 year lease w/20% discount  
LIST PRICE \$.....\$6,831  
MONTHLY PAYMENT...\$142.08



#### EXAMPLE #4

**MODEL: RS-1616FP (8 stereo in by 16 out):** Audio switching, mixing system expandable from 8 in 2 out to 250 by 250, stereo/mono. Remote, computer & front panel controls.

● Payment with order  
LIST PRICE \$.....\$3,850  
YOUR COST.....\$2,791.25

● 5 year lease w/20% discount  
LIST PRICE \$.....\$3,850  
MONTHLY PAYMENT...\$80.08



# RAMKO RESEARCH

**Moseley Associates Inc.** 339  
 On Display: DSP 6000 digital transmission system for STL and fractional T-1 program conveyance; Digimux subcarrier multiplex system; Musicode for Switch 56/64 remote and audio broadcast applications.  
 Also: PCL 6000 STL; PCL-606 STL; RPL 4000 RPU link; MRC-2 microprocessor remote control and MRC-1620 microprocessor remote control system.  
 111 Castilian Dr.  
 Santa Barbara, Calif. 93117  
 Contact: Jamal Hamdani  
 Phone: 805-968-9621  
 Fax: 805-685-9638

**Motorola AM Stereo** 806  
 On Display: AM stereo exciter and monitors. Also, demonstration of what

Galaxy and Satcom.  
 2025 M St., NW  
 Washington, D.C. 20036  
 Contact: Miriam Lenett  
 Phone: 202-822-2626

**National Supervisory Network** 1242  
 On Display: NSN will demonstrate its off-premise control services via satellite, including FCC legal monitoring and control of transmitters, EBS, tower lights and other parameter.  
 Also: Private link network demonstrations of data, message and audio transfers.  
 P.O. Box 578  
 Avon, Colo. 81620  
 Contact: Muffy Montemayor  
 Phone: 303-949-7774  
 Fax: 303-949-4364

**Nautel** 1107  
 On Display: Solid state FM transmitter;

**P**  
**Prophet Systems** 1120  
 113 West 4th  
 Box 509  
 Ogallala, Neb. 69153  
 Contact: Yvonne Groteluschen  
 Phone: 308-284-3633

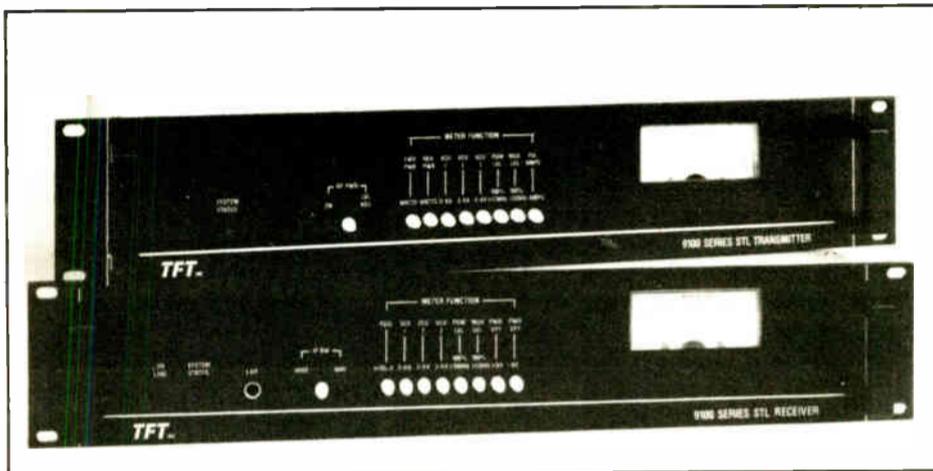
**R**  
**Radio Computing Services** 1014  
 On Display: Tracker digital audio logging system on DAT tape. Up to eight days storage on a single DAT tape; and Linker scheduling system for promos, liners, jingles and other features.  
 Also: Selector music scheduling system; Songtrack in-house software; Musicbase music information system and Prorate MegaRates software for yield management in radio.  
 Two Overhill Rd., Suite 100  
 Scarsdale, N.Y. 10583  
 Contact: Lee Facto  
 Phone: 914-723-8567  
 Fax: 914-723-6651

**Radio Systems Inc.** 1008  
 On Display: RS-700 DAT machines for on-air, archiving, sequential automation and long-form satellite dubbing.  
 Also: RS-2000 cart machines with built-in phase correction, flutter correction and splice detector; RS series consoles and RS-1000 DAT machines.  
 110 High Hill Rd.  
 Bridgeport, N.J. 08014  
 Contact: Paul McLane  
 Phone: 609-467-8000  
 Fax: 609-467-3044

**Register Data Systems** TBA  
 On Display: Digicorder digital audio record and playback unit, with 75 minute audio storage capability.  
 Also: Full line of Traffic Master sales/traffic/ billing/accounting systems; RDS System Six and System Seven computer systems, interfaceable to a variety of automation systems.  
 P.O. Box 1246  
 Perry, Ga. 31069

Contact: Lowell Register  
 Phone: 912-987-2501  
 Fax: 912-987-7595

**S**  
**Scientific Atlanta** 1213  
 On Display: Spectrum Efficient Digital Audio Technology (SEDAT™) for CD quality audio via data streams as low as 128 kbps; analog uplink and downlink systems for audio distribution; digital audio satellite distribution systems; and data broadcast uplinks and downlinks for point-to-multipoint data transfer.  
 420 N. Wickham Rd.  
 Melbourne, Fla. 32935  
 Contact: Mel Nance  
 Phone: 407-255-3055  
 Fax: 407-259-3942



TFT, Inc. Model 9100 Transmitter (top) and Model 9107 Receiver

is required to convert transmitters to AM stereo capability.  
 1216 Remington Rd.  
 Schaumburg, Ill. 61073  
 Contact: Don Wilson  
 Phone: 708-576-3592  
 Fax: 708-576-5479

AMPFET FM7 and FM4 solid state modular transmitters.  
 Also: Solid state AM transmitter, the AMPFET ND series 1 kW to 100 kW solid state modular transmitters, offering 75-80 percent efficiency.  
 201 Target Industrial Circle  
 Bangor, Maine 04401  
 Phone: 207-947-8200  
 Fax: 207-947-3693

**N**  
**NPR Satellite Services** 825  
 On Display: Full range of domestic interconnection services, including fixed and transportable uplinking, SCPC audio transmission, downlinking, digital fiber optic audio channels and service to

**O**  
 Orban 202  
 See AKG/Orban/dbx/BSS

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**NOW ONLY \$5,975**

**ALWAYS IN STOCK**

**IDEAL FOR 35-55 kW TRANSMITTERS**

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Circle 16 On Reader Service Card

**A-MAZE high definition, Concert Hall Sound**



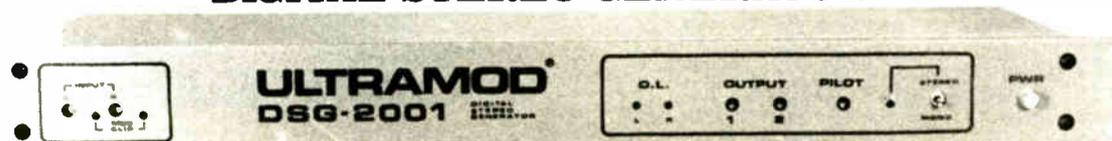
The A-MAZE is the industry's most "Psychoacoustically Invisible" processor. Your audio image is bigger, cleaner, wider, louder ... Guaranteed.



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Circle 105 On Reader Service Card

**DSG-2001**  
**DIGITAL STEREO GENERATOR**



The DSG-2001 is a superb Digital Stereo Generator incorporating many features not found on even the most expensive units. Dollar for dollar, this product is worth a closer look.



42 Elaine Street • R.R. 1 • Thompson, Connecticut 06277  
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Circle 125 On Reader Service Card

**Shively Labs**

905

On Display: Shively will feature three new band pass filters, as well as pattern work for both FCC directional and omnidirectional requirements.

Also: Shively will display models from their complete line of FM broadcast antennas, and such related gear as branched and balanced multistation combiners, rigid coaxial transmission, line, and pattern studies.

84 Harrison Rd.  
Bridgeton, Maine 04009  
Contact: Jonathan Clark  
Phone: 207-647-3327  
Fax: 207-647-8273

**Studer ReVox America, Inc.**

1208

On Display: The D740 CD Recorder, C221 CD player, and Studer Dyaxis 2+2 digital audio workstation with MacMix 3.2 software.

Also: The A764 FM monitor tuner with wideband composite output, a full range of professional CD players and controllers, the Studer A807 two- and four-track recorders and Revox's PR99 and C270 series of two-, four- and eight-track recorders.

1425 Elm Hill Pike  
Nashville, Tenn. 37080  
Contact: Dave Bowman  
Phone: 615-254-5651  
Fax: 615-256-7619

**T****Tennaplex Systems, Ltd.**

540

On Display: Kathrein FM broadcast antennas; and Pristine MMCS music management control system, automated programming and playing system with digital quality audio.

21 Concourse Gate, Unit 1  
Nepean, Ontario K2E 7S4 Canada

Contact: Marvin Crouch

Phone: 613-226-5870

Fax: 613-727-1247

**TFT, Inc.**

322

On Display: Low cost mono STL; live synchronous FM booster demonstration featuring 8900 Reciter, digital delay, 19 kHz time-base and Model 844A FM stereo modulation monitor with peak duration differentiator.

3090 Oakmead Village Dr.  
Santa Clara, Calif. 95052  
Contact: Darryl Parker  
Phone: 408-727-7272  
Fax: 408-727-5942

**360 Systems**

1138

Intro: AM-16/R remote control station for use with AM-16//R audio switchers. Provides multistation remote capability for X-Y or salvo switching via serial interface buss; HDS-40 external hard disk system for DigiCart digital audio cart machines.

18740 Oxnard St.  
Tarzana, Calif. 91356  
Contact: Don Bird  
Phone: 818-342-3127  
Fax: 818-342-4372

**TM Century, Inc.**

1202

On Display: Ultimate Digital Studio, a digital control room system, integrating music on CD, program scheduling, commercials and jingles on hard disk drive and commercial copy for live spots.

Also: Gold Discs and Hit Discs, production libraries, Powerplay music scheduling software and The Comedy Network weekly comedy service on CD.

14444 Beltwood Parkway  
Dallas, Texas 75244  
Contact: Richie Allen  
Phone: 214-934-2121  
Fax: 214-419-1054

**W****Weather Services Corp.**

908

131 A Great Rd., Bedford, Mass. 01730

Contact: George Stamos

Phone: 617-275-8860

**Wheatstone Corp.**

1207

On Display: Wheatstone Not-So-Hard Disk

Contact: Michael Shane

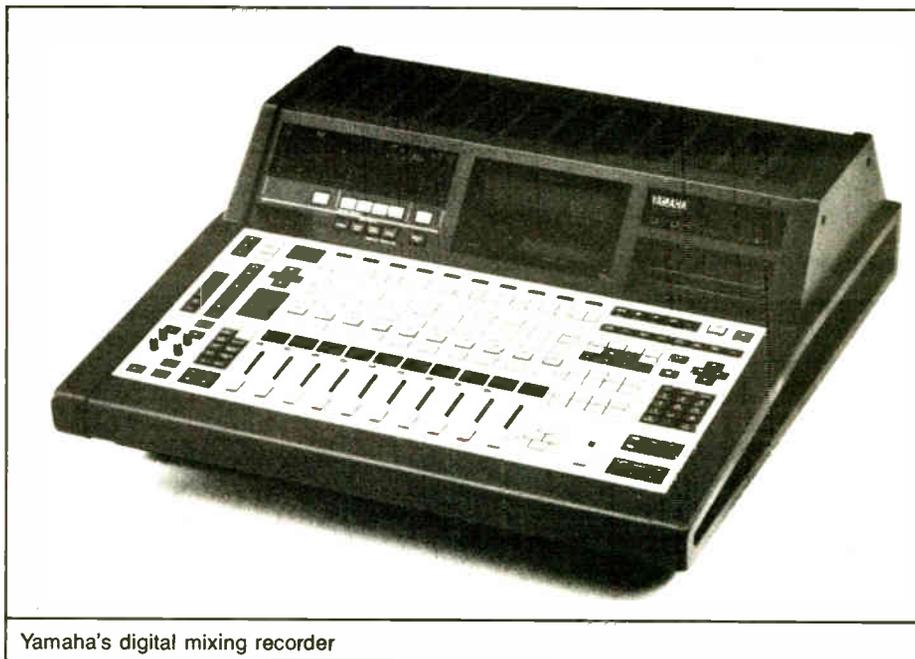
Phone: 315-455-7740

Fax: 315-454-8104

**Y****Yamaha Corporation of America**

1311

On Display: Digital Domain® products, including DMC1000 automated digital mixing



Yamaha's digital mixing recorder

digital audio program library for on-air broadcast; SP-42 and SP-44 mixing consoles for production and on-air, available in two-, four- and eight-track formats; and TS-500 talent station, integrating microphone, timing, communication and monitoring functions in one.

Also: A-500 and A-32 radio on-air consoles; SP-6 stereo production console; Wheatstone studio furniture.

6720 V.I.P. Parkway, Syracuse, N.Y. 13211

console; DRU8 eight-track digital recorder; YPDR601 CD recording system.

Also: Mixing consoles, microphones, signal processors, effects devices, power amplifiers and audio monitors.

6600 Orangethorpe Ave.  
Buena Park, Calif. 90620

Contact: Peter Horsman  
Phone: 714-522-9011

Fax: 714-739-2680

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That's what MYAT rigid line and RF components deliver. We manufacture them using highest quality pure copper or aluminum, and thoroughly test each one before shipping. Princeton University's Plasma Physics Laboratory evaluated MYAT performance, and chose our components for their research reactor.

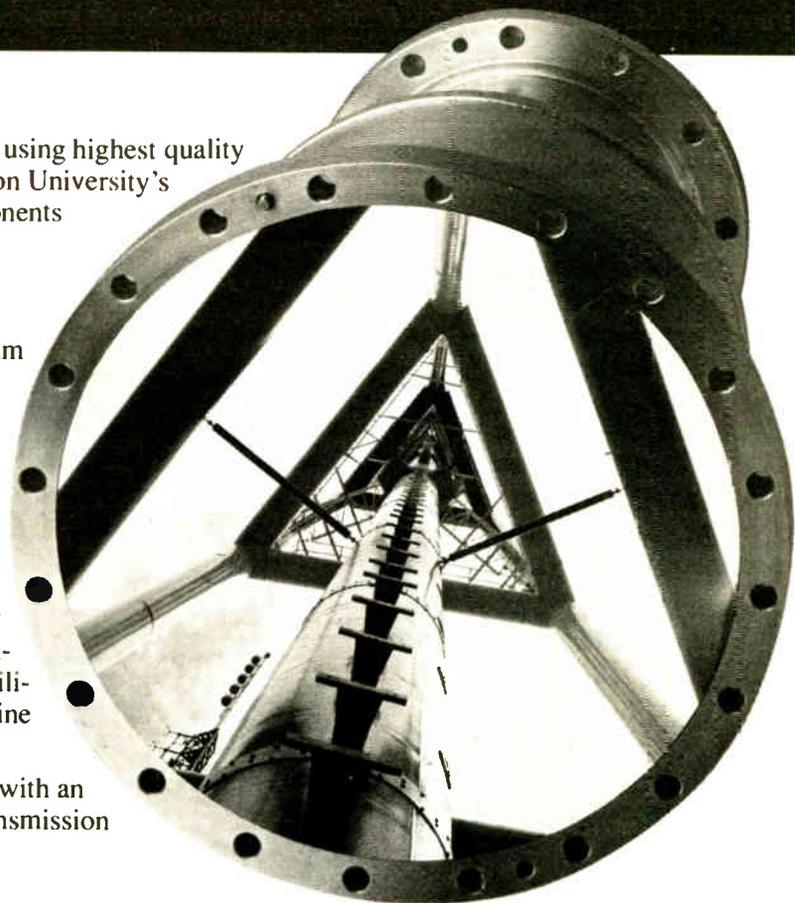
## RELIABILITY AND LONGEVITY

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World Radio History

# BUYERS GUIDE

Consoles

## SP-44: Tradition, and a Twist

by Ray Esparolini  
Director of Sales  
Wheatstone Corp.

**SYRACUSE, N.Y.** The new Wheatstone SP-44 console offers full multitrack production capability, while providing familiar program and audition bussing,

dip-switch feeding a mix-minus buss, making the console suitable for call-in production work.

Cue, phantom power, phase reverse and separate mic and line gain trims all are standard. Module on/off switches may be remotely controlled and can trigger control room and studio mute, as

SP-44 subgroup modules provide record outputs to the multitrack tape recorder during mixdown sessions, with each subgroup fader controlling the level of one track.

The same modules are equipped with buss/ext switches and tape level controls, allowing direct tape playback with no repatching; the final mix may then be monitored by assigning the subgroups to the console's master stereo program output. Alternatively, tape outputs may be routed to mono module line inputs, allowing the addition of EQ to playback.

rupt and control room mute functions.

A complete line of optional accessories includes studio modules, stereo line selectors, tape remote control, a multi-line phone module, an intercom module and a digital timer with auto-restart functions.



The new SP-44 offers multitrack production and on-air capabilities in one package.

allowing production rooms to double as back-up on-air facilities.

In talk or news formats, the SP-44 can free up primary air studios for routine calibration and maintenance sessions. Beyond its on-air capability, the SP-44 can be used as a four-track production console; it is equipped with three-band equalization, auxiliary send busses, subgrouping capabilities and full on-air type machine and console logic.

### Two types

Input modules consist of two types: mono mic/line and stereo line. Both have familiar program and audition buss assign switches for on-air application and routine two-track transfers and dubs. Mono inputs have an additional internal

well as auto timer restart. Control room and studio tally relays permit an on-air type of production environment as well as direct-to-air capability.

Stereo inputs have A/B source select capability, three-band reciprocal curve EQ and a stereo/mono send section for auxiliary effects (sends may be switched pre- or post-fader).

Channel on/off buttons are coupled to an on-air type machine and console logic system and can fire external machines, as well as receive tally back signals from same. The logic system also may be dip-switch-selected to command control room and studio mute, plus timer restart.

## TECHNOLOGY UPDATE

All components are Wheatstone quality throughout, with all-gold contact switches, gold buss connectors, gold I/O connectors, solid state on/off lamps and triple burned-in ICs. Faders are Penny & Giles long-throw conductive plastic. Performance specifications include typical frequency response at +0.1 dB, 10 Hz to 20 kHz; THD+N less than .004 percent 20 Hz to 20 kHz; and dynamic range of -114 dB.

■ ■ ■

For information, contact Ray Esparolini at Wheatstone: 315-455-7740; fax: 315-454-8104; or circle Reader Service 9.

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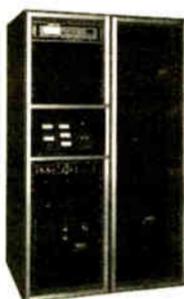


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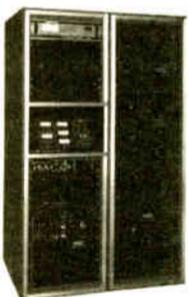


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# One Good BE Board Deserves Another

## WVAZ Chooses Six-Track BE Air Trak 90 Console After Retiring Station's 12-Year-Old Model 100A

by Bill Murdoch  
Engineer, WVAZ

**CHICAGO** The purchase of a console is not a decision to be taken lightly, even when you are strapped for something to put on the air. After 12 years of faithful service, our Broadcast Electronics 100A console in the newsroom decided to tell us it was ready for retirement.

At the same time, Broadcast Electronics was coming out with a new console with the same look and feel of the Mix Trak 90 at a surprisingly affordable price. We were contacted by BE to do a beta test of the new Air Trak 90 broadcast console. It was shipped within a week and we quickly put it through its paces.

provided concise and easy reading. We had the console up and running in a few hours.

Along with ease of installation, the new Broadcast Electronics Air Trak 90 exhibits great flexibility. This is evident by the many available input configurations.

## USER REPORT

It is possible to mix sources to different levels on the same fader simply by programming the motherboard jumpers. Each fader has three inputs and accepts signals from microphone level, consumer level and professional balanced



Broadcast Electronics' Air Trak 90 replaced WVAZ's BE 100A console.

The six-channel model was tested here. Air Trak 90 also comes in 12, 18 or 24 channel versions.

The newspeople liked the simple, ergonomic design with color-coded headphone and monitor pots and selectors. They also were impressed with the on-board red LED clock and green LED

**The Air Trak 90 compares very favorably with the other, more expensive consoles we have in-house, and it is RF-proof.**

timer. The timer can be programmed to start on the required channels by installing pin jumpers. A built-in cue speaker with an external input doubles as part of the included talkback system.

### Variety of outputs

There are a variety of audio outputs that range from the standard stereo audition and program busses to a mix-minus buss and mono outputs for both audition and program. The audio may be sent down any buss by the push of a soft-touch switch with indication by LED. Machine starts also can be tied to the Channel On buttons. We use the relay option to start a triple-deck cart machine. It really tightens up our newscasts and eliminates many errors.

Installation was accomplished with the supplied crimp tool and AMP connectors. The internal wiring is straightforward and the complete, well-illustrated manual

level. The remote starts can be configured as momentary or continuous, which can be individually selected for each input. This adaptability makes any operation much smoother.

From a design standpoint, it's evident that the engineers at BE are very concerned about quality in workmanship and signal flow. The Air Trak 90 has two motherboards for the audio section with extensive ground planning, VCA audio control on all audio leveling, Penny & Giles faders and a very good set of diagnostics. Front-panel LEDs show the status of power supply, audio presence and audio phase.

### Turning red

If the phase is incorrect, the multicolor LEDs turn red. A mono test function also lets you hear the audio in mono over the monitor speakers for a quick check. The internal talkback system also is a nice feature. For satellite-oriented stations, the clock has the capability of being synched to the network.

Of course, all the fancy control functions in the world cannot mask the most important part—the sound. The Air Trak 90 is one of the best-sounding consoles I have ever heard. It compares very favorably with the other, more expensive consoles we have in-house, and it is RF-proof. With an AM antenna on the roof within 30 feet of the studio, the board is unaffected.

Carrying an affordable price tag, this console is an extremely good buy. We sure could use another one.

For information on the Broadcast Electronics Air Trak 90, contact Bill Harland or Bob Arnold at 217-224-9600; fax: 217-224-9607; or circle Reader Service 100.

# ProductionMixer Excels at KPBS

by Christopher Durso  
CE, KPBS-FM

**SAN DIEGO** Pacific Recorders & Engineering has introduced a multitrack console designed specifically for the broadcaster. The PR&E ProductionMixer is a full-featured eight-track production console that combines the inherent operational characteristics of a conventional broadcast console with the flexibility of multitrack capabilities.

The ProductionMixer is custom configured according to the user's needs. The mainframe, available in 20- and 28-input sizes, can be stuffed with any combination of microphone and line level modules, in addition to eight multitrack modules.

In addition to the input modules, the console supports send/return facilities as well as full studio and control room monitoring systems with talkback. Room for up to 10 machine remote control panels is provided within the console to allow the operator to control studio tape equipment while concentrating on the mixdown session.

The console's meter bridge contains full metering for all eight-track outputs as well as for each stereo program output. Two auxiliary meters monitor the console sends, mono mix output, cue or

a source within a mix. This is extremely useful for trouble-shooting or fine tuning of the stereo image.

Pan pots on the microphone modules and balance controls on the stereo line modules are used to position the source within the image. A self-contained low-, mid- and high-range equalizer is included on each line and mic module. Separate controls for each range vary frequency and gain, respectively.

The ProductionMixer also has incorporated a feature known as Auto-Q. The "Q" of the filter continuously adjusts in proportion to the amount of boost or cut dialed in. This gives the equalizer a smooth and natural sound across its range. A boost or cut of approximately 15 dB is obtainable in each band. In addition, patch points are included.

Like its close relative, RadioMixer, the ProductionMixer departs from the design concept of audio on the fader and incorporates the Aphex VCA. Through careful attention to the tapering of the VCA control signal, the Penny & Giles fader has the feel of a high-quality audio taper fader.

The multitrack modules have the same stereo send busses, pan pot and built-in equalizers mentioned earlier. Each multitrack module can be assigned to the remainder of the tracks to accommodate track bounce. A buss/tape selector on the multitrack module selects the source to be mixed by the module.

In most cases the selector would be left in the tape position to allow the tape machine's own input/output switching to control the feed to the mixdown module. An alternate action button below the fader routes the signal to either of the two stereo program output busses. The Program 2 output module has a fader that can be placed in line with the circuit to provide a master gain control for the multitrack mixdown. In effect, the operator has both monitor mix and ster-

eo mixdown capabilities on the same module.

Each module has remote control logic capability. Logic input/outputs are 12 V CMOS and RFI, as well as short-circuit protected. Logic can be configured to

precipitate the layout and construction of the circuit cards. All inputs are instrumentation amplifiers that yield a very high common-mode rejection figure. Module logic and track configuration is handled through a combination of on-board dip-switches and header jumpers. Component designations are clearly silk screened on the card for quick and accurate identification.

Console interconnects are handled



Pacific Recorders' ProductionMixer can add a competitive edge with 20- and 28-input boards.

## USER REPORT

solo according to the operator's switch selection. The cue and solo levels are automatically metered whenever either function is selected by an input module.

One of the many outstanding features of the ProductionMixer is the ingenious off-line mix. From each line or microphone module selected to participate in the off-line mix, a mix-minus signal is derived by the telco module. When the modules are turned off, the mix-minus is routed via the off-line mix buss so the selected configuration remains but is no longer on the program buss. This greatly simplifies production of telephone contest promos and talk shows by making the transition from on-air to off-air seamless to both the talent and the caller.

Both line and microphone input modules feature two switchable high impedance inputs. The number of inputs can be expanded with the addition of a remote line selector. Two independent stereo buss outputs can be selected on each module as well as eight track assign outputs.

Two stereo send/return busses are available with pre/post fader selection. Line input modules let the operator select between stereo, left, right or mono modes.

Alternate action cue with metering and light tally, as well as "solo in place" functions are supported on all line and mic modules. When the cue button is depressed, the stereo pre-fader signal is fed to two cue speakers located in the console meter bridge. When solo is selected, the monitor feed is interrupted and the post fader/post pan signal is fed to the control room monitor speakers.

The solo in-place feature facilitates quick, non-destructive identification of

support both source inputs on each module. The meter bridge, which contains the built-in stereo cue speakers and clock/timer, has full metering for all console outputs.

The layout is logical with the main program meters located directly in front of the operator and the multitrack buss metering grouped together on the right hand side. The clock/timer is included with the console, and can be reset and started by the module-on function by setting a dip-switch on the module card or remotely operated from the timer control panel.

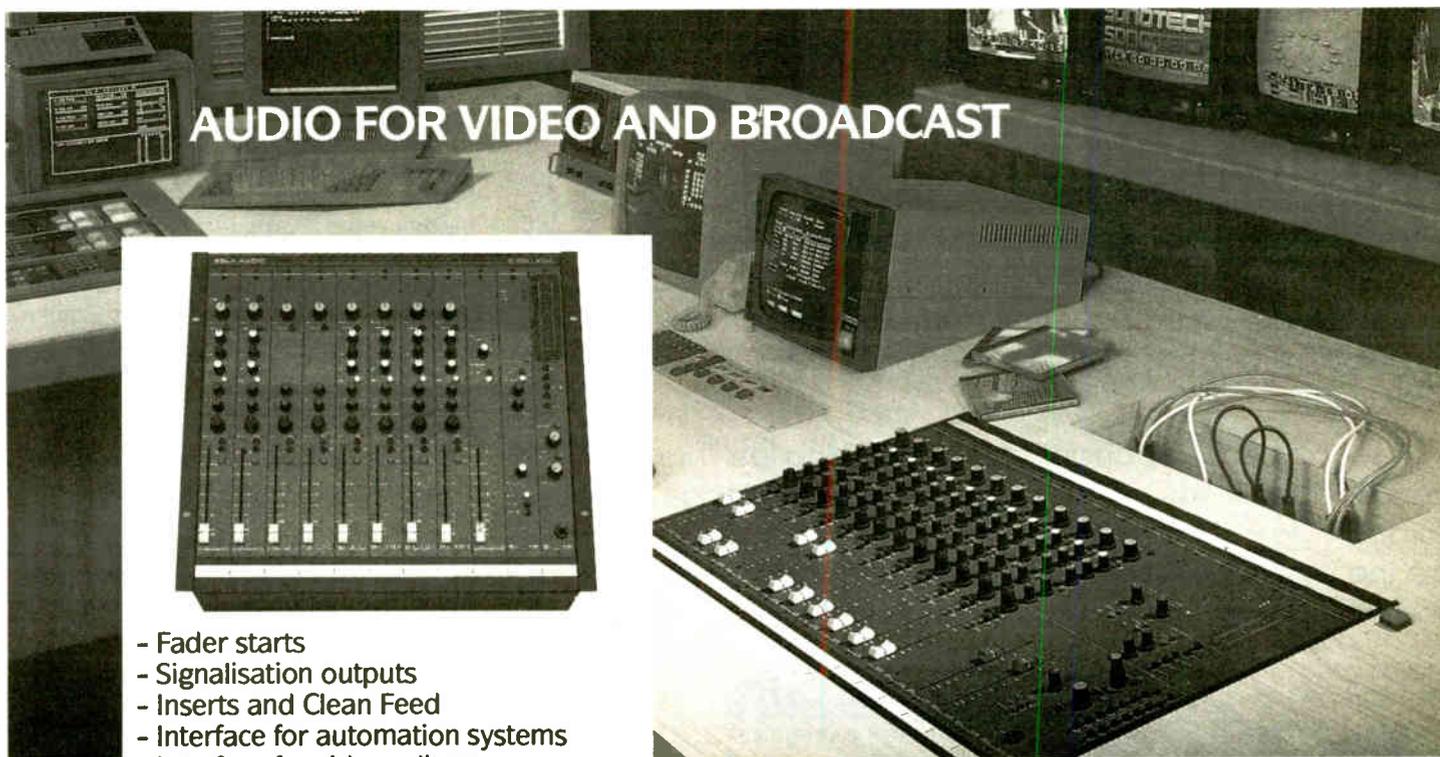
The flexibility of the ProductionMixer is a major plus for the production department—little or no training will be required to get product on tape.

The engineering department will ap-

through Molex connectors on the underside of the mainframe. A/B inputs, patch points and logic connections are arranged in order for each input. Control room and studio audio and logic signals also are available on the Molex connectors. PR&E makes available an array of logic interfaces to match the CMOS levels with external equipment.

Installation is straightforward and uncomplicated. Patch points can be brought out to a patchbay or simply jumpered across the connector. Machine control panels also are interconnected via Molex connectors.

For information on PR&E's ProductionMixer, call Dave Pollard, sales manager, at 619-438-3911; fax: 619-438-9277; or circle Reader Service 30.



## AUDIO FOR VIDEO AND BROADCAST

- Fader starts
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# Pace Is Set with RS Series Audio Console

## Albuquerque Consultant Sold on Radio Systems

by **Bill Pace**  
President, **Pace Audio Services**

**ALBUQUERQUE, N.M.** Albuquerque is a medium-sized radio market that has fallen victim to the broadcast speculation of the 1980s. There are more than 40 stations here struggling for part of an audience of just over half a million.

In light of the tight budgets in this market, we had to find an audio console that provided state-of-the-art performance at a reasonable cost. Over the past three years, we have installed 12 Radio Systems RS Series consoles, including three for Jones

stead of touchy trim pots.

The first good feeling you get when installing the Radio Systems consoles is from the well-written manual. It is concise and accurate, and 95 percent of what you need to know can be found by glancing at a mere half dozen pages. The

## USER REPORT

fold-out schematics aren't too big to be unwieldy, but big enough to contain an entire functional block of the consoles. Installing the console is a snap, because it maintains its sleek low-profile appearance without having to sink it into a counter top.

### Parts quickly changed

The factory always has made good on its promise to provide overnight delivery on (seldom needed) warranty parts. Many parts can be easily and quickly changed while the board is on the air, with minimal disruption.

Feedback from the operations people is universally positive. The board operators, initially fearing this new monster in their work space, were very comfortable after the first hour of use. Sonically, the consoles are, in our opinion, equal to anything on the marketplace.

Considering the market niche this particular line of consoles has established,

## The obvious stand-out advantages about the RS line of consoles are attractive appearance and simplicity of operation.

Satellite Services in Denver.

Our continued use of the Radio Systems console is a testimony to its overall quality and value in today's radio market.

### Keeps us happy

There are many features about the RS line of consoles that keep us happy. Prior to our first purchase, the obvious stand-out advantages were cost, attractive appearance and simplicity of operation. The Radio Systems series of consoles come in six, 12- and 18-channel sizes, all under \$10,000.

These are modern consoles with quality slide faders controlling electronic attenuators. The transformerless active balanced inputs and outputs use high speed opamps to provide superb audio.

The board has a sensible layout that makes it easy to operate. This is partially made possible by the sophisticated machine remote start controls for both the A and B inputs that can also reset a built-in timer.

In one installation we have a satellite music service controlling the console directly, firing breaks and liners, muting networks and discerning optional breaks. Radio Systems sells small modules for even more sophisticated control of turntables and cart machines.

Most models have separate meters for the program, audition and mono busses. Also included are a simple intercom system, a separate input switchable headphone amp, easily configurable monitor dimming/muting and flexible channel input stages—any of which can be configured from a microphone input to line level or anything in between. Stage input gain is set with jumpers and dip-headers in-

Radio Systems RS Series come in six-, 12- and 18-channel sizes.



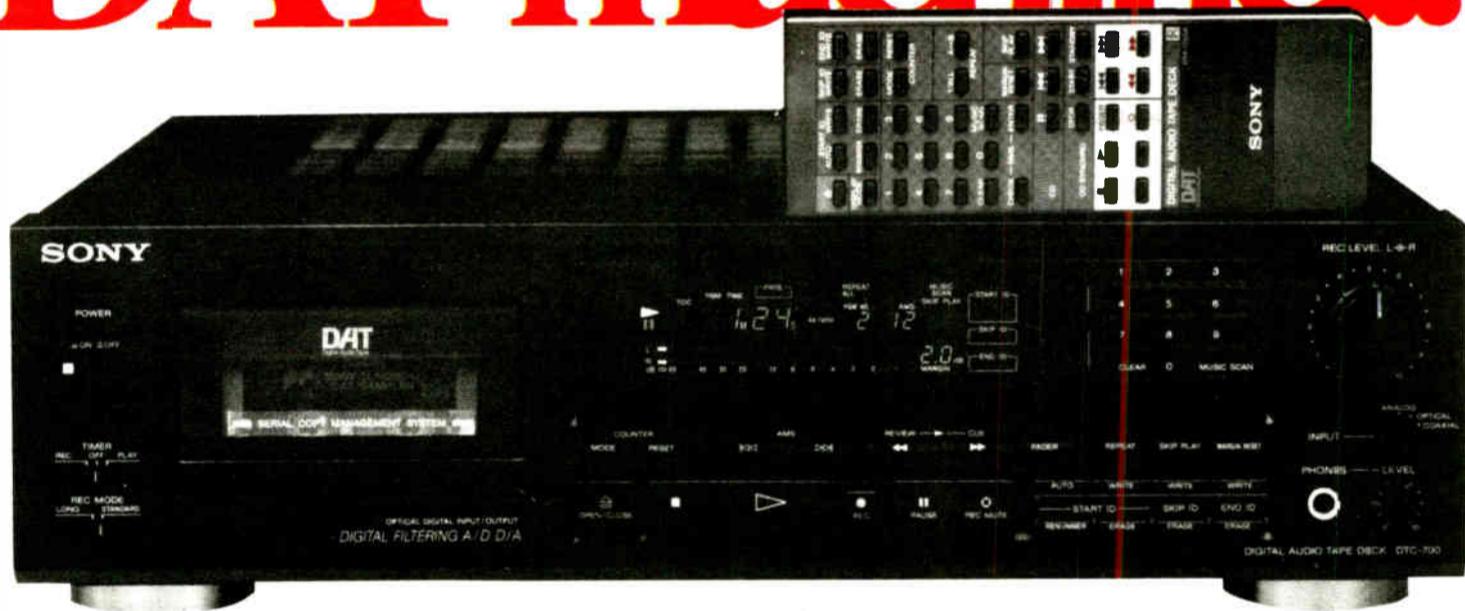
very little is lacking. Balanced monitor inputs would be nice. We added a balancing stage to correct this. We also found that under very heavy use, the monitor input switches tend to wear out quickly. These minor difficulties, however, can be overcome by careful planning up front.

This winner from Radio Systems makes us a winner with our client stations.

■ ■ ■

*Pace Audio Services employs four full-time technicians that, among other work, perform contract technical services for 15-plus Albuquerque area radio stations. For information on Radio Systems consoles, contact Dan Braverman, president, at 609-467-8000; fax: 609-467-3044; or circle Reader Service 15.*

# The new RS-700 from Radio Systems looks like every other DAT machine..



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- One Button Record for Network Applications.

Programmable logic functions automatically cue-up the tape on cassette insertion and after each cut has aired. Full remote wiring allows broadcast-standard pull-to-ground contacts and lamp drivers for console operator or network control.

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The RS-700 -- the new affordable DAT machine from the makers of the famous RS-DAT 1000.

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# Present Meets Future with 800

## Auditronics Board Features User-Programmable Logic Functions in a Low-Profile Mainframe Desktop Design

by Murray Shields  
Director of Sales  
Auditronics Inc.

**MEMPHIS, Tenn.** Outwardly, the new 800 Series of consoles by Auditronics Inc., appears to be a conventional but highly sophisticated console with a low-profile mainframe designed to be mounted in a desktop. But internally the 800 console design provides numerous advantages to the user.

It has both mono and stereo microphone inputs and mono and stereo line inputs. Any mono input module can be

"B" input source selectors.

The fader control detent also has a variety of logic functions that may be selectively programmed by the user. These include module on/off (with all of the functions described above) via fader up/down, plus fader activate/de-activate

action. Two input sources are available on each input module and each may have different logic control according to its usage.

All push button controls on the 800 console are electronic with LED indicators to show status. All faders control VCAs, permitting precise noise-free stereo balance. All pots on the console are provided with quick disconnect plugs, should replacement be necessary.

The Auditronics 800 Series consoles provide the highest possible reliability without the need for routine maintenance. And the console system specifications equal or exceed those required to be compatible with digital technology and digital audio broadcasting.

Each module in the 800 Series uses sophisticated thick-film hybrid technology mounted on plug-in boards. This superior technology permits more circuitry and features to be designed into a smaller area, with significant savings on replacement parts and labor. In the unlikely event that a problem should occur, it is a simple procedure to unplug the culprit hybrid and replace it with a new one.

### Voice/music bussing

The basic 800 Series console supports four stereo output busses (Program, Audition, Utility and Auxiliary), two monaural mix-minus busses (M1 and M2), and a selectable L+R mono sum output.

Unique to these consoles is an internal "voice/music" bussing structure for both program and audition outputs. This buss structure is provided so that the station may, according to the program content, apply different processing to the "voice" busses and the "music" busses.

A "smart" one- or two-line telephone interface module, utilizing the mix-minus buss, is available as an option. This module, occupying one input po-

(continued on page 75)



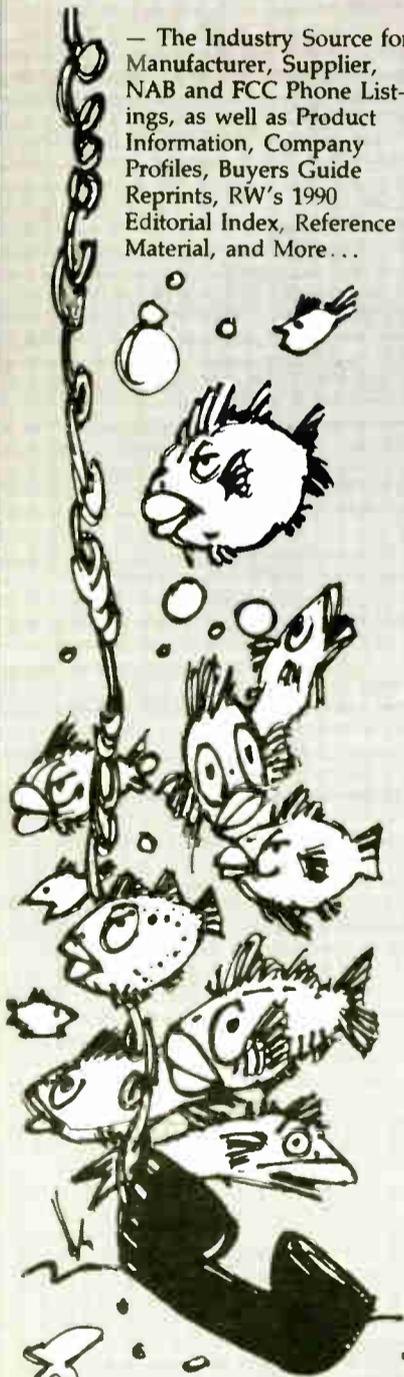
Auditronics has packed the 800 Series of consoles with a multitude of state-of-the-art features

## Fishing For A Phone Number?

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RW 1991 Directory Issue  
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Falls Church, VA 22041

used for mic or line and any stereo input module can be used for mic or line, permitting true stereo microphone inputs. In fact, it can be configured so that the "A" input can be mic and the "B" input can be line, or vice versa.

### User-programmable logic

Within its user-programmable logic control system, each input module contains a host of user-definable logic output functions available by dip-switch selection on the PC board.

The module on/off switch can be selectively programmed to start/stop a machine or external device with pulse or steady-state logic, start/stop the timer, mute/unmute the control room or studio monitors, and turn on/off "ready" indicators. Separate and complete mute logic functions are supplied for both "A" and

of the Cue functions.

All input module logic outputs are solid-state-relay isolated to 450 V, 150 mA.

## TECHNOLOGY UPDATE

There also are a number of logic input selections from external devices for module on/off, module muting and activation of the module "ready" LED indicator. The user also may select input logic leading/trailing edge sensitivity for end of message (EOM) use.

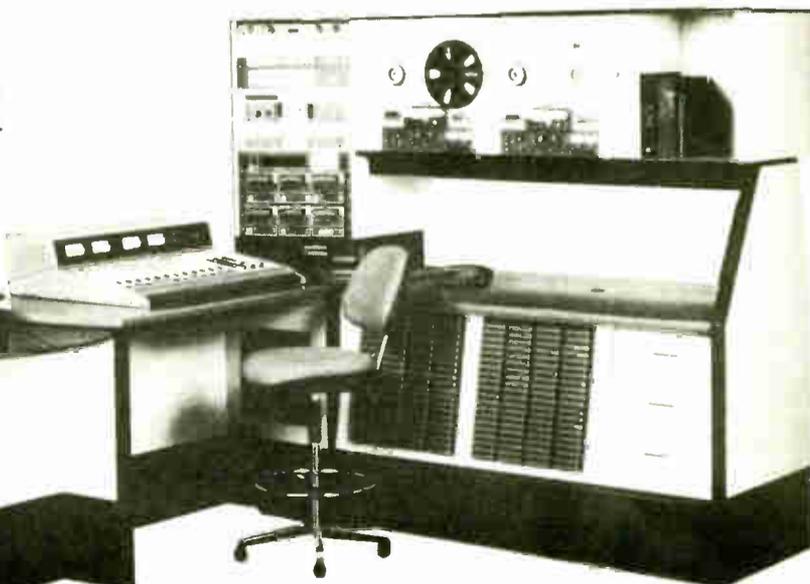
In addition, there also are both a module and system logic disable so that two consoles may share the same external equipment with no interference or inter-



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#417



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# Auditronics 800. Not just a new state-of-the-art.



## A new state of mind.

To really understand the thinking that created the Auditronics 800 series, you'll need more than a new appreciation for the state-of-the-art. You'll need a different state of mind – an open one.

Begin with an ideal: Perfection. Because when Auditronics design engineers began development of the 800, there was only one rule – no shortcuts.

To their credit, they took this opportunity to create an entirely new console whose appearance is more suggestive of high-performance stealth technology than the flight deck of a vintage B-52.

And, the beauty of our new 800 is much more than skin deep. Because beneath its subdued charcoal exterior you'll find uncompromising compo-

nent quality, and superior circuit design that clearly indicates a "no guts, no glory" mentality on the part of our design team.

In short, the Auditronics 800 is designed and built to incorporate the best of everything broadcasters say they need in on-air consoles today, while omitting needless bells and whistles. The results are astonishing – a high-performance console that clearly reflects not only a new state-of-the-art, but a new state of mind.

If this sounds like your idea of the perfect console for your station, we invite you to find out more about the Auditronics 800. Call 901-362-1350 today for complete information.



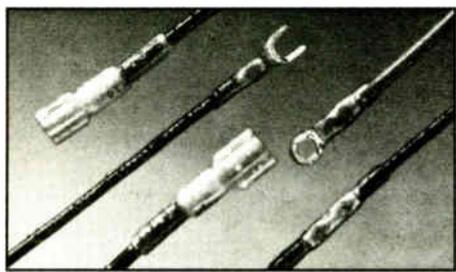
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# MARKETPLACE

Radio World's Marketplace, a compendium of new and recently introduced radio broadcast products, appears monthly in Buyers Guide.



## Panduit Heat Shrink Terminals

Panduit Corp. has added a new line of heat shrink products, which provide an environmentally sealed barrier both air

and watertight. It also provides additional strain relief for improved crimp integrity.

The heat shrink is made from polyolefin with an adhesive sealant liner.

Heat shrink insulation is available on many sizes of insulated terminals, splices and disconnects. Panduit also offers other heat shrink products, including thin and thick walled tubing and end caps.

For information, call the product manager of Panduit Corp. at 800-777-3300; or circle Reader Service 62.



## Roland S-750

Roland's new S-750 16-bit stereo digital sampler includes 24-voice polyphony, 32-part multi-timbral capabilities, 44.1 kHz and 48 kHz sampling rates, seven looping modes, a CRT interface and expandable memory using an optional expansion board and standard Macintosh SIMMs.

The machine includes 2MB of RAM in standard memory, which can be expanded to 18 megabytes with options.

For information, contact the sales department of RolandCorp US at 213-685-5141; or circle Reader Service 47.



## Lavalier Microphones

Sennheiser has added a three-pin XLR termination option to two of its lavalier microphones. The XLR option eliminates the need for the K3U power module.

For information, contact Al Zang at Sennheiser: 203-434-9190; fax: 203-434-1759; or circle Reader Service 147.

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## Best Intros a UPS

Best Power Technology's new no-break Uninterruptable Power System (UPS) uses patented, line-interactive circuitry to deliver no-break power at a price comparable to desktop standby systems. Best is releasing its Fortress in 360, 460 and 660 VA models.

Fortress includes alarm, battery and line status lights, as well as a lighted digital display.

For information, contact the sales department at Best Power Technology at 800-356-5794; fax: 608-565-2929; or circle Reader Service 133.



## Caig ProGold 100

Caig's Cramolin ProGold 100 is formulated to improve conductivity and protect gold and base metal surfaces. Two common problems associated with gold-plated surfaces are that the base metals will migrate through the soft gold surfaces and the gold surfaces are thinly plated and are susceptible to scratching and abrasion.

ProGold 100 is a non-abrasive/non-corrosive formula that conditions gold connectors, enhancing the conductivity characteristics to efficiently transmit electrical signals.

For information, contact Mark Lohkemper at 619-743-7143; fax: 619-743-2460; or circle Reader Service 21.

(continued on page 73)

# LPB: The Industry Workhorse

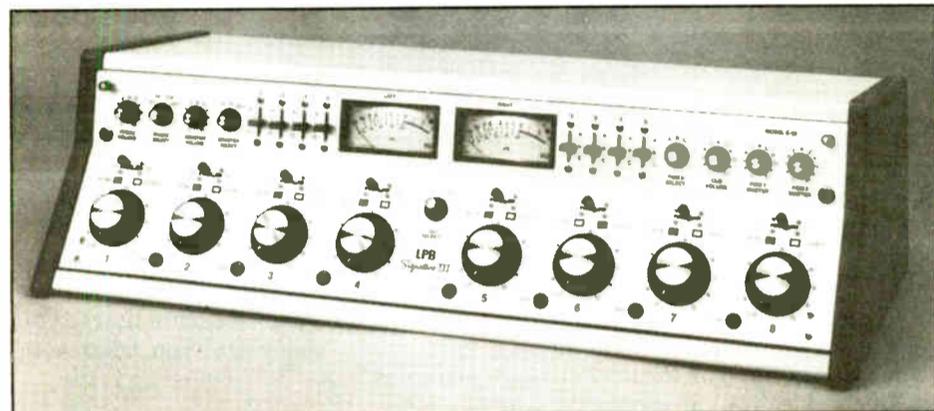
## Signature Series Console Leads the Pack in HGF Media Group, with 11 Separate Installations

by William Lakatas  
Director of Engineering  
HGF Media Group

ALLENTOWN, Pa. There are many advantages to operating several radio sta-

owned and the stations we've bought have all had some LPB consoles. The standardization process has been that much easier for me.

We currently have 21 consoles in the group. Thirteen of those are LPB con-



The Signature III is among 13 LPB consoles owned by HGF Media Group.

tions, including the ability to standardize on certain pieces of equipment.

This standardization helps keep your spare parts inventory to a minimum and enables your maintenance engineers to become thoroughly familiar with the equipment—fewer hassles, quick repairs and lower costs.

soles, with 11 of them being Signature II or Signature III Series consoles. I am very happy with them.

The LPB Signature Series of consoles has to be the industry "workhorse." These consoles can take all of the abuse, misuse and daily wear and tear that can be imagined—and they still continue to function.

My LPBs are used for both on-air and production. They are as versatile and as easy to use as any console I've ever seen. They are easier to maintain than anything I've worked on and they sound good on the air.

The LPB Signature Series of consoles comes in either mono or stereo configurations with up to 12 faders. There are three inputs per fader. The output buss consists of an "on-air" buss (Program 1) and three Program 2 outputs. Additional outputs are provided for feeding tape

recorders and for feeding a mono source (mono sum options on stereo consoles).

Also, LPB has introduced in the past year a mix-minus kit for its Signature Series. This Mix-Minus kit allows you to interface the board with any broadcast-quality telephone equipment such as Gentner, Symetrix or Hnat-Hindes. You can finally do away with that "speakerphone" in the control room and allow your air talent to carry on a phone conversation by using his studio mic and his headphones. The mix-minus adaptor works excellently.

LPB has an excellent reputation for

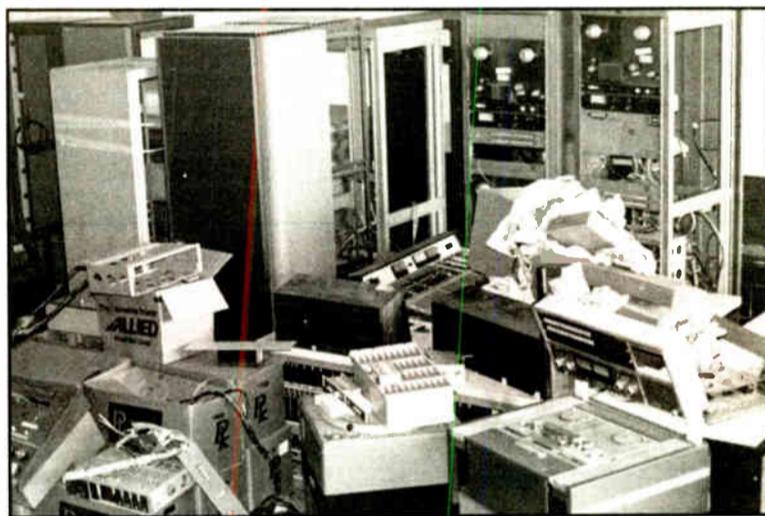
high quality, low cost products. Not only is the initial cost well within almost anyone's budget, but the cost of maintaining the equipment is about as inexpensive as I can imagine. (I've had more headaches during this past year with the other brands of consoles in our group than I've had with all of the LPB equipment we've owned over the past four years.)

Here in Allentown, we're home to Mack Trucks. Their slogan is "Built Like a Mack." Perhaps the phrase "Built Like an LPB" should become part of every broadcaster's vocabulary.

For information on the LPB Signature Series, contact Ed Devecka at 215-644-1123; fax: 215-644-8651; or circle Reader Service 111.



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- ➔ Several Revox cassette machines.

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## USER REPORT

Of course, when you purchase a radio station, you don't have control over which equipment you "inherit"—you deal as best you can with the equipment that comes with the license.

I have been fortunate in that the vast majority of consoles in our group have been LPB products. The stations we



...because you can't always trust your ears.

The Sentinel is a Station Monitor Receiver with all-mode reception: NRSC AM/AM-Stereo, FM/FMX™-Stereo and SCA. But what's more important, The Sentinel has built-in diagnostics that measure and display 12 separate parameters of the program audio signal.

With 24 station presets and well-defined readouts, even non-technical personnel can instantly compare their audio with anyone else on the dial for Peak Modulation, Relative Loudness, Dynamic Range, Spectral Profile and Stereo Image.

The Sentinel: see what your ears have been missing!

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# Arrakis Series 12,000 Worth the Wait at WQBZ

## System Twelve Anchors On-Air and Production

by George Mimbs  
CE, WIKS-FM

**NEW BERN, N.C.** Few engineers get the chance to build an entire radio station from the ground up. I was fortunate enough to be given that opportunity when our group owner purchased WQBZ-FM in Fort Valley, Ga., last May.

Q-106 had an upgrade from Class A to Class C2 pending, so I was told to "put it all together." Since I had the opportunity to do things right, I chose the Arrakis Systems Series 12,000 audio consoles for both Master Control and Production A.

When I first looked at the 12,000's price, I figured it had to be a misprint. Compared to others, the 12,000 is a lot of console for not a lot of money. The 12,000 Series comes in mainframe sizes of eight, 18 and 28 channels, with a full range of options from "bare" to "bells and whistles."

I chose the "System Twelve," which is an 18-channel mainframe that comes stocked with 12 input modules. We decided to fill 'er up and ordered the additional modules to fully load the main-

frame.

Rod Graham and the crew at Arrakis must have stumbled over our consoles and Modulux furniture crates a thousand times, while we built the transmitter site and tried to find a studio site in Macon from which we could make the STL hop. It took us almost a year from initial order placement to giving Rod the go-ahead to ship.

I had both 12,000 consoles configured identically for the benefit of operator familiarization and redundancy. The only basic difference in Master Control and Production A is that Master Con-

## USER REPORT

trol's furniture package included a four-bay equipment overbridge to hold the STL, TRL, main and auxiliary processing chains and other items.

### Getting to work

The consoles and furniture arrived in perfect condition and the Modulux furniture went together smoothly and with no problems at all. I put two complete studio furniture groupings together by myself in just three days, and it looked



WQBZ's production room is enriched by the Arrakis Series 12,000 console.

great, even without any equipment mounted in it. We then rolled up our sleeves and started the console installation.

The 12,000 is a breeze to wire, with all input and output connections made with Molex connectors. The pin-outs for every input position on the motherboard are identical, so you can change the console configuration by moving modules around.

We chose the basic microphone module, but Arrakis offers several other types of mic modules that include pan pots, mode switching and other goodies. All line input positions were filled with their basic stereo line input module, but here again they offer other modules with different features.

The 12,000 has no shield connections on the Molex connectors, so it's almost impossible to create a ground loop during installation. The manual is straightforward and had no "printing errors" that sometimes creep in—you know, the typos that cause you to call the factory and they tell you: "Oh, that's a misprint, do it this way . . ."

Any questions I did have were answered quickly and clearly by the support people at Arrakis. Rod Graham and company even managed to create a piece of woodwork for me literally overnight

that was required by WQBZ management's decision to change the location of the overbridge in Master Control.

I feel that the degree of Arrakis' factory support alone was worth the price of the console, since a lot of times "you pays your money and you takes your chances."

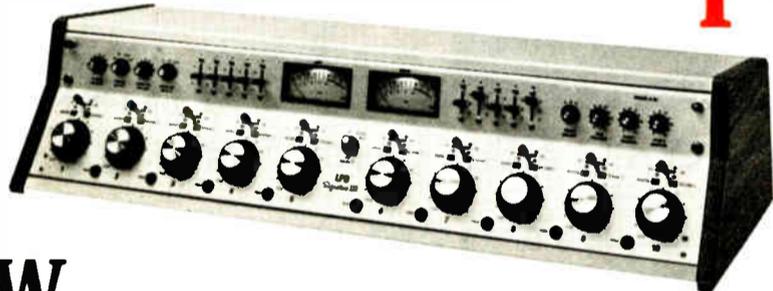
### Monitor dim

One neat feature on the 12,000 is the "monitor dim." If a source is placed in cue, the monitor speaker volume drops by an internally adjustable amount and the source in cue is heard at normal volume through the speakers. I figured this would confuse the jocks totally, but when they began using the console, they loved it. Of course, if you want to, you could hang an amp and external speaker across the cue output for conventional cueing.

The console is built very well, with Penny & Giles slide faders, ITT/Schadow switches, a hefty power supply and substantial sheet metal. Audio quality is superb. Once we were on the air from the new facility, WQBZ's air staff kept coming up to me and saying, "I'm hearing parts of this music I didn't know were there." Listener reaction also was great, with people calling the station and com-

(continued on page 75)

It's hard to stop.  
It's hard to stop.  
**It's hard to stop.**



**W**hat is it about the Signature III that keeps so many leading station groups and consulting engineers coming back for another, and another, and...? Is it this console's unparalleled record of reliability and longevity? The LPB Signature III's easily maintained modular electronics? Its excellent RFI immunity? Or is it designed-for-radio features like the following:

- 3 inputs per channel
- Identical Program 1 and Program 2 output busses
- Remote starts on all channels (except channel 1)
- Mono/stereo input switch (on stereo consoles)
- Components and connections clearly labeled for painless installation and easy maintenance

Chances are, it's all of the above. But whatever the reasons, leading stations and engineers across the country demand Signature III's "unstoppable" performance. In fact, they've made it one of the most popular consoles ever built. If you've been spending too much time inside your console lately, contact your broadcast equipment dealer or call LPB for full information and specifications at (215) 644-1123.

LPB Signature III audio consoles are available in 6,8,10 and 12 channel stereo and 6,8 and 10 channel mono configurations.

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# MARKETPLACE

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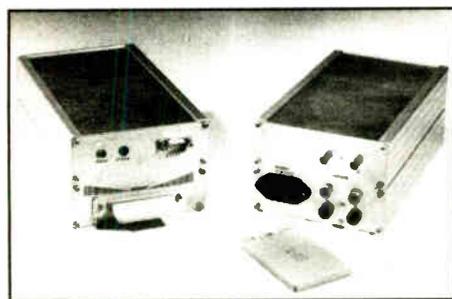


## Acoustic Pressure Equalizer

The acoustic pressure equalizer (APE) from Bruel & Kjaer is an attachment for the Bruel & Kjaer omnidirectional Series 4000 microphones (types 4006 and 4003).

The attachment is a passive acoustic processor. The APE uses diffraction to modify the sound field near the microphone diaphragm to change the frequency and polar response of the sound field.

For information, contact Morten Stove at Bruel & Kjaer: 508-481-7000; fax: 508-485-0519; or circle **Reader Service 22**.



## Noise Removal System

Sonic Solutions has announced "de-clicking and de-crackling" options for the NoNOISE system. NoNOISE is a digital signal processing-based system for noise removal.

The updated version of NoNOISE includes an algorithm to eliminate both clicks and pops. It also can record scratch or "crackle" in a single pass in real time.

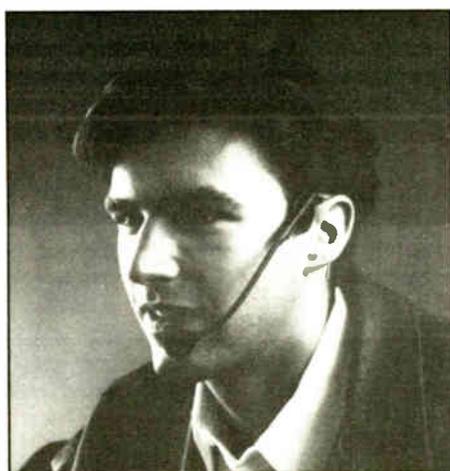
For information, contact Carmen David at Sonic Solutions: 415-394-8100; fax: 415-394-8099; or circle **Reader Service 19**.

## Alpha Recorder

The Graduate 2001 recorder from Alpha Products is a remote recorder with remote and programmable data collection systems. The Graduate is a four-channel analog input recorder that can be modified to accommodate 20 programmable TTL level input/output ports.

Data is stored on a 512 kilobit solid state memory card. Information can be maintained for easy access via PC, Option IBM card reader, modem, mini or mainframe computers with optional software packages using the RS-232 port.

For information, contact Kevin Tschudi at Alpha Products: 203-259-7713; fax: 203-254-0619; or circle **Reader Service 136**.



## Cardioid Condenser Headset Mic

The Audio-Technica ATM71 miniature cardioid condenser headset microphone can be powered by an external 5 V to 52 V DC phantom power supply, or by AA/UM3 1.5 V battery, supplied with the headset.

The microphone is attached to the end of a 3 3/4-inch flexible, adjustable gooseneck. The gooseneck is covered with a moisture-proof tubing to prevent damage. A foam windscreen is provided to reduce noise and popping.

For information, contact Ken Reichel at Audio-Technica U.S.: 216-686-2600; fax: 216-688-3752; or circle **Reader Service 80**.

## Connectors Catalog

Tru-Connector Corp. is offering a catalog featuring a broad line of RF coaxial connectors, waveguides and related components, including UG part numbers.

The Tru-Connector RF Coaxial Connectors Catalog D features pulse series ceramic, BNC, C, SM, N, HN, LC, LN, small twin series weatherproof, high-voltage miniature, QDS and QDL, BN and UHF connectors.

For information, contact Scott O'Neil at Tru-Connector Corp.: 508-532-0775; fax: 508-531-6993; or circle **Reader Service 65**.



## Stereo Signal Processor

The Roland RSP-550 stereo signal processor is an effects processor that provides stereo processing capabilities as well as reverb, multitap delay, enhancer, equalization, flanging and phasing. Multiband pitch shifting, rotating speaker effects and a vocoder also are included.

The RSP-550 has a dynamic range of 95 dB, frequency response of 10 Hz to 21 kHz and a THD of 0.02 or less. All signal processing is conducted at a sampling rate of 48 kHz with independent 16-bit A/D and D/A converters for each channel.

For information, contact Chris Gill at Roland Corp. U.S.: 213-685-5141; fax: 213-722-0911; or circle **Reader Service 152**.



## Audio Test and Service System

The Neutrik A1 audio test and service system contains a sweepable generator, analyzer and oscilloscope to measure level, wow and flutter, noise, crosstalk, frequency and THD+N.

Single measurements or graphic sweeps can be read on the LCD or printed on any standard dot matrix printer. The instrument has automatic ranging, tuning, nulling, scaling and calibrating functions.

For information, contact Ken Smalley at Neutrik: 908-901-9488; fax: 908-901-9608; or circle **Reader Service 132**.

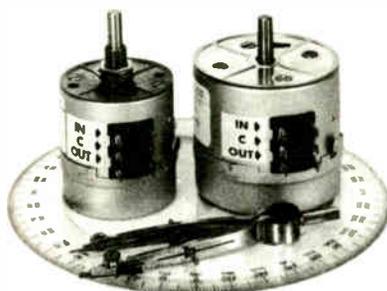
## Smarts Digital Audio Products

Smarts Broadcast Systems has introduced a 10 kHz digital audio automation unit for AM broadcasters that features more than two hours recording time.

The company's Smartcaster also has new software enhancements to allow for the virtual total automation of a radio station. Units may now be programmed to allow for automatic recording of network feeds; automatic playback at a later time; automatic correction of missed satellite breaks; and more.

For information, contact John Schad at Smarts Broadcast Systems: 712-852-4047; fax: 712-852-3061; or circle **Reader Service 73**.

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For details on the Motorola C-QUAM Stereo system, call Don Wilson collect at 708/576-0554. Fax 708/576-5479.

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**With Modulation Assurance, you'll never pay a fine for overmodulation.**

We've said all along that ModMinder's digital technology produces the most accurate, stable and reliable measurements of peak modulation. Now we're putting it writing: **If you faithfully follow the Modulation Assurance program and still run afoul of an overzealous FCC Field Inspector, we assume full responsibility for your defense and, if necessary, pay any penalties.**

This unique program lets you cross overmodulation off your list of things to worry about—forever. And it costs you nothing when you register your purchase of a ModMinder™ with the internal DeMod Board or have your existing unit retro-fitted at the factory.

Now, you do have certain obligations: to install your ModMinder at the transmitter site, to connect it to your transmitter room telephone with an inexpensive modem, and to adjust your air chain so that peak modulation does not exceed legal limits. (The modem lets you check modulation levels from any modem-equipped PC using ModMinder Remote software.)

Of course nothing can release you from the responsibilities that come with your FCC License. But we do promise you that with Modulation Assurance, you'll never pay a fine for overmodulation.

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No one else makes this offer. Because nothing else can match ModMinder's total system accuracy ( $\pm 1\%$ , two to five times better than conventional monitors whose accuracy is widely acclaimed).

Nothing else can match ModMinder's stability (readings are fully accurate from 32° to 114° F). Nor can anything else match the DeMod Board's reliability.

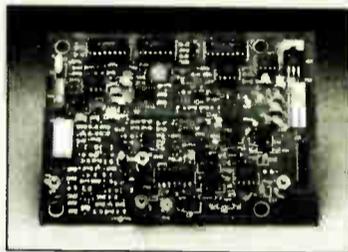
DeMod requires no user calibration, and it's the only modulation measurement device whose calibration can be traced to a reference maintained by the National Institute of Standards and Technology (formerly the NBS), a Federal agency.

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Circle 120 On Reader Service Card

World Radio History

# Auditronics 800 Series Offers Peek at Future

(continued from page 68)

sition, has individual caller level controls, individual caller cue selections, individual caller on/off switches, cross-feed assignment for caller-to-caller conversation, assignment to Program, Audition or Utility busses, and a VCA fader for overall level control. It also includes

a direct output for pre-recording conversations.

Two output master modules are provided as standard equipment in each 800 Series console. One contains the audition and the two mono output amplifiers, plus the stereo auxiliary return input and assignment of the return to any of the master output busses.

The other output master module contains the program and utility output amplifiers, the stereo auxiliary send master, and the L+R mono selector matrix. These modules are designed for screwdriver output level adjustment but may be optionally equipped with linear faders.

Each 800 console is equipped with a control room monitor selector module as standard equipment. A communications/studio monitor module is optional.

### Control room monitor

The control room monitor contains the cue master level control, selection of nine sources to monitor (all outputs plus an air feed and a user-defined spare) with an LED indicator for each, a mute LED, a dim LED, a speaker "on" switch with an LED and the level control potentiometer, which controls a VCA providing longer life for this control. Retained in the 800 is the popular headphone equalizer, which permits the operator to equalize the headset output to personal tastes without interacting with the on-air signal.

The communications/studio monitor module will provide monitoring and communications facilities for two individual studios simultaneously. This optional module also contains the talkback assign, press-to-talk and level control to each studio. Individual speaker muting is provided from the input module logic systems.

A further option for these consoles is the eight- or 16-position two-way intercom modules providing two-way communication between the console and such diverse places as the newsroom, traffic, continuity, etc. Companion remote intercom positions, desktop, wall-mount and rack-mount are optionally available.

# WQBZ Taps Arrakis

(continued from page 72)

plimenting the audio quality.

There's also a meter select switch for the third set of meters on the 12,000. In the normal position, these meters are across the "utility" stereo output buss, but the other switch position follows the monitor select push buttons.

If you're using both external monitor inputs, you have the capability of metering "program" and "air" simultaneously on the console, or watching how loud the other guys are compared to you. I ran the output of the TFT 844A modulation monitor into Ext. 1 and an AM/FM stereo tuner into Ext. 2 to provide maximum flexibility for the operators and program director to monitor the competition.

All modules on the 12,000 have a complete range of logic functions, including remote on/off (say, from a newsbooth), pre-fader patch points, direct module outputs, talkback assign to two separate busses, mix-minus assign to two separate busses, gain trims and almost everything else you can think of.

Add to this the Program, Audition and Utility stereo outputs, with each module assignable to one or all outputs, and the fact that Arrakis still believes in real relay closures for machine remote start, plus a muting system that can handle three different studios.

As you can see, the Arrakis Series 12,000 is a lot of console for the money.

■ ■ ■

For information on the Arrakis 12,000 Series, contact Rod Graham at 303-224-2248; fax: 303-493-1076; or circle Reader Service 107.

**Business . . .** Radio Systems was named Manufacturer of the Year by the Maryland/District of Columbia/Delaware Broadcasters Association. The award salutes the company for its "professional excellence and contribution to the continuing growth of the broadcast industry."

In response to increased international business, Harris Corp. has reorganized its manufacturing and customer service departments. A number of personnel were named to expanded and newly created positions, following sales increases of 25 percent during each of the past three years. For more information, contact Harris at 217-222-8200.

**People . . .** Miles Thomas was promoted to director of audio services for the Los Angeles office of IDB Communications Group. Jill Jameson

joined the company's New York office as audio sales manager; and Joel Evan Quirt was promoted to audio control manager in Los Angeles.

Jeff Berry was appointed customer service supervisor for Audio Animation. He previously was the company's lead test technician.

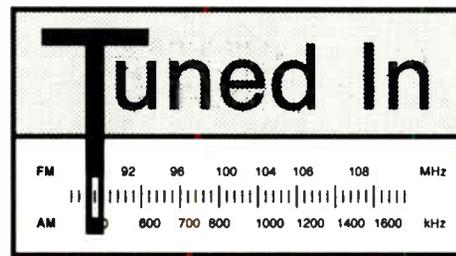
NWL Capacitors has hired Robert

Kropiewnicki as a design engineer; Bill Wisniewski as a manufacturing engineer; and Charles Cox as a sales and design engineer.

Howard

Kirsch has been appointed district sales representative at JVC Professional Products Co. His territories will include Northern California, Oregon, Washington, Alaska, Montana, Idaho and northern Nevada. Kirsch formerly was with Midwest Communications.

Lexicon has appointed Tony Balboa sales representative for the Southern California region.



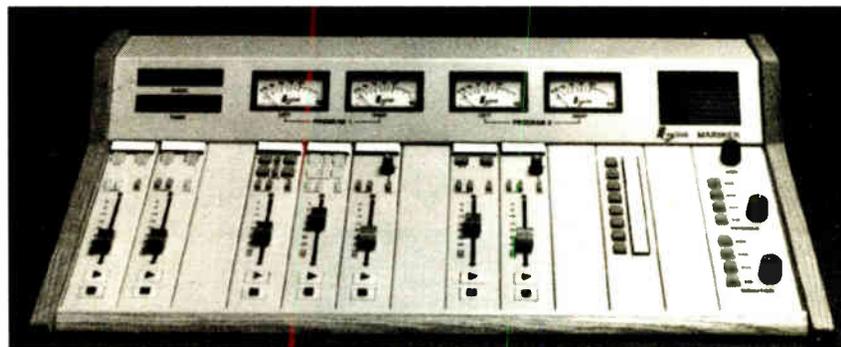
Accessory modules, some new and some similar to those found in other Auditronics consoles, are available. These accessory modules may be mounted in the right and left hand optional module positions of the console, or they may be mounted externally to the console for guest/announce control.

The new 800 Series consoles are available in three mainframe sizes of 12, 18 and 24 inputs.

■ ■ ■

For information on Auditronics consoles, contact Murray Shields at Auditronics: 901-362-1350; fax: 901-365-8629; or circle Reader Service 117.

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Circle 37 On Reader Service Card

Circle 51 On Reader Service Card

# Mariner Sails Through Tests

by Tag Borland  
President, Logitek

**HOUSTON** The Mariner console series was introduced at the NAB show in Las Vegas this year as a ground-up redesign of Logitek's popular Perfectionist on-air consoles.

Our two goals were to reduce initial cost while retaining durability and audio quality, and to reduce long-term cost by making the console resistant to wear and abuse while keeping it simple to use and to service.

With this in mind, we have used water-

proof switches and pots, along with a special enclosure designed to keep dust, dirt and even liquids away from sensitive areas. In fact, the Logitek Mariner will continue to operate even while soda is being poured over its mixers.

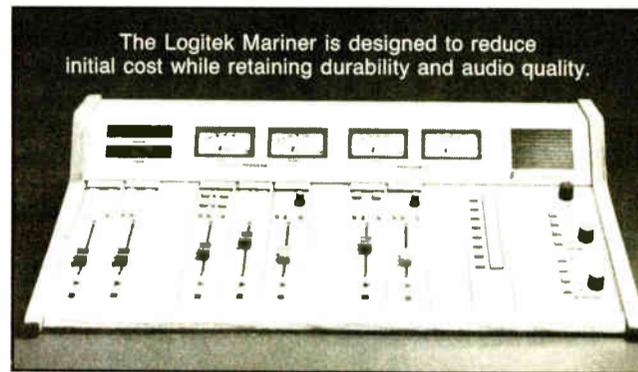
Key switches, return springs and sealing bezels for each module are molded out of translucent rubber in a single sheet and will survive 10 million operations. LED backlighting provides even, long-life illumination and, when mounted, the rubber gaskets form a water-tight seal around each switch.

All the switches are momentary action

with electronic latches. The actual audio is switched either by sealed, nitrogen-filled relays or speed-controlled FET T-switches. Long-term reliability is significantly increased because audio is not routed through mechanical switch contacts.

The Mariner also features new wiperless linear fader technology. Our new resistive element is composed of a pressure sensitive ink over a column of thin sensing fingers sealed between two sheets of tough plastic. The fader knob is connected to a small, low friction roller that runs up and down the element surface, changing the resistance of the section it presses against. This sealing scheme, plus the use of heavy duty main bearings, will provide years of maintenance free service.

frame sizes that hold six, 12 or 22 input mixer modules. These mixers are available in three different types. One has a single stereo line input with a six-button, LED-lighted, machine control interface. Another has two line inputs with start and stop pulse machine control. The last has a single microphone input with phantom power supply and a balance control. Optional features include g-input preselector panels and a



The Logitek Mariner is designed to reduce initial cost while retaining durability and audio quality.

clock/timer module.

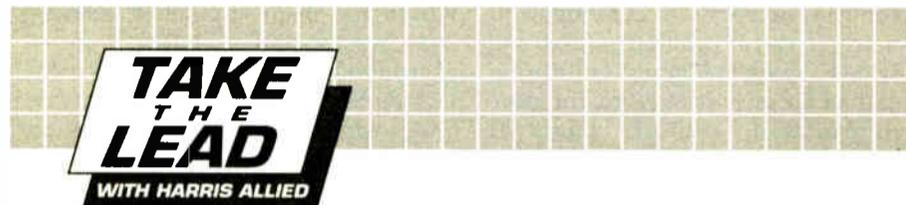
For flexibility, the Mariner has five mixing busses. Two stereo busses feed the main output channels. Two auxiliary mono busses are for mix-minus or IFB use. And the mono cue buss feeds a built-in amplifier and speaker.

The Mariner is fully modular. The plug-in mixers can be removed with the board still in operation for uninterrupted service. All audio connections are made using ADC's QCP connector posts. And the slim desktop cabinet is easy to position and install.

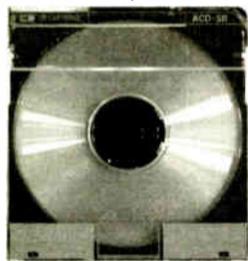
The new technology used in the Mariner, along with tight control of the assembly process, has allowed us to make a board with greatly increased reliability for only two-thirds the cost of our previous consoles.

■ ■ ■

For information on Logitek products, contact Tag Borland at 800-231-5870; fax: 713-782-7597; or circle Reader Service 24.



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## TECHNOLOGY UPDATE

Several new circuit features also are included in the Mariner. The electronically balanced inputs have an adjustment-free CMRR of 100 dB and 40 kilohm impedance. Special quiet VCA amps maintain low THD to within 1 dB of clipping and left to right tracking to within .25 dB. Opto-isolated machine control outputs reduce noise interference, while 60 ohm voltage drive audio outputs provide low loss drive of long cable runs. An optional backup power supply extends primary supply life while adding reliability.

The Mariner is available in three main-

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See Us At Radio '91 Booth 420

# Ramko: Affordable Durability

by Todd Noordyk  
Manager, WSHN

**FREMONT, Mich.** Our company was destined to grow. WSHN, after all, is based in Fremont, Mich.—the world's baby food capital, home of Gerber products.

## USER REPORT

My dad, younger brother and I operate a 24-hour AM/FM combo 45 miles north of Grand Rapids in Fremont. We also own a small AM in Grand Rapids, Mich.

Recently, WSHN acquired a full-time AM in the Upper Peninsula town of Manistique. The recent acquisition included a \$100,000 CP for an FM. This will be our fifth nightmare . . . uh, I mean station.

As WSHN expanded, we realized the wisdom in buying identical equipment—parts could be swapped.

We looked at several board manufacturers. Ramko Research seemed to fit our bill. The price was dirt cheap.

The new Ramko board is sleek in design. Ramko uses good fader pots of conductive plastic. The pots operate smoothly and are guaranteed not to wear out, lose contact or have "channel drop" when turning.

Ramko's channels are activated with a

micro-switch. A red light pops on when the channel is alive. With a quick glance, it's clear which channels are active.

Inside, the board is solid state and modular. Boards pop out easily. Several chips are socketed. Ramko also sent along a spare parts kit. You don't need to be a rocket scientist to service the board. It's surprising that the board has not had lightning problems, even though a recent storm just took out our remote system. The board seemed to handle it fine.

Ramko's manual is only a couple pages long—that's all they need. Ramko had the idea of including the instructions inside the board, complete with wiring diagrams and the circuit. How nice. How many times have you looked for a manual in the engineering file? Ramko gives it to you when you open the board.

When mounting a console, it's important to consider your viewing level. For example, In one of our production rooms,

**Overall, for the low price, we leaped into 1991 with a state-of-the-art, fully solid state, clean, durable piece of gear.**

the board is at desk level for seated use. It's easy to see the LED metering. However, at the other production room up



When you call Ramko for its consoles, say hello to Frank.

north, the board is at standing level. It's hard to see the metering.

Also, ask Ramko for the small wire nuts that fit their terminals. They were

solid state, clean, durable piece of gear. Plus, I can interchange them throughout our stations.

I like Frank at Ramko. He's a straight shooter, honest and easy to deal with. The company has always been helpful. On two occasions, they immediately answered the 800 support line. I'd recommend the new 1991 model Ramko boards for any on-air or production applications.

For information on Ramko Research consoles, call Mike Pardee, national sales coordinator (or ask for Frank) at 916-635-3600; fax: 916-635-0907; or circle Reader Service 141.

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D+R USA's Aircom is touted to be "DJ-proof."

## D&R Aircom Console A DJ-Proof Radio Tool

by Paul Westbrook  
President, D&R USA

**MONTGOMERY, Texas** Designed and manufactured in Holland by D&R, a company heavily involved in advanced console design, the Aircom is an on-air

### TECHNOLOGY UPDATE

broadcast console designed with the latest in technology, electronics and assembly techniques.

The totally modular welded steel chassis houses the state-of-the-art electronics, resulting in a low noise and "DJ-proof" reliable radio tool.

The Aircom features easy-to-use controls and switches, with all the needed functions of the live talk show or regular stereo on-air broadcast of the 1990s. The D&R design team talked with radio engineers and announcers from all over the world, so only the needed functions were incorporated into the design.

The microphone module has a "restricted range" three-band equalizer to avoid over-equalizing the signal. Completing the heavy duty module are two aux sends and two clean feeds (for telephone hybrids), cue switching, on/off switching and a wide range mic gain control. A long throw 100 mm fader with pulse/continuous opto-coupler contacts enables external equipment to be started or stopped by moving the fader.

The input and output connectors are mounted directly on the printed circuit

boards under the movable meter bridge, which allows for easy installation. All mic inputs are electronically balanced.

The stereo line module has two switchable sets of stereo inputs to allow for easy selection of any stereo devices, such as turntable preamps, CD players, tape cartridges or reel-to-reel machines. The three-band stereo equalizer has restricted ranges to avoid over-equalizing. Center dented pots identify the "flat" position.

The master section incorporates all functions for the announcer-driven or engineer-driven broadcast. Metering is analog "VU" or high resolution LED bar meters. The meter hood houses the mounting for several signal processors such as telephone hybrids, stereo com-

**The Aircom features all the functions of the live talk show or regular stereo on-air broadcast of the 1990s.**

pressors, limiters, etc.

The 16-input frame will allow you to start off with fewer input modules and add as your budget or need arises. Factory direct price is \$4,784 for the downloaded 16 frame with two microphone modules, four stereo line modules and 10 blank modules.

For information, contact Paul Westbrook at D&R USA: 409-588-3411; fax: 409-588-3299; or circle Reader Service 69.

## BUYERS BRIEFS

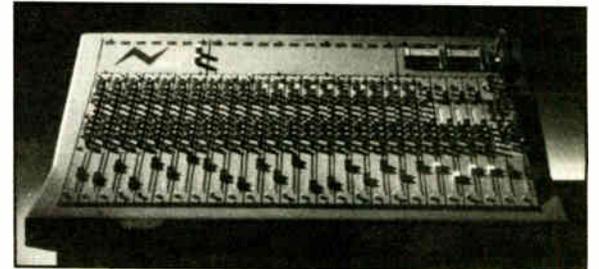
Innovations in Consoles

**HERTFORDSHIRE, England** Neve Electronics International Ltd., has launched the Neve 44 Series console, a low-cost compact unit suitable for both stereo and mono applications.

The console features separate mic and line inputs on the mono module and a line level input on the stereo module; a selectable three-frequency high pass filter followed by a three-band equalizer with sweepable mid-band; a pan or balance control preceding the routing selection to the eight busses; and gold-plated switches and connectors for all signal circuits.

Also included is a fader start output for each line level and a single mic live output if any microphone is on.

For information on the Neve 44, call Hazel Simpson at Neve Electronics: +44 (0)763-260776; fax: +44 (0)763-261886; or circle Reader Service 4.

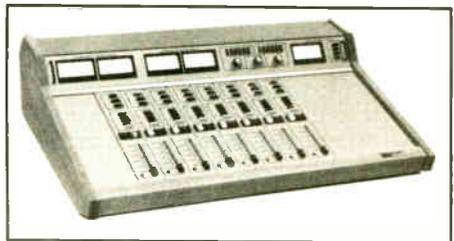


**ACTON, Mass.** The Comrex STLX Sports console is a compact, rugged four-channel remote mixer that incorporates the Comrex two-line frequency extender and transmits high-quality 5 kHz audio over two standard dial-up phone lines.

The STLX Sports console also incorporates the Comrex five-band noise reduction system, which significantly improves the signal-to-noise ratio of telephone lines.

The completely self-contained remote broadcast system provides for three telephone lines—two for program and one for communications—with a built-in telephone interface. It also provides for four microphones (two mics per line) and four headphone feeds.

For information, contact Lynn Distler, at Comrex: 800-237-1776; fax: 508-635-0401; or circle Reader Service 122.

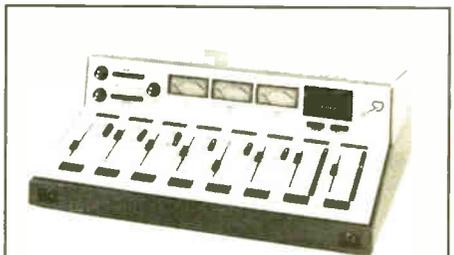


**MOORESTOWN, N.J.** The current line of consoles available from Broadcast Audio, a division of Fidelipac Corp., range from six mixers to 24 mixers. Consoles range in price from \$3,650 to \$15,400.

Double-sided ground plan motherboards assure minimum noise and crosstalk as well as superior RFI immunity. Premium Penny & Giles faders are standard. VCAs are not used. Ribbon cables are not used for audio signal paths.

All mixer modules can be interchanged freely because console logic is not programmed on the module; each module is switchable between mic and line levels.

For information, contact Scott Martin at Fidelipac: 609-235-3900; fax: 609-235-7779; or circle Reader Service 40.



**PLANO, Texas** The Autogram Corp. Pacemaker 828 features eight pots and 28 stereo inputs with plug-in connectors. Aluminum construction with engraved front panels is standard.

Each input, including remote lines and external monitor inputs, has gain range pads, switchable termination and adjustable level control.

All audio and control connections are made using miniature screw-type connectors that plug into the associated circuit board.

For information on the Pacemaker 828, contact Ernest Ankele at Autogram at 214-424-8585; or circle Reader Service 55.

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Naturally, with all of our experience at building and interfacing consoles, we've worked out the details: like convenient hinged down punchblock panels for easy installation and maintenance, really generous cable pathways between enclosures, and equipment turrets with both back and side door access. Our rackmount base cabinets have mount-

ing rails on both sides, so equipment can be mounted any way desired or even switched at a later date. Concealment doors can be placed on cabinets intended for future electronic installation. Continuous length floor risers assure even cabinet-to-cabinet alignment. We've even included heavy duty ground bonding terminals.

This furniture family is complete, with both stand-up and sit-down versions, angled equipment turrets in two heights (with or without risers), concealed, fully isolated turntable cabinets, auxiliary wallmount equipment cabinets, wall and cabinet mount cart and CD storage, utility and file cabinet pull-out drawers, reel-to-reel tape deck mounts, interview counters—practically anything you can imagine. With this much variety, Wheatstone's rock solid construction and major market look, there really is no comparison.

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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*