

## Florida Broadcasters Withstand Hurricane

by John Gatski

**MIAMI, Fla.** Amid billions of dollars in destruction caused by Hurricane Andrew last month, most radio stations survived the storm with minimal damage and off-air time.

Three radio stations that had their transmitters and antennas at a TV tower site, however, were not as fortunate. The antennas of WMCU-FM, WXDJ-FM and WRTO-FM were on the CBS-owned WCIX-TV tower, which was toppled by the storm.

Two days after the Aug. 24 hurricane moved through south Florida, WXDJ contract engineer Jim Leifer said it would take several weeks to get the station back on the air even at a reduced power, and possibly

months to get back to normal power.

He said equipment could be obtained to get the station on the air, but finding an alternative site is a problem because of the tight protection ratios in the Miami area. The destroyed tower was located just south of Miami, in Homestead, an area devastated by the hurricane.

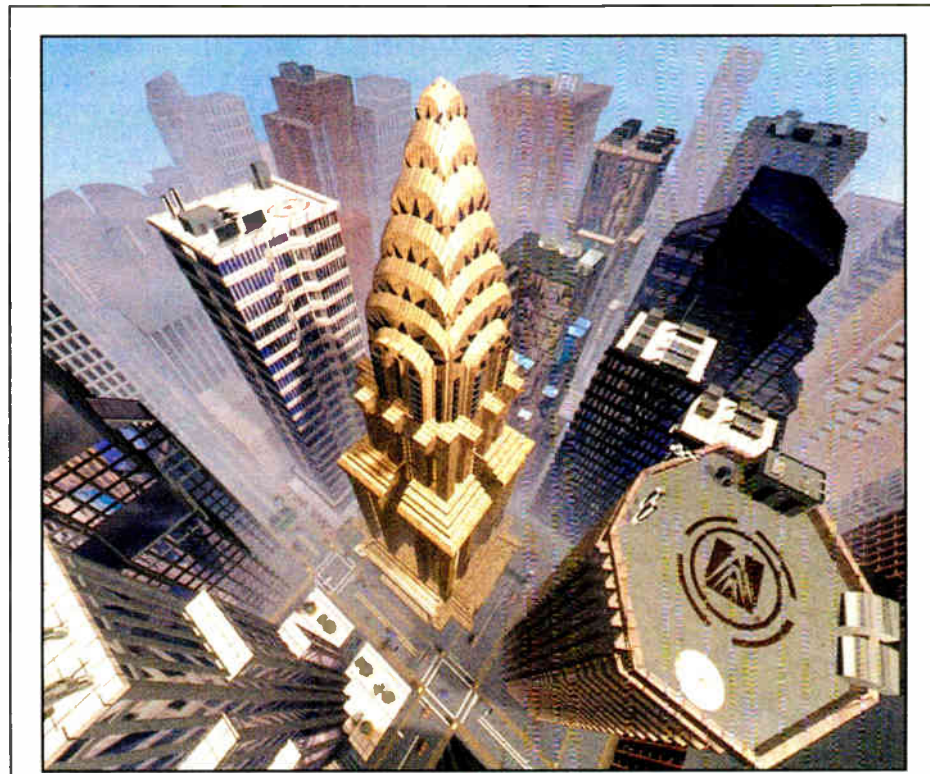
"It was the only site for that Class C for the city of license over at Homestead. There is just no other place to go. Right now we are looking for any place we can get something going," Leifer said.

Leifer also is chief engineer for Gannett-owned WINZ-AM and WZTA-FM. He said those stations stayed on the air for all but a few minutes of the quickly-passing storm. Little structural damage was found because the studio building is a concrete structure built to withstand a category 5 hurricane (the most severe).

"We fared very well. We lost a bunch of trees, a light pole out front. But all our equipment...stayed wonderful. We have seven AM towers and they all survived," Leifer said.

WINZ and WZRA were still on generator power for the first few days after the storm, according to Leifer.

The station, like many others on the Flori-



**Towering Accomplishment:** The design phase for a new FM combiner serving 11 New York City stations is nearly complete. For details, see pp. 7-8.

Graphic by Gene Badio

## Project Acorn Tested On-Air

by Alex Zavistovich

**WASHINGTON** USA Digital Radio won a race against time to have its Project Acorn in-band, on-channel digital audio broadcasting (DAB) system tested over the air before the NAB Radio Show in New Orleans.

In late August, a scant two weeks before the convention, USA Digital received authorization from the FCC to construct and operate a 10 kW experimental digital AM station in Cincinnati, Ohio at 1660 kHz in the expanded band.

A day later, the FCC granted the partnership authorization to construct a 6 kW experimental FM station in Urbana, Ill. at 93.5 MHz. Authorization also was granted to have WILL-FM, licensed to the University of Illinois and operating at 90.9 MHz, simulcast a digital signal 30 dB to 35 dB below its analog signal, to test Project Acorn's FM signal extraction system from an over-the-air source.

Additional details of the FM tests were not available. Ed West, CE for WILL-FM, told **RW** he was legally constrained from providing any information on the testing. He did indicate, however, that his station's 1 millivolt per meter (1 mV/m) service contour

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da coast, had a hurricane plan of action. "We have a full disaster plan already worked out ahead of time," Leifer said.

He said there was one tense moment when he had to go outside during the full assault of the hurricane. "It was raining so hard that the water was going left to right and actually

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## WMTX Hypes Unique Niche: Quality Audio

**CLEARWATER, Fla.** In these days of cut-throat obsession with loudness and dial dominance, it's rare to hear of a station promoting audio quality. But at WMTX-FM, program director Mason Dixon is doing just that.

The processing box that has prompted this unusual promotional strategy is the Unity 2000 from Cutting Edge Technologies of Cleveland, Ohio. The box combines digital EQ, compression, limiting, clipping and digitally-controlled stereo generation in a single unit.

"It (the Unity) is the best processing box I've ever heard, and we sampled everything," Dixon said. In deciding on Cutting Edge's Unity, WMTX-FM "even set things up so we could switch between boxes in late overnight," he added.

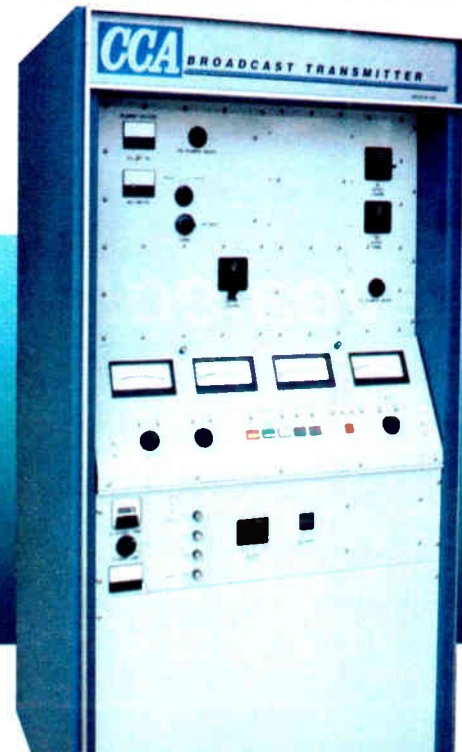
The station went on the air with the Unity 2000 in June. Within 10 days, air personalities began reading liners two or three times during each shift, promoting WMTX-FM's move to digital processing: "Mix 96, Tampa Bay's best variety of music, now with digital audio, giving you CD quality right on your radio."

### Intelligent listener base

Dixon describes WMTX-FM's format as "Top 40 for adults." He said the station serves "an intelligent listener base that

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# NEWSWATCH

## duTreil, Lundin & Rackley to Move

**WASHINGTON** The consulting engineering firm of duTreil, Lundin & Rackley has announced plans to relocate its offices from Washington, D.C. to Sarasota, Fla.

According to Robert DuTreil, a skeleton force will be sent down to Sarasota in early December to start the new office. Other employees will follow through the rest of the month, and the firm will be operating from the new office by "the first of the year."

"We basically wanted to get out of the rat race of D.C.," duTreil said, noting that with advancements in technology it is no longer necessary to be geographically

bound to Washington to operate effectively.

The firm will maintain a local phone number for its Washington-area clients, duTreil said. The new address for duTreil, Lundin & Rackley will be the South Trust Bank Building, 240 N. Washington Blvd., 7th floor, Sarasota, FL 34236.

## Broadcaster Clinic Scheduled

**MADISON, Wis.** The University of Wisconsin's annual Broadcaster Clinic, sponsored in part by RW, will be held November 10-12.

Topics to be covered at the clinic include transmitter site safety, using the Sony

Mini Disc, digital STL transmission, contract engineering, digital and analog audio processing, microphones, solid state AM transmitters, in-band digital audio broadcasting (Gannett's Project Acorn), an FCC question and answer session, and several television technology sessions.

The clinic will be held at the Holiday Inn Southeast, Highway 12 and 18 at I-90 in Madison. Registrants should make their own hotel reservations by calling 608-222-9121.

The registration fee for the clinic is \$150 for all three days and \$115 for any two days. For more information, call 608-262-2451.

## RAB Responds to Disaster

**NEW YORK** The Radio Advertising Bureau (RAB) offered free sales assis-

tance to stations that were affected by Hurricane Andrew in Florida and Louisiana last month.

Although most radio stations survived the storm with minimal or no damage, RAB provided "relief kits" to the stations, which included information on advertisers who offer the best business opportunities in the post-hurricane rebuilding period. The RAB also has offered "post disaster" promotion ideas.

## Duggan Makes Fine Statement

**WASHINGTON** FCC Commissioner Ervin Duggan has clarified his position on the fine schedule the FCC approved earlier this year.

The new schedule, which lists more standardized and higher amount fines, has been criticized as too inflexible and for being adopted in a process that did not allow sufficient public and industry input. The NAB and a telephone company are considering court action to stop the new schedule's implementation.

Duggan said he concurred with most of the new schedule, especially applying uniformity to the schedule and moving away from the liberal application of case-by-case assessments. "I believe strongly...that

continued on next page ►

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we need to retain some flexibility in issuing forfeitures," Duggan said. "In some cases, for example, extenuating circumstances may necessitate lowering a fine rather than robotically applying the written guidelines."

Duggan also echoed sentiments expressed by Commissioner James Quello in that he has concerns about assessing a fine that is beyond a small business's ability to pay.

Duggan said there already is evidence that the fine policy is being interpreted with flexibility, referring to the Field Operations Bureau's "first offender policy," that allows leniency towards those who unintentionally commit minor offenses.

#### Antex Adds Dolby AC-2

**GARDENIA, Calif.** Antex Electronics has licensed the Dolby AC-2 digital audio coding systems for its line of add-on digital audio boards for personal computers, PS2s and other compatible computers.

The Dolby AC-2 digital audio coding system allows 20 kHz audio at 128 kilobits per second. Previously such audio quality was only available at the cost of using massive storage devices, according to the company.

Antex Sales Vice President Richard Gross said the addition of Dolby AC-2 "will open up tremendous opportunities to broadcast equipment manufacturers and FM broadcasters."

#### Devlin Assumes RNA Post

**NEW YORK** Rick Devlin has been named president and executive director of the Radio Network Association, replacing Albert "Bud" Heck who recently resigned.

Involved in radio since 1967, Devlin previously was president of ABC Talkradio; president and general manager at New York stations WOR-AM, WXLO-FM, and WPLJ-FM; and most recently he served as president of D&F Broadcasting, which owns and operates stations in New Jersey and Texas, including WJLK-

AM/FM in Asbury Park, N.J. and KROD/KLAQ in El Paso, Texas.

#### SBE Cooperates with Mexico

**MEXICO CITY** Society of Broadcast Engineers (SBE) President Richard Farquhar was featured at the AMITRA technical seminar held here in mid-August.

AMITRA is the Mexican equivalent of the SBE. The seminar featured topics such as digital audio broadcasting, WARC 1992, and multiplexed antenna designs.

Farquhar and AMITRA President Sergio Beristain have discussed future joint projects between the two organizations, including cooperative educational efforts. Beristain also is promoting SBE certification for AMITRA members, and several members of AMITRA will be attending the SBE convention in San Jose in October.

"The engineers in Mexico face many of the same problems that we do here in the U.S.," Farquhar said. "With a common ground of technical and management needs, there is much that each group can learn from each other."

SBE also has signed cooperative agreements with Canadian organizations: Central Canada Broadcast Engineers and Western Association of Broadcast Engineers.

#### CCA Helps Hurricane Victims

**WEST PALM BEACH, Fla.** Transmitter company CCA was able to contribute to the relief effort in south Florida following the devastation of Hurricane Andrew last month.

During a scheduled transmitter shipment to WKGR, the Fairburn, Ga. company realized it had a lot more room in the truck. So the company collected food, bottled water and household supplies and shipped those needed goods along with WKGR's new FM3500G transmitter.

"We are glad that CCA could deliver the transmitter and be a small part of the relief effort," CCA Sales Vice President Steve McElroy said.

## WMTX-FM Promotes On-Air Quality in Tampa Bay Area

► continued from page 1

knows quality and doesn't just go in for a loud, grungy kind of sound."

Initially, according to Dixon, the impetus for promoting the new air sound was primarily "to combat digital cable radio."

As listeners began to take notice of the change in audio quality, however, the station stepped up the promotion. "We just rolled a promo that we had something different. We took a very definite difference between us and the other stations in the market and promoted it."

In particular, that meant going head-to-head with an AOR station in the Tampa Bay area. For several weeks, the station ran a spot while the other station aired a song. The spot suggested that listeners turn up the volume on WMTX-FM, then switch to the other station, compare the two and decide for themselves which station's sound they preferred.

#### Clean, pure and natural

Dixon said the response from listeners has been enthusiastic. "They call up, saying, 'Man, I don't know what you did to your sound, but it sounds great!'" Dixon is equally enthusiastic about the Unity 2000.

"It's the cleanest, most natural, pure reproduction of what's coming off the CD," he said. "With the other boxes, even flat, what was coming out of the radio was not what was coming off the CD."

"Once (the Unity) is on, you can tailor the sound a little for your listening audience," Dixon added. "We watch the high end for the female listeners. Too much of a bright, sparkly sound seems like it hurts their ears, so we smooth that out a little."

Dixon even attributes the success of some songs on WMTX-FM to the effects of the Unity 2000 processor—in particular, "Life Is a Highway," by Tom Cochrane. "That song has a booming low end that's all rumble and roar, but with the Unity it's listenable. That's why it's tracking so well with us, doing even better than on some of the CHR and AOR stations down here," Dixon said.

For Dixon, promotion of WMTX-FM's on-air audio quality is not unusual, it just makes sense. As he pointed out, "You promote quality in your programming; why not promote quality in your audio, if it's noticeable?"

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# DAB and the Race Run

by Alex Zavistovich

**WASHINGTON** I suppose that with the presidential elections now less than two months away, I've become more attuned to the political process. Not so much policies and platforms, that is, but the way politics seems to infiltrate our day-to-day lives.

Look at the political imprint on digital audio broadcasting (DAB), for example. It's undeniably an election, with front-runners, dark horses, luminaries, lobbyists, pundits and gadflies (or journalists, as we prefer to be known).

The voters: broadcasters. The issue: in-band or out-of-band. The threat: overseas. And behind the scenes, the grease that keeps the creaky wheels of progress turning: money.

Ron Strother, a pioneer of in-band DAB development, has been candid about the difficulty system proponents face in obtaining funding. It's no surprise, then, that the in-band system furthest along should be USA Digital Radio's Project Acom.

As a partnership of CBS, Group W and Gannett Broadcasting, USA Digital has the engineering credentials to come up with a first-rate system. More importantly, though, the partnership doesn't have to worry as much as its competitors about where the money's coming from.

But it's not USA Digital's campaign, successful though it may be, that got me on this whistlestop of thought. It's the demise of another runner in the race, a dark horse, in the opinion of many observers: American Digital Radio.

Edward Schober has withdrawn as an active proponent of a DAB system. His company, American Digital Radio, proposed a system called ADR 2000™, combining frequency diversity, space diversity and data coding. Assisted in this effort by his partners Peter Moncure of Radiosoft and William Spurlin of Christian Science Monitor, the system was intended to employ the unused channels between FM stations in the market.

The reason for American Digital's withdrawal from the race? Money.

Schober maintained that he is bowing out because of "financial constraints"—insufficient funding to continue the development of the system. He added that he plans to "stay active in digital radio, but not as an active (system) proponent."



As early as the NAB's 1991 radio show in San Francisco, Schober showed himself to be a true political animal. At a DAB session during the convention, he sought to galvanize broadcasters behind his in-band solution by strongly criticizing the NAB for its then pro-Eureka stance.

The principal concern voiced by Schober at the show and throughout his campaign has been that Eureka's out-of-band system would lead to the eventual dominance of satellite transmission. He still holds that position.

"My concern is that none of the remaining systems will be adequate to the task of ensuring that the future will not be a satellite (broadcasting) system, with terrestrial left by the wayside," he told me.

Unfortunately, Ted Schober's willingness to play the political game did not work to his advantage in this particular campaign. The average broadcaster is only now becoming aware of the various layers of politics at work in the DAB issue; a year ago, Schober's address at the NAB did not stir his listeners to action as he intended. To some, instead, he was tilting at windmills, taking on the NAB in its own arena.

Of course, in politics, that's what you do. If you're convinced that you know how things ought to be done, you go out and get people to believe in your message. And if that

means holding court at an NAB-sponsored event, well, that's what it means.

The problem, in this case, may have been the message.

Unlike some politicians who promise too little too late, Schober asked for too much too soon. Key to the success of his system was that some pioneers relinquish their current assignments to participate in his nascent DAB plan at a different location on the dial. Schober's idea may have been ill-timed, coming during the heat of the recession, when broadcasters were struggling in some cases just to stay in business.

Support for the system never really came, and fighting against the inertia of fund-raising eventually overwhelmed the project's partners. At press time, Schober planned to issue a statement of his intent to withdraw on Sept. 10. He expects to turn his attention back to Radiotechniques, his Haddon Heights, N.J.-based consultancy.

For my part, I respect a man with the drive and commitment to try to develop an idea into reality. I never learned enough about the nuts and bolts of ADR 2000 to have an opinion about its potential for success, although the transitional period for broadcasters seemed somewhat cumbersome. Also, in his heated entry into the politics of DAB, Schober may have strayed too far from the heart of the matter. For whatever reason, he was unable to reach those who could have helped him realize his goal of bringing an in-band system to American broadcasters.

Still, in Ted Schober I see a man who acted on an idea, brought it along, and had enough control of his ego to know when it was time to move on to something else. It's clearly better to have tried than never to have made the effort at all. Unfortunately, in this arena as well as the larger political one, if you want to be in it over the long haul you need money. In the words of the immortal chanteuse of the '80s, Cyndi Lauper, money changes everything.

By way of consolation to Schober, I need to point out that the Inter-American Committee on Telecommunications (known by its Spanish acronym CITEL), met in Mexico City in mid-August to decide how the organization should deal with DAB in the U.S., Canada and Latin America. U.S. representatives included both the VOA and the NAB.

Apparently, the U.S. delegation held a common line during the meetings, urging that any policy decision regarding DAB should consider existing bands as well. The delegation stood its ground against a vocal contingent of Canadian and Mexican representatives who are, as is becoming increasingly apparent, quite serious about L-band development.

According to the VOA's Don Messer, the U.S. group was able to undermine what he called the "steamroller effect" that seemed to pervade the meeting, a prevailing sentiment that anything other than L-band was irrelevant in DAB discussions.

The U.S. countered that in-band was relevant and suggested, in Messer's words, that nations committed to L-band DAB should not try to "short-circuit the development of in-band in the Western Hemisphere."

The upshot of the discussion was that an ad hoc CITEL working group on DAB has been formed to share information internationally. But from U.S. broadcasters' standpoint, what's most important is that the NAB is representing the in-band position in international forums. It feels good to all be on the same side.

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

*Alex*

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### The role of music in radio

Dear RW,

I am writing in reference to your *Pilot Tone* article in the August 5, 1992 issue. The article dealt with the new music scene in Buffalo, N.Y. and with radio airplay of new music. I wanted to correct you on a couple of things and offer my views.

I lived and worked in Buffalo from 1980 to 1983. I still make it back for a few Bills games each year and have consulted stations in the area. Folks there prefer to be known as Buffalonians. I also wanted to correct your spelling of Niagara Falls. People there rarely get mentioned in anything other than bridal magazines.

As a consultant, I see both arguments for playing new music. On one hand, most people like familiar things: comfortable shoes, a cozy home and music they know and like. They like consistency. They want a Big Mac to taste like a Big Mac at whichever McDonald's they buy it. On the other hand, there are those who like to try new things and who don't like pizza three times a day.

Estimates say that 60 percent of all stations are losing money right now and, unfortunately, when that happens, people are afraid to take risks. Playing a song that may cause someone to change the station is a risk most owners simply can't afford.

As program director of WECK in Buffalo (licensed to Cheektowaga), we took a 1 kW AM on 1230 and drove it into the top five, 12+. We licensed "Music of Your Life" to keep it out of the market but the music was all ours. Sure, there was a large amount of "hit," Big Band and standard product, but we broadened the appeal of the station and eased library burnout. We went deeper into the library and added new and different songs.

Whether the group was local or not, we used what research we could afford and our "gut" to play new products that fit the "texture" or sound of the format. We controlled rotations and controlled the market, beating such powerhouses as WKBW (now WWKB) and WGR.

What I'm trying to say is that new music

has its place. Alternative stations find their niche, and if properly sold and run efficiently can make money, but even heritage stations languish in the ratings. Most operators need to go for a bigger slice of the pie to service debt and operate the way owners desire.

A friend in El Paso has produced an album called Artworks. It is a by a local sax man named Art Lewis, and regional response has been good. They've been direct marketing it but stations have started playing cuts! Because it features jazz, blues as well as country and Dixieland, it is finding a home in several formats. The final point is good music will find a way to the marketplace and radio will respond when appropriate.

J.R. Russ, President

J.R. Russ Programming & Research  
Philadelphia, Pa.

### Defending RBDS scanning

Dear RW,

The broadcasters who object to RBDS format scanning (RW, August 19) are failing to see things from the listener's point of view—a fatal flaw in a business that can't survive without its listeners.

NAB Spokesman John Marino may be right that there are many subtypes of country music; but how many of them exist within a given market? The country music listener who lives in such a market will set his radio's memory buttons to the station or stations that give him the subtype he wants, but format scanning will let him get past the clutter of rock and MOR stations (and let rock and MOR listeners skip C&W) to find a group from which he can select his favorites. The car radio listener who's only passing through can scan the stations with his favorite format to find the music he likes before he's passed through that market and onto the next.

Too-narrow format categories will be self-defeating. The bebop fan who has to scan through 17 stations full or sports, talk, country, classical, MOR, heavy metal, golden oldies, wall-to-wall Sinatra, earnest lectures on Lithuania's ecology and more, is likely to stop scanning and plug in a tape or CD long before he finds anything he'll listen to; and radio loses.

If he's scanning strictly for bebop, the odds are his radio will report there's nothing on the air to hear, and again he'll switch from radio to something else; radio loses again. A scan for jazz in general might yield an acceptable substitute—in which case, radio wins.

I suggest that format-scanning critics borrow an ID Logic radio (Panasonic and Alpine have 'em), drive 100 miles away from home, and try finding music they like both with and without a format scan. Unlike them, I've done this, and it works.

Ivan Berger

Technical Editor  
Audio Magazine  
New York, N.Y.

### Put music first, not DAB

Dear RW,

Not an issue of RW goes by that I don't see an article about DAB being the salvation of the radio industry. Not an issue goes by that I don't see a letter in the

## Industries Overlap at AES

"CD quality." It used to be that "FM quality" was the phrase denoting the ultimate in audio reproduction. Now "CD quality" has taken that distinction. Fortunately, today's radio broadcasters are faced with the promise of digital transmission, which will again level the playing field.

That promise carries with it a challenge, however.

Now more than ever, broadcast engineers need to stay aware of developments in audio engineering in general. The Audio Engineering Society convention, to be held Oct. 1-4 in San Francisco, is just the place to get this information.

Since the advent of digital technology, the influence of the recording industry on broadcasting has been keenly felt. The distinction between the two realms of engineering is increasingly blurred.

At WMMS-FM in Cleveland, for example, the AOR's morning show benefits from recording technology with its "Zoodio," a 16-track recording facility with a Mirage sampling keyboard and a full rack of processing gear. While modest by the standards of recording facilities, the Zoodio is quite advanced for a typical radio station.

Industry overlap is clearly a trend, even in smaller radio markets. Production rooms have grown in many cases from simple two-track reel-to-reels for dubbing cart mixes to four- or even eight-track recording setups. Companies like ART and Alesis, which got their start in the musical instrument/recording industries, are vying for attention with broadcasting stalwarts at the NAB show. And the digital audio workstations that have kept convention attendees buzzing for the past few years are as comfortable in a recording studio as they would be in a radio station.

These days, to deny the importance of this and similar technology to broadcasting is to rob a station of the chance to gain a competitive edge. In some markets, it has become less an edge than a necessary tool of the trade.

In the rush of conventions that occurs every fall, it's all too easy to skip one that seems less relevant than the others. Don't skip the AES convention.

RW

Readers' Forum regarding DAB.

Whatever DAB standard is picked, it will probably offer a much greater variety of available channels, and better possible fidelity. However, I suspect that this will result in many more channels that sound the same, and the same low quality over-processed audio that existing stations use.

Frankly, so few FM stations come even close to the amazing fidelity that is possible with FM. Why should DAB be any different? Unless folks start to care about audio quality, no new standards will help anything. Unless people start getting up in arms about stations so heavily clipped and compressed that the peak and average modulation meters read within a dB or two, no new standard is going to help. We'll just get super-loud, super-compressed, super-processed digital audio.

Unless stations start distinguishing themselves from the rest of the market by playing different music, I don't see any great hope for DAB. Ten thousand channels with identical 200-song playlists, all distinguished only by their varying processing schemes—now that just doesn't sound like my idea of a vast improvement.

We need to start caring about the music for a change, folks.

Scott Dorsey  
Custom Audio  
Williamsburg, Va.

### The golden days of country

Dear RW,

I read with interest Nancy Reist's article about the Country Gold Network (RW, July 22, 1992). I'm sure that other collectors of old-time country music have pointed out the fact the Patsy Montana's "I Wanna Be a Cowboy's Sweetheart" was not recorded until 1935; therefore, the 1913 date listed in the article is in error. This song, by Patsy with the Prairie Ramblers, was the first song by a country girl singer to sell 1,000,000 copies.

My own collection is extensive, about

10,000 78s, plus many 45s and LPs. I'm glad that the Country Gold Network is keeping the old songs alive. There is a place for the complete country music spectrum in today's radio, and with modern processing such as offered by the American Gramophone and Wireless Company, the sound of yesterday's hits can compare favorably with the sound of today.

I also collect old-time network radio shows, and have been delving into older country music since the 1940s, when my dad purchased a wind-up phonograph from a next-door neighbor, and introduced me to Jimmie Rodgers, Riley Puckett and the Carter Family. I would be happy to correspond with other collectors.

Bill N. Morris, Assistant Manager  
WCDT(AM)  
Winchester, Tenn.

### CD clarification

Dear RW,

I would like to correct an inaccuracy in the article, "Japanese Radio Goes Personal" by Frank Beacham which appeared in the July 24 issue of RW. Quoting Kazuhiko Nishi of ASCII Corp. Japan, Mr. Beacham writes that the compact disc was invented in 1985. Either Mr. Nishi misspoke or Mr. Beacham misquoted because the CD was invented through ongoing research in the U.S. and Europe during 1979-1981. That's right, the CD is not a Japanese invention. The CD began commercial delivery to stores in the U.S. during the latter part of 1982. The 1985 date actually refers to the introduction of "Walkman"-style portable CD players, which are a Japanese invention. Otherwise the article was informative, but seems to spell even more trouble for the already fractured radio listening marketplace.

Edwin Bukont, Chief Engineer  
WPGC-AM-FM  
Washington, D.C.

# Radio World

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# ERI Designs New York FM Combiner

by Mary Gruszka

**NEW YORK** Eleven of New York City's FM radio stations will be one step closer to moving higher up the Empire State Building with the installation of a new combined master antenna system.

The antenna is one part of the total rebuild system project, which is designed, engineered and managed by ERI installations, Inc., of Newburgh, Ind.

The rest of the system, including new combiners/filters and coaxial transmission lines from the stations' transmitters to the new antenna, is currently in the final design phase, and is scheduled to be installed by March 1993.

## Room for everyone

When completed, the system will accommodate the 11 stations (WXRK, WQXR-FM, WSKQ, WRKS-FM,

WBAI, WHTZ, WQCD, WNEW-FM, WMXV, WLTW and WBLF) on a single system and will have the capacity for four future stations, according to Jim Kemman, ERI's Engineering Project Manager for the Empire State Building Project.

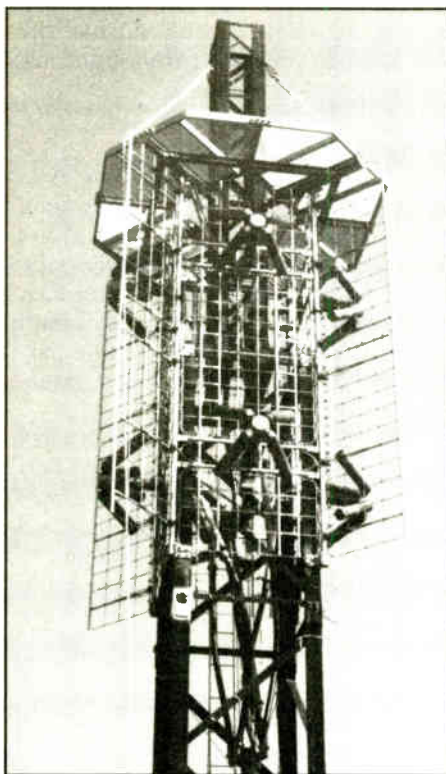
The new antenna will have two layers of radiating elements, according to Kemman. "We're using a steel tower with a square cross-section that tapers to a point," he explained. "It's about five feet, nine inches on-face. The radiating elements fit closely around the face. Screens surround the tower to provide electrical isolation of the case and the elements, and improve the pattern circularity."

The installation phase of the project is the culmination of four-and-a-half years of planning.

When most of the TV stations moved their primary antennas from the Empire State Building to the World Trade Cen-

ter in the mid-1980s, the space they had occupied on the upper part of the tower became available. The FM stations, which have been occupying a less desirable space further down the tower where the cross-sectional area is larger, took this opportunity to relocate.

At the same time, the stations decided to replace the almost 30-year-old combiner system instead of moving it.



A close-up of the ERI antenna system to be used in the 11-station combiner project atop the Empire State Building.

(That system will remain as a back-up.)

The existing system was "quite an innovative undertaking in the early 1960s," noted Bob Tarsio, chief engineer, WLTW-FM and chairman of the project's master antenna committee. "It was the first combined FM system

built. It was quite a unique system, but today there are better ways to combine FM radio stations onto a single antenna."

"Technology changes," Kemman added. "We've made some improvements from the original."

Tarsio said a new design also will improve the overall performance of the current RF system. "The pattern we get leaves something to be desired. So we wanted to improve performance and obtain a better circular polar pattern."

The new radiating elements will be installed in a more favorable location, 120 feet or so farther up the tower, where the cross-sectional area is smaller.

continued on page 8 ▶

# USA Digital Tests Acorn On-Air

▶ continued from page 1  
was 43.1 miles.

At press time in the first week of September, FM frequency tests had not yet begun. Glynn Walden, director of engineering for Group W—which is a member of the USA Digital partnership, along with Gannett Broadcasting and CBS—said the tests would begin "very soon," probably within the week.

"We have to start soon, to make it in time for New Orleans," Walden said.

On August 28, Gannett issued a press release stating that USA Digital had "successfully" tested its Project Acorn system in the AM band in Cincinnati. The release promised on-air tests of both the AM and FM systems at the New Orleans radio show.

The Project Acorn system digitizes source material with the MUSICAM

compression algorithm and broadcasts it below the FM or AM signal. A multiple carrier approach is used to ensure system robustness, and a chip on the receive end extracts and demodulates the DAB signal.

The chip used for the FM extraction, according to USA Digital Radio sources, was developed by the Defense Advanced Research Projects Administration (DARPA). Known as "acoustic charge transport" technology, the DARPA chip will be available in consumer quantities through the USA Digital project.

USA Digital Radio has contracted with Electronic Decisions, Inc. (EDI) of Urbana for the development of the prototype receiver used in the on-air Project Acorn tests. No additional information on the relationship between USA Digital and EDI was available at press time.

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## ERI Designs Combiner for New York FMs

► continued from page 7

according to Kemman. This will help reduce the nulls in the horizontal polar pattern that the current system suffers from.

### Lower costs

"The advantage of a combined system is that it reduces the cost of real estate," Kemman said. "There is only so much room on a tall location in a densely populated area. The system allows access to a good location for a number of different stations, and by doing this, we take care of intermod products between the different stations.

"We wanted to improve the system reliability and efficiency," Tarsio added. "The overall efficiency of the old system is not very good; it's about one-half, so it is wasteful of energy."

The new system also will insure RFI compliance. "We are in compliance with ANSI standards right now, so we don't have to move for that reason, but we want to stay ahead of any future standards."

In the current system, the filters and combiners are scattered across the mooring mast, the upper portion of the Empire State Building that was originally designed as a mooring point for dirigibles, Kemman said.

"Now they will all be located in a single room on the 85th floor. It's a better environment in a central location and a big improvement over the old system," he said.

The stations also wanted a mechanism to assure safety to workers when the system is being serviced. "They needed a way of ensuring the safety of someone working on it," Kemman said. "So we've built-in a safety device that will put a dead short circuit across the transmitter to prevent it from transmitting through the combiner."

### Numerous challenges

ERI faced a number of challenges in developing the design for the system. "You just don't stick a system up on the building and tower," Kemman said. "You have to build it into the building, install transmission lines so they aren't stumbled across, and find suitable passageways for the lines from the transmitter rooms to the antenna."

Added to this are New York City building and fire codes, building permits, Landmark Preservations Commission approvals, and other landlord and tenant requirements to consider.

"We're people with actual broadcasting experience," Kemman said. "We understand the station engineer's problems."

ERI performs a large number of pre-

tests on their system. "The antenna is tested thoroughly on our antenna test range," Kemman said. "It is assembled on a reproduction of a portion of the tower that is on Empire, and the radiation pattern is measured. The antenna is adjusted and the impedance bandwidth optimized, and then it is disassembled and shipped."

Kemman said the combiner system will be completely assembled in a location near the plant and tested there before it is shipped, and retested after it is assembled on site.

"As the transmission lines are installed, they will be checked physically and electrically. We will have to demonstrate that we meet a number of pages of specifications," he said.

### Overseeing the project

In addition to its engineering and design duties, ERI is also the general contractor for the project, which includes furnishing the equipment, overseeing the installation, coordinating the project with subcontractors and assessing systems performance. Local contractors familiar with the local market will do a significant amount of work and ERI will have "people on hand to do the tests and keep an eye on things," Kemman added.

The antenna and tower installation will be handled by North American Tower Maintenance, Inc. of Sewell, N.J. According to Company President Jim Graf, the antenna sections will be brought up to the 102nd floor through freight elevators inside the building.

From there, they will be hoisted the rest of the way to the top from the outside. "We'll be installing a protective safety-catch scaffolding above the JJ level of the building," Graf said.

The actual installation of the antenna and combiner will present its own set of challenges, which RW will report on in the future.

## Broadcasters Endure Storm

► continued from page 1

went in (to the transmitter building) and stalled the generator. So about 4:30 or five in the morning, my assistant and I had to run out in the midst of 100 mile an hour winds...and redo it.

"It'll scare the hell out of you, I'll tell you that," Leifer added.

Jim Strickland, chief engineer for NBC-owned WPOW-FM, said north Dade County fared better than the southern part of the county, with wind speeds clocked at 100 m.p.h. He said his station was off the air for about 26 hours because it did not have a backup generator.

Hurricane Andrew struck south central Louisiana two days later on Aug. 26 as it made its westward assault. The rural coastal towns of Morgan City, New Iberia, Houma and Amelia were among the hardest hit. As in Florida, radio stations survived the storm mostly intact.

KVPO in Morgan City was off the air for several days, but most other stations that had generators were able to keep broadcasting.

Janice Lebel, a spokeswoman for KHOM in Houma, said the FM station remained on the air using its backup generator. She said the tower and satellite swayed in the 100 m.p.h. winds, but were not damaged.

"We were very surprised," by the lack of damage to the station, Lebel added.

The NAB and the Radio Advertisers Bureau (RAB) offered help to stations affected by the hurricane. The RAB offered free sales assistance to stations while the NAB "informally" coordinated equipment searches from major radio groups and equipment manufacturers. Also, the area was declared a disaster area by the federal government, allowing businesses and private citizens to apply for financial assistance.

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# WORKBENCH

## Life and Death of Console Switches

by John Bisset

**FALLS CHURCH, Va.** Phil Wells at Sunny 103.7 in San Diego faxed me an interesting note regarding switch life expectancy in control room consoles.

Phil writes that his ADM consoles use the Honeywell (Micro Switch) AML 21 series push-button switch for module "start/stop" functions. These are the switches with separate lamps for the top and bottom halves of the legend.

Phil had been experiencing a situation where the switches would fail by becoming super-sensitive to the slightest tap—causing carts and CDs to fire as the jock rapped out the beat on the console tabletop. Phil sent one of the switches along with a note to Honeywell. The response he received showed that the switch was way beyond its expected life. Honeywell's analysis showed the movable contact leg had fractured, which apparently is typical for switches that had surpassed

the company's TV/video/CCTV accessories. circle Reader Service Number 94.

★★★

Mike Sokol, an independent producer, sent in a neat tip for anyone recording narration on DAT—pass this on to your production director! Because recording voice-only spots or narrations requires only one channel of audio, Mike uses

the second channel for headroom safety.

Mike states the "digital facts of life" in blunt terms: There is no headroom above 0 VU! His solution to crunching up against the 0 VU brick wall is to pan the record balance control on the DAT all the way to the left before recording mono voice. This causes the right chan-

nel to record about 8 dB below the left. Since Mike generally uses the left channel for editing, if the 0 VU wall is hit, he grabs the take from the alternate channel.

Mike reports that this method has saved more than a few editing sessions, especially when the DAT tracks were recorded by personnel with lots of analog experience, but not much practice with setting levels on a digital machine. Mike Sokol  
continued on page 18 ▶

**If you have problems with the Hall-effect switches ...you can guesstimate the number of operations until failure**

100,000 operations.

In the mid '80s, ADM changed to the AML-II series Hall-effect switch. The lifespan of these switches was increased tenfold. Nonetheless, these switches also will wear out. If you have problems with the Hall-effect switches that Honeywell makes, you might guesstimate the number of operations until failure (i.e., 4 breaks per hour x 2 uses per break x 24 hours a day x 365 days a year x number of years) to determine whether the switch is still in warranty. For the AML-II series momentary action push-button switch, the electrical/mechanical life specification is 1,000,000 cycles.

Phil dealt with Applications Specialist David Hill. If you have Micro Switch/Honeywell switch questions, Dave can be reached at Micro Switch Corporation, a division of Honeywell, by calling 800-532-2235. Phil Wells is engineering manager at Sunny 103.7, and can be reached at 614-238-1037.

★★★

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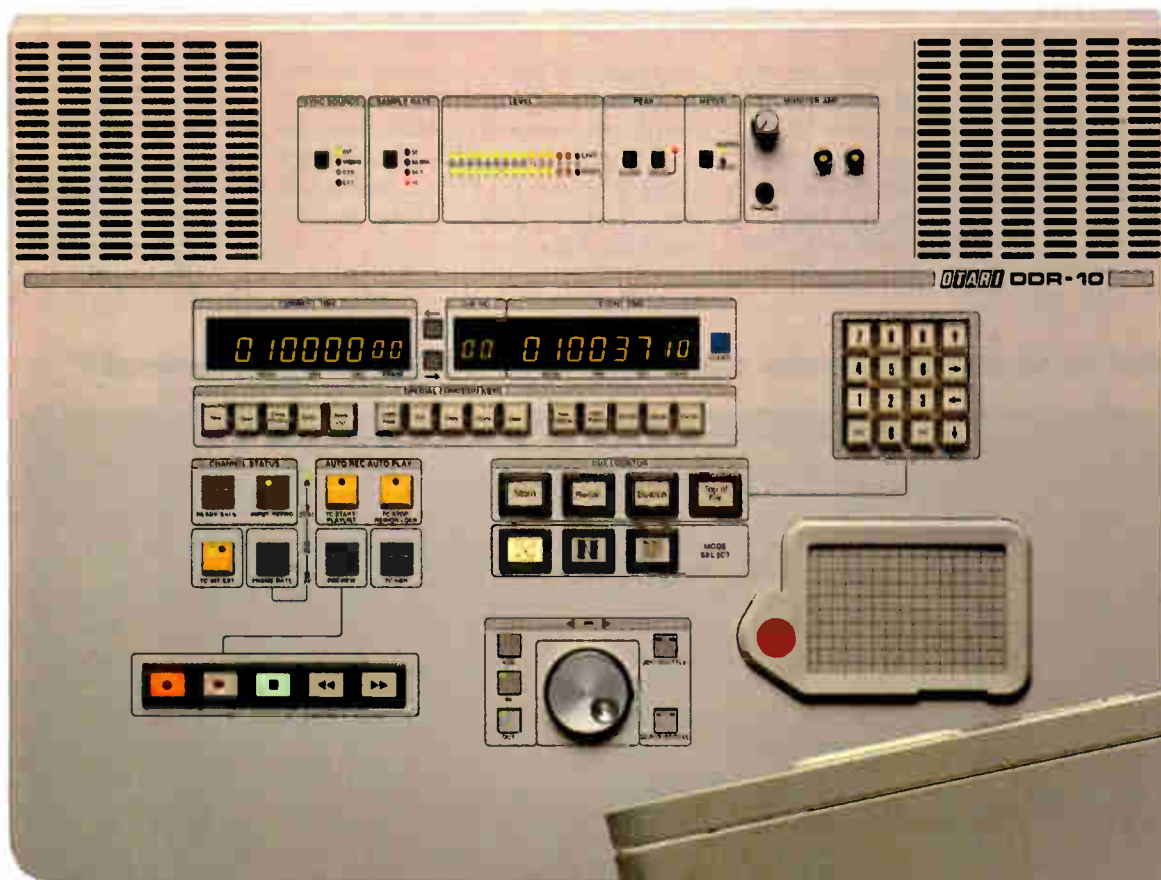
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World Radio History



## FACILITIES SHOWCASE

# WMMS-FM Wins Construction Race

by Dee McVicker

**CLEVELAND** The only rule to building a radio studio is start from the beginning and work until it's finished. It's also a good idea to finish on time and within budget, so as not to raise the ire of management.

Those were the guidelines governing Ric Bennett and two engineering assistants at Cleveland's WMMS-FM/WHK-AM during a construction marathon. Bennett, also known as Rocco, had taken the job as chief engineer of Malrite's Cleveland stations in November, leaving behind an on-air position for the design challenges that lay ahead.

There were seven major studios to turn out in less than six months, and what amounted to about three remotes every week for the Talk AM and the AOR FM, which is known for its logo

## The plan was to fit more studio into less space.

of a buzzard—a 20-year tradition. Moreover, the site management had selected, a complex overlooking Cleveland's prestigious The Avenue shopping area, was smaller than the station's previous site—by 1,000 square feet for the studio area alone.

### More studio in less space

Rocco started the project with the all-important plan to fit more studio into less space. This dominated staff meetings throughout much of December and January, and Rocco went from room to room in the old facility taking notes.

After much discussion and planning, it was decided that in addition to an on-air studio, newsroom and production studio, WHK-AM needed a comfortable living room-like studio for its panel discussions.

Also, as the flagship station for the Cleveland Browns football team, WHK-AM was in desperate need of a network studio to feed programming to its 54 network affiliates, a capacity lacking in its previous facility in the old Statler Office Tower.

WMMS-FM, meanwhile, needed to find room for its on-air studio, 8-track studio, and what is endearingly called the "Zoodio," a studio for morning zoo production with a full 16 tracks for live band performances. This studio is the bread and butter of WMMS-FM's ratings; Julian Lennon and John Mellencamp are just two of the top artists to stop by for an on-air concert.

With a rough studio layout in hand, Rocco put the job on the street for bid. Eleven general contractors responded, and Rocco narrowed the search down to two, based on presentation and the best bid for the money.

### The race is on

By late February, after Rocco and his two assistants had specified isolated grounds and conduits for each studio, the blueprints were drawn. Soon after, upon the general contractor's receipt of the necessary building permits, construction of the new studios began.

It was now less than five months until July 1, the cut-off date when WMMS-FM/WHK-AM needed to vacate the old Statler building according to its lease requirements.

Nonetheless, Rocco proceeded carefully, working with the subcontractors daily. "We were pretty much on-site from day one and that's the only way a lot of problems were averted," he related. On Mondays, Rocco held a construction meeting with the crew—added insurance that all was going as planned.

Meanwhile, Rocco still had two sta-

tions to engineer, along with several remotes a week. Later, when construction had moved to the point of wiring the studios, his attention would be diverted once again.

In large part, he said, what made it all come together was a new automated routing switcher by Sierra. Rocco liked the fact that the switcher could be interfaced to a PC for labeling, had remote units for dialing up access feeds in each studio, and had pin outs instead of jack fields.

"You're eliminating \$10,000 worth of

DAs, accompanying wire, and the man-hours involved in wiring up a DA rack," he pointed out.

The operation of the Sierra is also exemplary. When a live performance needs to be piped into the WMMS-FM air studio from the Zoodio, he said, this can now be done by dialing up the air studio through the router.

Likewise, the AM talk studio can now be used for FM purposes with little more than a push of a button in WMMS-FM's on-air studio. "Essentially, that piece of equipment is the lifeblood of the whole studio setup," commented Rocco.

When the dust finally settled from all the construction, the WMMS-FM

continued on page 32 ►

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Circle (124) On Reader Service Card

World Radio History



## KEYBOARD CONNECTION

# The How-To's of Station BBS Installation

by Barry Mishkind

**TUCSON, Ariz.** I've often urged RW readers to take advantage of the resources available via computer link. Everyone in the station from sales to programming to engineering benefits from knowing how and where to connect.

The next logical step is for a station to install a BBS (Bulletin Board System) of its own. As we'll see, it doesn't take much to get started, and the benefits can be amazing.

For example, would you like to stop the endless waste of copy paper sending memo after memo to your staff? Would

you like to know what your listeners think about a new song, your format, your disk jockeys? How about easily sharing information with other stations in your organization?

Station operated BBSs can do all of this and more. Several program packages are available that can be set up easily, with added functions available to expand the usefulness.

### Saving the trees

Every business has a need for internal communication. Typically someone will write a memo, and the copy machine cranks out dozens of copies. Some days,

I'd get six or eight memos. Multiplied by the size of your staff, you can almost hear the trees falling.

With a very basic BBS, every person in the station can log in and read the memos that affect him or her. The sender just types it in the memo and the program takes over, even generating a return receipt showing the date and time the message was read by the recipient.

Now, let's reach out a bit. Connect your BBS machine to the phone system. The staff can get its messages anytime, day or night, from anywhere (even on business trips). You can even set up to remotely access your station files and run applica-

tions. Write a letter, check the playlist, or have the sales staff connect from their laptops to develop proposals or enter sales contracts instantly. You can even invite the public to dial in and participate in areas you set up, to leave their comments and suggestions.

More options are achieved by connecting to one or more of the national data networks. The addition of a "front end mailer" allows your BBS to talk to other BBSs in an automated way.

For example, you could exchange messages and playlists overnight with your sister station in another city, so you can read them in the morning. Or receive information and share messages with others all over the country who have similar interests, via such systems as the BROADCAST, FCC or SBE conferences we've discussed.

The software for all this is surprisingly easy to install and not overly expensive. Wildcat!, version 3.52 from Mustang Software is an excellent package. It'll handle everything we've been discussing, including security precautions to keep your data secure and accessible only by those you designate. Wildcat! lists for \$129; you'll find it on the street for under \$100.

There are quite a number of other BBS packages out there, with a predictably wide range of features and prices. Some can connect dozens of phone lines to one BBS message base for larger users. Others like RBBS and Maximus cater to the hobbyist; they're free to non-commercial users. This can be important for those on tight budgets or operating out of your home.

For ease of installation, it's hard to beat "RBBS-in-a-Box"—a package from Quanta Press. It has all the software, an automated setup program and thousands of other shareware and public domain packages on a CD-ROM.

Setting up for overnight data exchange or hooking up to the national BBS networks isn't too hard; many local computer enthusiasts will volunteer to help you over the rough spots with the front-end mailers. And the cost is minimal. Wildmail (for Wildcat!), Binkley and Front Door are some programs that will do the trick.

### Hey—That's MY computer!

Some may be worried that this will tie up a valuable computer. But if even one of your computers has an 80386 processor in it, you can use a program like DESQview™ from Quarterdeck to effectively turn your one computer into several. This works because for most applications, your computer spends almost all of its time waiting for input.

DESQview acts like a traffic cop and coordinates applications, dividing the processor time between your other programs and the BBS. It's so smooth that you may never know the BBS is there unless you use it.

Windows™ users may be happy to know that Microsoft has released Windows 3.1. If you basically like the Windows graphic environment but have been frustrated by constant program crashes, this upgrade may solve your problems. Among other new features, Windows 3.1 now has "hot keys" to start applications quickly.

Digital Research has released an upgrade for its DR DOS™ version 6.0, making it fully compatible with Windows 3.1. In a nice move, DR has automatically sent copies free to all registered users. Un-registered users also can get a free copy by sending in the card, or calling 800-274-4374.

continued on page 19 ►



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World Radio History



## LOWPOWER LOWDOWN

## PCs Can Help Identify Translator Frequencies

by Howard L. Enstrom

**MOUNT DORA, Fla.** It used to be that spotting a useful frequency for a translator entailed no more than tuning the band or studying an FM log. But that isn't the way anymore.

The continuing demand for FM services, coupled with NAB complaints, has led the FCC to change the rules that address interference problems. Typical problems are co- and adjacent-channel relationships, as well as TV channel 6 problems, which relate chiefly to lower frequency translators; and possible I.F.

beat interference when two strong signals, separated by 53 or 54 channels (10.6 or 10.7 MHz), are received.

Severity of interference ties in with a signal's effective radiated power (ERP), signal path distance, pattern, polarization, antenna height and the type of terrain over which it traverses. While FCC station files show antenna height above average terrain (HAAT) based on average terrain elevation for eight radials, such files for translators show antenna HAAT based on 12 radials.

In order to determine precisely any information about protected and interfer-

ing contours for radials at closer intervals, a terrain study must be done. Whether the terrain changes mildly or radically, what lies between 30 and 45 degree arcs may be of critical importance when qualifying a frequency.

**Numbered parameters**

Such procedures use numbered parameters, including meters for antenna center of radiation (COR) HAAT or above mean sea level (AMSL); kilometers for dis-

point terrain database, a monthly updated FCC database, and special programs to do chores quickly, precisely and with repeatability. Although specialized, these programs are available for purchase from specialized shops. Sit with me as we conduct a frequency search and terrain study.

**Case study**

This study is for a California community college that operates a non-commercial FM station. High elevation terrain shields its signal from four scattered communities having a combined population of about 45,000. The station management asks what a translator can do, if it's located at a certain communications

## Whether the terrain changes mildly or radically, what lies between 30 and 45 degree arcs may be critical.

tances between stations and to their F(50,50) protected contours, F(50,10) interference contour and to express their clearance or overlap margins. Other data is similarly expressed, as kW for ERP, dBu for contour level fields, and degrees, minutes and seconds for geographical coordinates.

Numbered symbols also denote station classes, so that applicable values are used in studies. Numbers, or digits, are their first nature, so computers are indispensable engineering workhorses.

Our computers use a National Geophysical Data Center (NGDC) 30-inch

site having an elevation of 6,421 feet; 1,957 meters AMSL. The translator's antenna could be located 39 feet above ground level, so its center of radiation (COR) is 1,969 m AMSL.

Some attending circumstances:

The prospective translator site and communities are rather close to a humongous metro area. Three of the communities are generally clustered, and lie toward 338 degrees. The fourth, an important one, lies at 196 degrees from the site. Because the site is within 320 km of the Mexican border, translator power output (TPO) is limited to 10 watts, although a gain

continued on page 19 ▶

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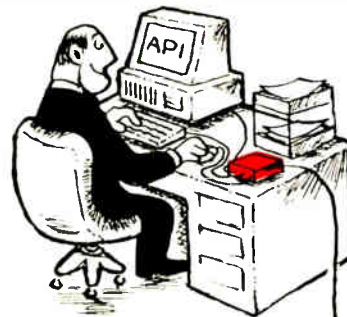
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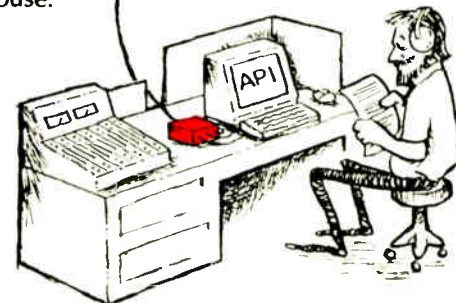
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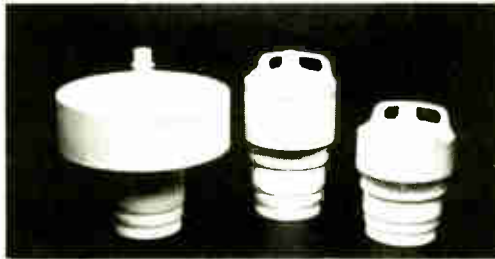
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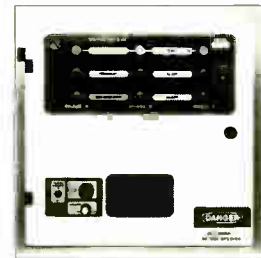
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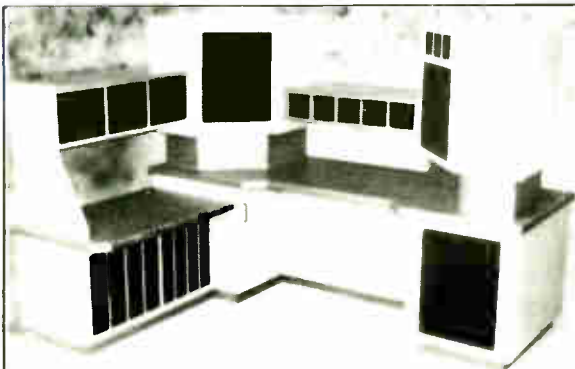


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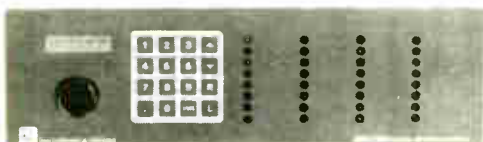
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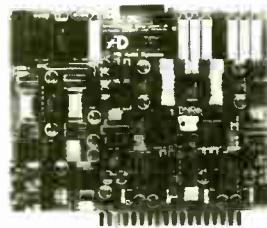
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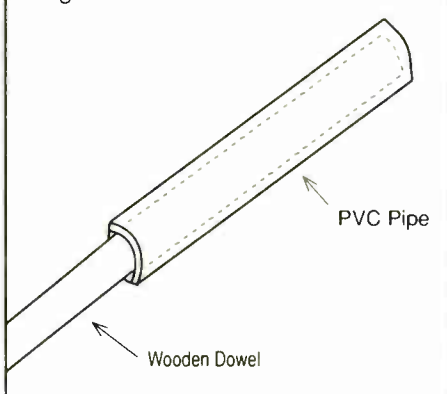
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# WORKBENCH

Figure 1.



can be reached at JMS Productions in Hagerstown, Md.: 301-791-2568.

★★★

From our "do it cheaper" department comes Larry Albert with a couple of wiring tips. The first involves wire identification. Wire markers, labels, and numbers are fine; their only problem is trying to read them upside-down, as you lay under the console. An effective and cheap alternative is to color-code the cables using automotive touch-up paint.

The advantage to using the touch-up paint is the low cost and the built-in

brush. Since the brush is stored in the paint, no cleaning is required. If you want to use paint colors for the standard resistor color code, however, you'll find it harder than imagined (When did you last see a factory original VIOLET vehicle?).

Look around, you just might locate a bottle of purple paint at a hobby store. The hobby paints can be used; their only drawback is there is no built-in brush. A wooden cotton-tipped swab makes an inexpensive substitute.

Larry advises using truck colors, since most auto colors are muted or pastels. You can label the wires with color dots or bands that stand for the resistor color code numbers. Better yet, simply choose colors for "IN," "OUT," "LEFT," "RIGHT," and "MONO". Replacing a tape machine's input and output cables will be greatly simplified.

Next time you have to wire a multipin connector, Larry advises that you drop by your local sewing shop and pick up a crochet hook. These hooks come in various sizes, and some are made of non-conductive plastic. The little hooked end is appropriate for holding the small wires used in electronics. When half the wires are soldered on a connector, and the next wire needed has hidden itself amongst the previously soldered wires, the crochet hook will effectively locate and hold the wire in place for soldering.

Electronics distributors also sell a variety of hooks, but usually at higher prices. The crochet hook is not a replacement for other tools, rather a supplement. Larry Albert maintains the television department at Murray State University in Murray, Ky.

If you need a non-conductive means to mount an RPU antenna, you might want to consider this idea from Bob Reinhardt at WDOV in Delaware: Use a piece of PVC pipe. By itself, the PVC pipe is pretty flimsy, but when you insert a wooden dowel down the center, it becomes almost as rigid as its metal counterpart (see Figure 1). Wooden dowels come in sizes that



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*Editor's note: Always use the utmost care and follow good engineering practices when working with or around electrical equipment. RW will not assume responsibility for any loss or injury.*

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

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# PCs Can Identify Translator Frequencies

► continued from page 16

antenna could be used for higher ERP.

We input the site coordinates and some antenna data, and lo-and-behold—in vivid colors, a 3-D screen display of the area's terrain features. Rotate the site and zoom in. Uh-huh...the problem is seen graphically, but we want hard copy numbers.

We use the contour program to determine numerically the translator antenna's effective HAAT for each of 12 radials. It runs from 106.5 m below MSL at 90 degrees to 1,247.1 m AMSL at 210 degrees. Within a 210 degree arc, the antenna height far exceeds 541 m HAAT, which limits the ERP to 10 watts in those directions.

By the way, let's not forget Section 73.207(b)(3) of the FCC's Rules about Mexican allotments. If ERP is limited to 10 watts, even with our height, can it serve the communities well, but cause interference? We'll get to that later.

Right now, let's print the screen display with six columns of tabulations for 12 radials. It shows average terrain elevation (3 km to 16 km out) is 1,413.1 m. Effective antenna HAAT is 555.9 m, but that's average. Exit the program, but we'll probably return to do more radials.

## Interference studies

Now for the interference study program, which integrates terrain and FCC data with our input information for the TBA translator. All other stations are reference stations. We will search a radius of 285 km,

tell the computer to search only non-commercial channels and list all stations with incoming or outgoing interference—based on TBAs antenna HAAT of 555.9 m.

We want the maximum distance between protected and interfering contours shown as 50 km, and we'll use FCC curves in this study. We are deep into the anatomy of a frequency search, but coming back out, so don't leave now.

Here is what's happening: The compiler program hands its sorting over to a contour interference program that processes and analyzes data and other information relative to TBA and every reference station within the search distance.

It mathematically calculates and posts distances for correct contours, including margins of clearance or overlap. It also shows statistical information on each station and computes data in regards to special FCC rules, including status applications and Commission actions. Reference stations may have up to 21 types of data, displayed in colors.

So far, our search is based on a non-directional radiation, so displayed interference to or from a reference station might be dealt with in numerous ways. A close-up single channel study may suggest adjustment of site location, antenna height, or ERP. Or, introduce suppress radiation in a certain direction using a directional antenna. When we determine what level of ERP does not interfere, we can assign that ERP for the azimuth of

concern to form a directional antenna, with suppression expressed either in dB or voltage.

## Selecting the right answer

Whatever single or combination of "off the shelf" antenna patterns, the coverage, not radiated, pattern is displayed and tabulated in a computer plot program. In addition to terrain data and geographical coordinates, the program is input for non-directional antennas. For directional, the antenna patterns azimuthal parameters, including maximum array ERP and COR AMSL.

The program generates the plot and superimposes it on adjustable scale geographics. It can be stand-alone for coverage, or TBAs interference contour with a reference station's protected contour

graphic, producing accurate plots that show clearance or overlap. Reverse contours may be added, and scaling changed for close examination...all in screen colors and printable.

On that California translator—we'll have to use linear-polarized log-periodic antennas because of their deep side-null characteristic. From this site, the only useful channel frequency requires 18.4 dB of suppression; 0.15 watts toward 253 degrees true (T).

Hope this has been interesting, though more space is needed for such a large subject.

□ □ □

Howard L. Enstrom is an engineering consultant and president of FM Technology Associates, Inc., 30925 Vista View, Mount Dora, FL 32757. His firm specializes in FM translator services and represents equipment manufacturers. He may be reached at 904-383-3682, or by fax at 904-383-4077.

# Station BBS Installation Tips

► continued from page 14

And here's a program that's a definite "buy" if you use a DOS word processor: NVELOPE Plus from LA-SOFT. This great utility will "grab" an address from a letter and add it to a database, from which you can print envelopes or address labels of all sizes. Or, you can "drop" an address into a letter. That alone is a time saver, but there's more.

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postal office. And several categories of USPS and UPS shipping costs are automatically calculated from one ounce to 70 pounds, eliminating all those annoying charts that are always somewhere else. LA-SOFT can be reached at 800-448-2970.

□ □ □

Barry Mishkind, aka RW's "Eclectic Engineer," is on-line, too. He can be reached on FidoNet at 1:300/11.3 or "barry@coyote.datalog.com" on Internet. Phone him at 602-296-3797.

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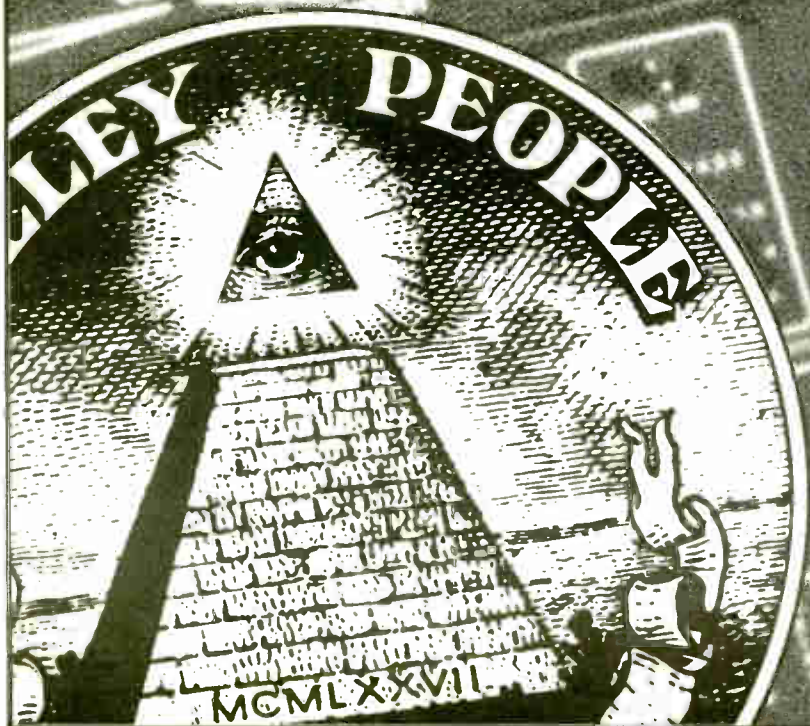
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# Engineers Flock to San Francisco AES

by Nancy Reist

**SAN FRANCISCO** Thousands of audio enthusiasts and more than 200 exhibitors are expected to congregate in San Francisco's Moscone Center on Oct. 1-4 for the Audio Engineering Society's 93rd convention.

PR Chair Brian Cheney said this is the first time the annual show, which routinely alternates between the east and west coasts, has been held in San Francisco.

Cheney explained that San Francisco is an appropriate place for an audio convention. "There is a lot of audio history from this area; a lot of major inventions in audio were made here. There's an audio museum down at Ampex which is very interesting. It shows basically what's been going on in the past 60 years in audio in this area. There are a lot of high tech recording and film post production facilities in the Bay Area, such as Lucas Films, Fantasy and Dolby Labs. We're trying to make it as attractive for the overseas and out of town visitor as possible."

### Organized tours

The AES has organized a wide range of excursions for the convention, including seven technical tours of Bay Area facilities. The AES has tourist-oriented tours planned as well, and Cheney said the annual awards banquet will be held on a yacht.

Convention workshops are intended to combine practical advice with hands-on experience. Topics include MIDI, MADI, grounding and isolation, the future of women in a "man's field," and fiber optic technologies for studios and touring.

Terry Schultz, technical sales engineer for Motorola Semiconductor, will be chairing the workshop, "Data Compression Techniques and Pitfalls." He said workshop participants will be discussing, comparing and listening to various forms of data compression, including MPEG audio, Dolby AC-2 and AC-3, and the systems used in the Philips digital compact cassette (DCC) and the Sony Mini Disc (MD).

Gary Hall, manager of technical support for Sonic Solutions, will chair a workshop on random-access digital audio workstations. He said the workshop's intent is to look at the field overall and discuss generic issues of maintenance and operation, rather than to compare different systems. The panel will include both users and manufacturers.

### Workstation discussion

"The basic premise is there's been a few years of experience now with (workstations), and it's time for people to get together in a public forum and discuss some of the ins and outs of what they've gone through and what the differences are in operating and maintaining a hard disk-based system," he said.

There also will be two technical panel discussions held in Spanish—with no translation provided. Convention Chairman Leo de Gar Kulka explained, "This is the first time that we've had a meeting that is directed to one geographic area. We feel that there are a lot of people from South America coming up here. We want to honor them and get them in touch with the Spanish-speaking community we have here in the U.S. for an exchange of ideas."

"We felt that the people in South America

have been sort of isolated from the general community. We have to make the technical community aware of what is going on in the rest of the world and make the technology available to them."

### Perceiving sound

Of course, many technical paper sessions will be featured at the convention. A session on psychoacoustics is scheduled for Thursday morning, Oct. 1. Session Chair Marjori Schmutzler, VP of Frank Hubach Associates, said discussion topics will cover human perceptions of sound, such as how signal-to-noise ratio affects our ability

to feel we can hear clearly, and listener preference of speaker placement.

"Psychoacoustics is an up and coming field. They're starting to take these psychoacoustic principles and apply them so that our entertainment is heightened. So I think that you're seeing more and more activity happen in this area as time goes on," Schmutzler said.

The challenges associated with interfacing digital equipment will be discussed in another Thursday morning session. Chris Dunn and Malcolm Hawksford from the University of Essex, United Kingdom, will be presenting a paper, "Is the AES-

EBU/SP DIF Digital Audio Interface Flawed?" Other papers will focus on jitter, a pulse width analyzer for testing AES/EBU serial digital audio signals, a minimal delay digital audio synchronizer, audio system architectures, and low-rate coding for high quality audio over telephone lines.

Also scheduled for Thursday are two sessions on digital signal processing. The morning session focuses on theory and includes papers on scalable audio compression for mixed computing environments, relationships between noise shaping  
continued on page 22 ▶

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# Engineers Converge on AES

► continued from page 21

and nested differentiating feedback loops, the use of IIR filter structures for acoustic equalization and processing, VLSI architecture for asynchronous sample-rate conversion, and compatible improvement of

focus on A/D and D/A conversion, including papers about a fifth-order Delta-Sigma modulator with 110 dB audio band dynamic range; an 18-bit Delta-Sigma D/A processor system achieving full-scale total harmonic distortion plus noise (THD+N)

greater than 100 dB; a low distortion D/A converter; achieving optimum performance from Delta-Sigma A/D and D/A converters; and time-domain behavior of dithered quantizers.

Auralization will be the topic of a Saturday morning technical paper session, which includes papers about EARS software, the auralization of QRD, a sound field simulator for the

design of room acoustics, and two papers on binaural auralization.

Another Saturday morning session will highlight loudspeakers. The presenters will discuss acoustic waveguides, the design of Class B output stages, a new midrange horn driver, efficient loudspeaker parameter estimation, a computer model for loudspeaker-amplifier interactions, a compact dipole loudspeaker, and source directivity using the Hankel Transform.

Other technical paper sessions include: adaptive filters, active control of sound fields, digital music and measurement,



The Moscone Convention Center in San Francisco will play host to this year's AES gathering.

16-bit systems using subtractive dither.

In the afternoon, the emphasis switches to coding. Ten papers dealing with different aspects of this topic will be presented.

## Numerous topics

The first technical paper session, scheduled for Friday afternoon, Oct. 2, will concentrate on multichannel sound reproduction. It will include a variety of papers on multispeaker, multichannel and surround sound systems, transaural stereo, and private broadband LAN.

Another Friday afternoon session will

## AES Schedule at a Glance

*Editor's note: The following is an at-a-glance schedule of the sessions and seminars of the 93rd AES convention in San Francisco, Calif. Not included here are the individual papers to be given or the many related workshops planned by the society. For additional information, contact the AES at 212-661-8528.*

### Thursday, Oct. 1

- 9 a.m. Psychoacoustics  
Digital Signal Processing (Theory)  
Interfacing Digital Equipment  
*Silicon in Audio (full-day seminar)*
- 1 p.m. Digital Signal Processing (Coding)
- 1:30 p.m. Adaptive Filters
- 2 p.m. Active Control of Sound Fields

*Exhibit Hall Open 10 a.m.-6 p.m.*

### Friday, Oct. 2

- 9 a.m. Auralization 1  
Digital Music  
Measurement  
*Computers in Audio (full-day seminar)*
- 1 p.m. Multichannel Sound Reproduction
- 2 p.m. Architectural Acoustics 1
- 3:30 p.m. A/D and D/A Conversion

*Exhibit Hall Open 10 a.m.-6 p.m.*

### Saturday, Oct. 3

- 9 a.m. Auralization 2  
Loudspeakers 1  
Digital Signal Processing (Applications)
- 1 p.m. Digital Innovations in Audio Technology
- 2 p.m. Architectural Acoustics 2  
*Loudspeaker Measurements (three-hour seminar)*
- 3 p.m. Microphones

*Exhibit Hall Open 10 a.m.-5 p.m.*

Reception and Awards Banquet (time TBD)

### Sunday, Oct. 4

- 9 p.m. Loudspeakers 2  
Care and Feeding of Hard Disks in the Studio Environment  
(three-hour workshop)

*Exhibit Hall Open 10 a.m.-4 p.m.*

# Sessions Embrace Wide Range of Topics in Audio

by Nancy Reist

**SAN FRANCISCO** The AES convention has planned several technical sessions that will present cutting edge computer research and technology that can assist radio engineers.

"Digital Innovations in Audio Technology," scheduled for Saturday, Oct. 3, will look at some of the more fundamental issues involved in digital technology. Robert Currie, director of software engineering at Digidesign, will chair the session.

The session will be very helpful for the growing number of people who are interested in practical ideas for using digital technologies, he said.

"What I've found from my personal experience at Digidesign is that two or three years ago we'd go out to a facility and people would be completely blown away by graphic editing, undo-redo, and the ease of manipulation. Now, even people that don't use digital audio workstations from day to day start asking you right up front, 'What about backup? How about file management? How about library management? What are we going to do for long-term storage?'"

## A digital examination

The session includes papers on file management, longevity and reliability of R-DAT tapes and CDs, and signal quality throughout the signal chain.

Another technical session will focus on a variety of applications of digital signal processing. A paper from the BBC research department will discuss a technique for unobtrusive compression of musical

material for broadcast. Dolby Laboratories will present a paper about a digital stereo generator for FM broadcast.

Other topics include a multitask method for digital restoration of old recordings, high dynamic range audio applications for digital signal processing, restoration of recorded audio through adaptive noise cancelling, signal processing for simulating realistic stereo images, computer simulation, analysis of pre-distortion, adaptive equalization of digital satellite and digital microwave radio systems with nonlinear transmit amplifiers and multipath propagation.

## Acoustic methods

"Architectural Acoustics 2," also on Saturday, will focus on computer and electronic modelling of enclosed acoustic spaces such as concert halls and studios. Session chair Jeffrey Borish, president of EuPhonics, said that models can be invaluable tools for audio engineers and acoustic architects because they can approximate the sound of a studio and help designers detect possible problems with the acoustics before expensive construction begins. He said models also are important because they allow designers to simulate different acoustic designs and test people's subjective responses to them.

A technical session on microphones will include papers on Blumlein Shuffling and stereo microphone techniques, microphone techniques for three-channel stereo, a 3-1 quadraphonic microphone for HDTV, and the use of interference tube microphones.

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## PRODUCER'S FILE

# Learning to Use the Roland DM-80

by Ty Ford

**BALTIMORE** This edition of *Producer's File* picks up where last month's ended with "the rest of the story" of the Roland DM-80 digital audio workstation. For about \$7,000 you get a four-channel version, which is upgradable to the \$13,500 eight-channel version. If you can afford the eight-track version, go for it. You can never have enough tracks.

Four channels will do just fine for mono spots and newsroom editing, but four channels is cutting it a bit tight for complex stereo spot production, (especially if you use stereo effects on the voice track and stereo music beds). The DM-80 also generates SMPTE time code and locks to LTC (linear time code) and video sync, which is useful in audio for video applications.

### The learning curve

Because the DM-80 doesn't require a computer interface, the learning curve is not as steep. (You have to double the learning curve for systems that require a computer front end because you have to know the computer system as well as the workstation system.)

In addition to the extra counter space that having a computer in the production studio requires, the noise from the computer fan and hard drive is not conducive to "combo" production. You may also find, as I did, that some mics don't like to be too close to a VDT (video display terminal). One of my mics became a noise antenna, picking up an unacceptable amount of radiation in the form of a rather nasty buzz from the VDT in my studio.

Learning 80 percent of the DM-80's operating system requires anywhere from a few days to a few weeks, depending on how easily the operator absorbs the information, the amount of time spent working with the system, and the difficulty of the project. Typically, the production director will learn the system and pass on the information to the rest of the staff. Don't expect everyone on the staff to jump at the chance. Simple airstaff production chores like straight voice, donut filling, recorded tags and simple voice-over spots will probably still be done "hot," using carts and reel-to-reel and/or DAT machines.

The power and performance of the DM-80 comes from the quality of its digital audio, its editing precision, the flexibility it offers in making alternate versions, its digital EQ and its automated mixing. The 64xdelta-sigma A/D (analog to digital) converters and the 8x20-bit D/A converters make for very nice sounding audio. You can hear that kind of quality on the air.

### Complexity and control

Stations with DAWs (digital audio workstations) typically have more complex production because the systems offer more control. More control translates into better timing, being able to get more information into a promo, thus more animated productions. The intelligent use of this ability is the best weapon I know of for punching through

the clutter to reach the listener.

It can be argued that boot-up and archiving take extra time. Startup time varies depending on the size of the production that is first loaded into the system. On an average, it took about 1.5 minutes for the system to boot up. Most edits and moves typically take less than three seconds. However, the time you save by being able to enter a sound effect, voice or music drop into the system and then move it to exactly the place you want in two steps more than makes up for the time lost trying to punch a cart machine or CD player at

the exact right moment during "on-the-fly" two-track or multitrack tape production.

Then there's the time you save and the flexibility gained by being able to edit a music track so that the vocal upcut happens right where you want it. Say you're doing a concert spot. Generally I don't like having vocals under the copy. It's too distracting. With the DM-80, you can enter the instrumental section and vocal upcut of the song you want, and edit them together so that the vocal happens exactly where you want it to. I usually go for the "hook," which

is often part of the song's chorus. Choosing the chorus that leads to the instrumental break provides a natural return of the instrumental for the rest of the copy. Once you get proficient with digital slicing and dicing, you can chop the upcut if it's too long, or loop portions of instrumental bed to make the bed last longer.

### Digital patch bay

The DM-80 also includes an internal "digital patch bay" that allows you to route any analog or digital input to any track. The patch bay is one of the many screens that can be called up on the DM-80R remote control panel that comes with the system. The eight separate analog outputs, stereo analog "mix" output, stereo digital output and

continued on page 34 ►

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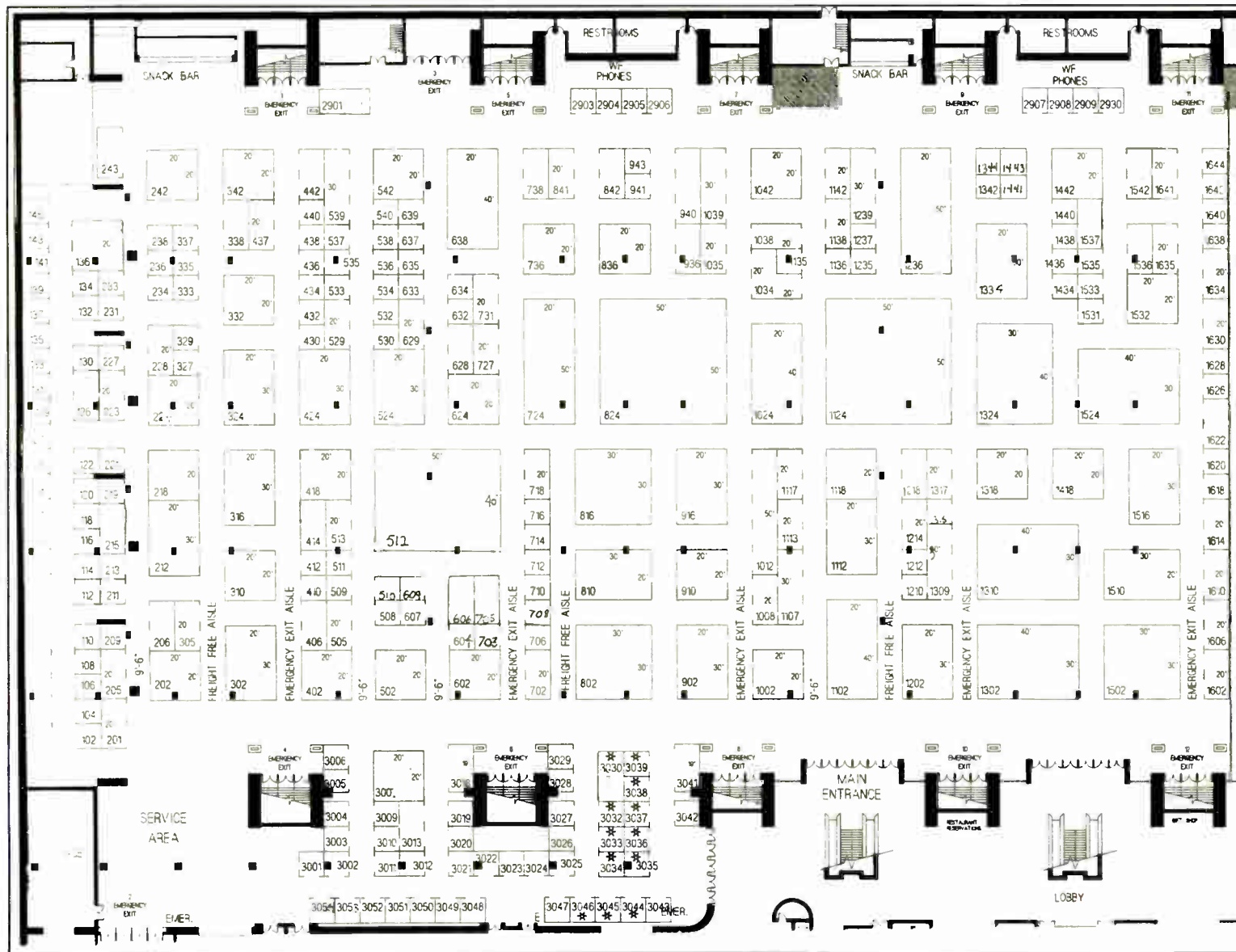


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**1992 AES Exhibit Floor**

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 AES source materials

**AES Sponsors Bay Area Technical Facility Tours**

by John Gatski

**SAN FRANCISCO** Along with a full schedule of papers and workshops at the 1992 AES show, registrants also can take advantage of planned tours of technical facilities.

The first tour gets underway on Thursday, Oct. 1, with an excursion to Silicon Graphics' twelve-building complex in Mountain View, Calif.. The company is known for its computer graphics and digital audio workstations. The first tour of the facility is scheduled for 9:30 a.m.-11:30 a.m. The second is slated for 1:30 p.m.-3 p.m.

The second technical tour, Dolby Laboratories, should be of particular interest to radio engineers. Highlights of the Friday, Oct. 2 visit will include a demonstration of the new digital stereo motion picture audio and analog audio equipment with the Dolby S encoding, that is said to rival DAT. The first tour is scheduled for 9:30 a.m.-11:00 a.m., with the second scheduled for 1:30 p.m.-3:30 p.m.

Another Friday tour will showcase the Plant Recording Studios in Sausalito. Numerous classic rock albums have been recorded there, including Fleetwood Mac "Rumours" and Stevie Wonder's "Songs in the Key of Life." The tour is scheduled for 10 a.m.-11:30 a.m.

The first Saturday, Oct. 3 tour takes place at Charles M. Salter Associates, a

major designer of acoustic environments. Projects developed here include the LucasFilm Technical Building at Skywalker Ranch and Dolby's Screening Room. Four tours are slated: 9:30 a.m.-10:30 a.m., 11:00a.m.-12 noon, 1:30 p.m.-2:30 p.m., 3:00 p.m.-4:00 p.m.

A second Saturday tour will feature Fantasy Studios in Berkeley. A major recording studio with four separate recording areas, it also includes a mastering facility and tape duplication rooms. Such artists as Huey Lewis and Aerosmith have recorded there. The tour also includes a stop at the Saul Zaentz Company Film Center. The entire tour is scheduled for 9:30-1:00 p.m.

The last Saturday tour showcases the Ultrasound facility in San Rafael, innovators in the concert sound reinforcement field.

Those undertaking the tour will get a first-hand demonstration of a newly developed DSP-based sound reinforcement measurement device. The tour is scheduled for 1:45-3:15 p.m.

The last technical tour on Sunday, Oct. 4, will take place at the University of California's Center for New Music and Audio Technologies (CNMAT). The center focuses on the synergy between artists and scientists in these fields. The tour is scheduled for 9:30 a.m.-11:30 a.m.

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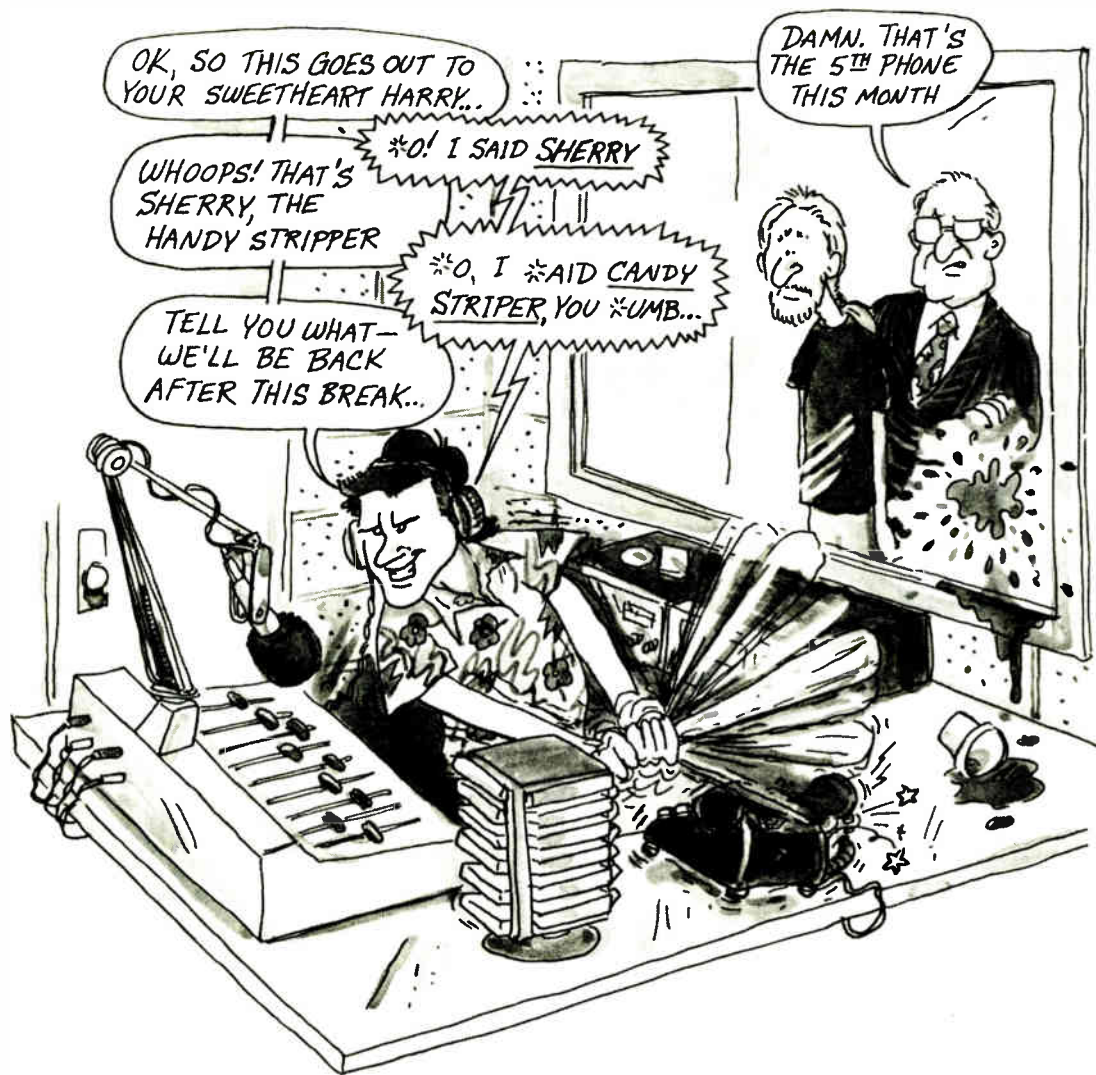
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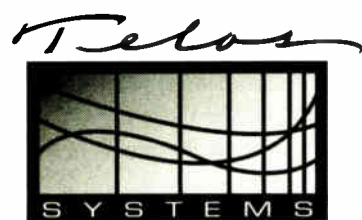
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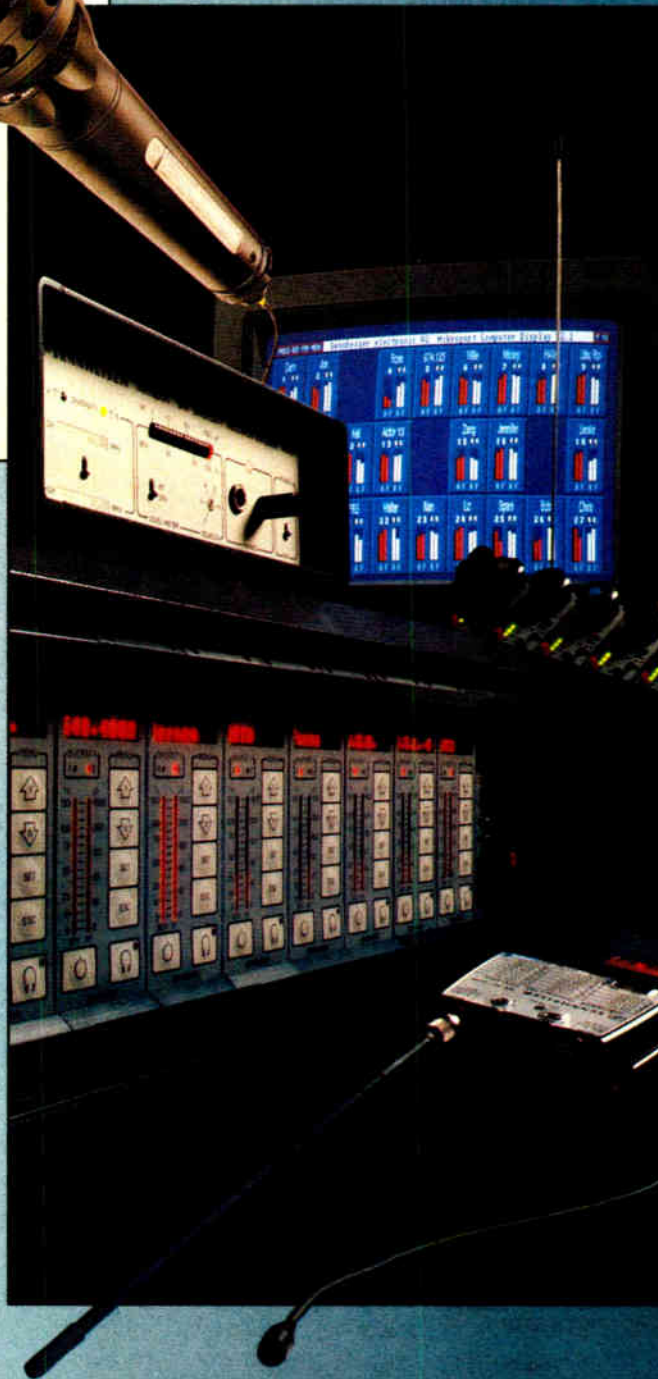
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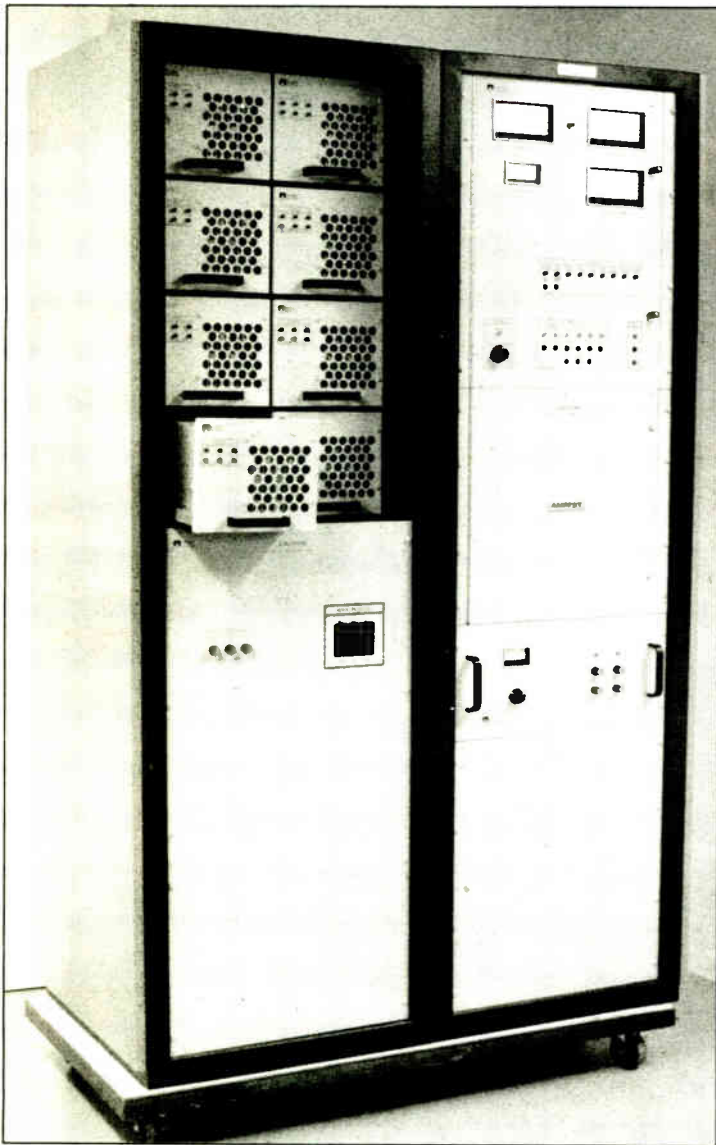
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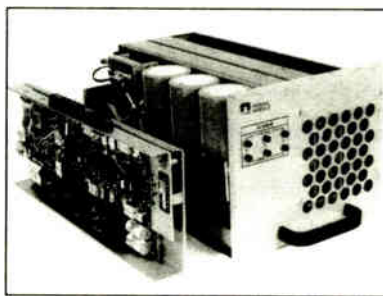
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# WMMS-FM Wins Construction Race

► continued from page 13  
WHK-AM studios emerged.

## AM talk and FM Zoodio

The AM air studio houses a Harrison console, Fidelipac cart machines, Denon CD players, and Studer reels. A newsbooth and AM talk studio are off to the side of the air studio. The talk studio enables station talent to hold their panel discussions in the comfort of a relaxed atmosphere, complete with couch and chairs.

WHK-AM also finally got its much needed network studio, which is

equipped with a Harrison console and Fidelipac cart machines as well as Comrex couplers for the network feeds.

For the FM's Zoodio, a full 16-track reel-to-reel recorder holds the key to flexibility. The station made the leap to 16-track with a Tascam ATR60 tape recorder, and had purchased a Tascam M600 studio mixer with ample in-line EQs and sends and returns for effects. A voice booth sits off to the side of the FM Zoodio for voice-overs during production, and the main FM air studio, which is similar in equipment setup as the AM, is

adjacent to the voice booth.

In the production studios for AM and FM, Rocco decided to bring over existing Pacific Recorders consoles as well

said Rocco, adding that the T1 service is "saving (the station) a couple grand a month."

The next step, he said, will most likely be Switched 56, a technology that will make it more feasible to hook into Malrite stations in Philadelphia and elsewhere.

Until then, Rocco is staying busy with



The high-tech WMMS "Zoodio" features a Tascam 16-track reel-to-reel, Mirage sampling keyboard, and a rack of effects.

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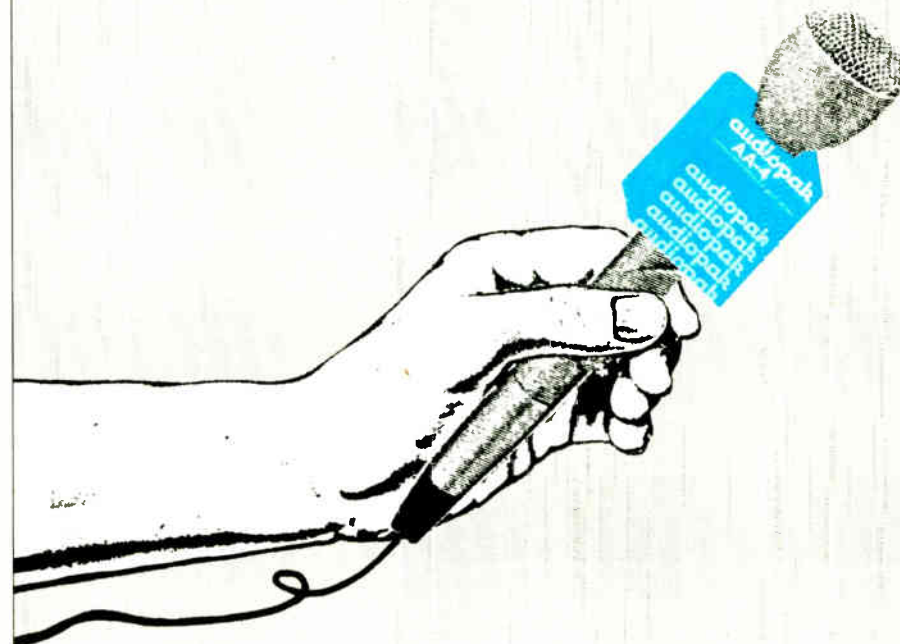
as Studer recorders and Denon CD players.

For an auxiliary studio-to-transmitter link, Rocco decided to go with T1. "I'm using the T1 primarily as backup to the Marti (950 MHz), but I'm also using it as a return for my satellite services which are located at the transmitter."

plenty of remotes and the day-to-day operation of the two stations. Occasionally, he said, he also takes time out to enjoy the new studios.

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

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## Learning to Use the Roland DM-80 Workstation

► continued from page 25

two stereo AUX busses give you an impressive amount of flexibility. Headroom is adjustable from 0 dB to -23 dB, which allows the DM-80 to comfortably coexist with a wide variety of different system levels.

In the eight-track version, each of the eight tracks has its own  $\pm 12$ dB digital high and low frequency sweepable shelving EQ. The low band sweeps from 40 Hz to 1500 Hz, the high band 500 Hz to 18 kHz.

### Automation

The crowning jewel in the DM-80 is its real-time automation. Once you get your tracks laid in, you can do an automated mix, including level, EQ and pans. If, during mixing, you don't like the EQ on one

element on a track, you can adjust the EQ on that track and then set it back to the original setting before the next element on the track is heard. If you make a pan move that's not quite right, you can punch back in and update it until you get it right.

Incidentally, the gain stages of the pan circuitry are designed so that you don't get that summing gain bump as you pass through the center of the stereo spectrum.

The only criticism I have of the system is its lack of "reel-rocking" or "scrubbing". To find edit points, you put the system into either of two loop modes. One loop mode lets you hear the audio up until the edit point, the other begins at the edit point and lets you hear everything thereafter. You can set the loop time to hear anywhere from 0.1 to five seconds.

If you've ever tried to "tight cue" a CD by putting the CD player into "Pause" mode and bumping up the start position until you hear the beginning of the track, you've already learned the skill necessary to find edit points. Being a "reel-rocker" from way back, I was concerned about the accuracy of my edits. With a little patience and practice I was able to edit out the breaths between words with no trouble. As I became more comfortable with the system, my speed increased. The more you work on the system, the more automatic your responses become and the more options you discover.

The DM-80 also needs a more easily accessible "Undo" function. In the beginning, before I got my chops up, I would hit the wrong key or use the wrong feature to

get something done. At this point you can revert to the previously saved version, but it takes a few keystrokes and a few minutes to reset the system. The truth is, as I got better acquainted with the DM-80 I made a lot fewer of those mistakes.

Even as you are reading this column, Roland is working on fine-tuning the operating software based on users requests. Because the software is upgradable via EPROM chips which you will be able to plug in yourself, and because of its price, I predict that the DM-80 will find a comfortable niche in the radio, audio-for-video and music project studio markets. It's definitely worth a look.

For more information, contact the Roland Pro Audio/Video Group at 213-685-5141, ext. 337.

□ □ □

Ty Ford may be reached at his beta test site studio at 410-889-6201, via MCI Mail 347-6635 or America Online (Tford).

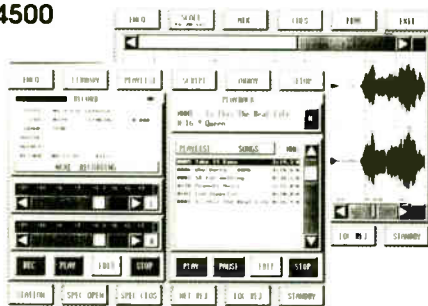
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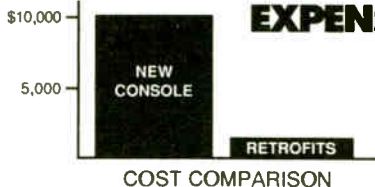
There are two null controls for reducing the audio input to output transfer. The hybrid also has an audio processor to reduce receive gain by 10 DB while audio is being sent to the caller. This reduced trans-hybrid leakage to a point where it is not normally audible to listeners.

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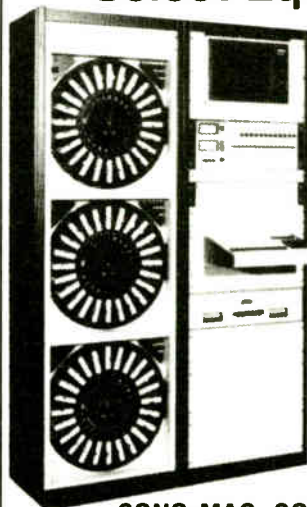
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# Small Wonder

ASHLY was founded in 1972 with the stated goal of producing professional audio equipment that would set new standards for sonic excellence and reliability. The Company originally manufactured large mixing consoles with on-board signal processing for touring sound systems. Later, the consoles' built-in processing components were offered as separate rack-mounted units. The initial product line consisted of limiter/compressors, parametric equalizers, and a full selection of electronic crossovers. ASHLY added power amplifiers to its product offerings during the late 70's, and soon gained a solid reputation for the amps' outstanding sonic performance and incredible reliability.

Building on this background of success and technological innovation, ASHLY has set out to expand its amplifier product line to encompass new markets. The new model SRA-120 professional stereo amplifier has been

developed toward this goal, and offers superior sonic quality, rugged construction, and many useful features in a single rack space chassis. The compact SRA-120 is suitable for full-range applications, such as small control room monitor systems or as an ideal headphone distribution amp.

With its excellent signal bandwidth, the SRA-120 is also well-suited for driving the high-end of a bi-amplification sound system setup.

The amplifier will deliver 60 watts per channel into 4 ohms stereo, 45 watts per channel into 8 ohms stereo, or 120 watts total into 8 ohms mono-bridged. Its design is based on "Class A" voltage amplifier stages with a complementary bipolar output section for low distortion and excellent overload behavior. Features include turn-on delay circuitry and instantaneous turn-off to eliminate any transients to the speaker. Each channel will also independently turn off its output if an overheated condition occurs.

This model also features rear panel switches to select between two choices of input sensitivity, stereo or mono operation, or normal or bridged mode. Rear panel input connections may be made via 1/4" balanced phone jacks or barrier strips with ground lift provision. Level attenuators for each channel are provided on the front panel, along with a stereo headphone jack. Status L.E.D.'s on each channel include signal present, clip alert, and "protect-mode" indication.

The SRA-120 is approximately 10" deep and weighs in at under 20 pounds, yet has performance characteristics and features typically found only in larger, more costly competitors. All Ashly amplifiers are covered under the company's exclusive Five Year Worry-Free Warranty program, offered at no extra cost to the user.

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- 45 WATTS PER CHANNEL INTO 8 OHMS
- 120 WATTS BRIDGED-MONO INTO 8 OHMS
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- INPUT SENSITIVITY SELECT SWITCH
- 1/4" PHONE JACKS AND BARRIER STRIP INPUTS
- CLASS A FRONT END
- TOROIDAL TRANSFORMER
- TURN ON DELAY
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- INDEPENDENT THERMAL PROTECTION
- STEREO HEADPHONE JACK
- CONVECTION COOLED





# disk & dat



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TECHNOLOGY UPDATE

## Up in the Sky...DATS Not Just a Bird!

### GE Americom's Digital Audio Transmission Service Offers Flexible Method for Program Distribution

by Fred Cain  
 Director, Business and  
 Broadcast Services  
 GE American Communications

**PRINCETON, N.J.** Since radio networks discovered the advantages of satellite transmission in the early 1980s, satellites have provided a cost-efficient, reliable conduit for the distribution of network programming.

Today, virtually all major radio networks distribute programming to their

tion specifications far exceed those of currently available analog transmission systems.

#### Diverse programming

Typically, one satellite transponder can carry 20 15 kHz channels, 40 7.5 kHz channels, 220 32 kilobits per second (kbps) voice or data cue channels, or combinations thereof. The normal configuration is 19 15 kHz channels or a combination of 15 kHz and 7.5 kHz, as well as 11 cue channels. This flexibility makes it

easy for networks to provide diverse or expanded programming.

Working with ABC Radio Network and Scientific Atlanta, GE American Communications (GE Americom) developed and launched DATS in the early 1980s.

Today, GE Americom still is the only satellite service supplier providing DATS, which is available on one of the company's C-band satellites, SATCOM C-5. The recent development of Spectrum Efficient Digital Audio Transmission (SEDAT) by Scientific Atlanta has further increased the flexibility of DATS technology, while reducing per-channel costs.

National, regional or specialized networks also can make use of satellite-distributed Single Channel Per Carrier (SCPC) service. The advantages provided by this proven technology include flexible audio channel bandwidth and flexible carrier bandwidth growth that can accommodate

future expansion.

Both GE Americom and other satellite suppliers offer SCPC service in digital or analog formats. Analog SCPC provides radio programmers with both 7.5 kHz and 15 kHz analog signals. Recent developments in digital SCPC channels allow for a variety of data rates (128 kbps to 384 kbps), providing 10 kHz or 20 kHz audio channels. The frequency-agile digital SCPC service makes possible the efficient use of the satellite frequency spectrum, thereby keeping costs down. GE Americom can accommodate SCPC users

on three of its satellites: C-band service on SATCOM C-5, or K-band service on SATCOM K-1 and K-2.

#### Consider all the options

For both national networks and smaller startup services, satellite audio distribution can be tailored to meet a variety of technical and business needs. These

tively. For example, almost all of the major commercial U.S. radio networks use SATCOM satellites to distribute programming to their affiliates. This represents a potential affiliate base of more than 7,000 stations.

When you're considering a satellite carrier for audio distribution, be sure to evaluate all of these technical, service and

**Signal-to-noise ratios and harmonic distortion specs far exceed those of analog transmission systems.**

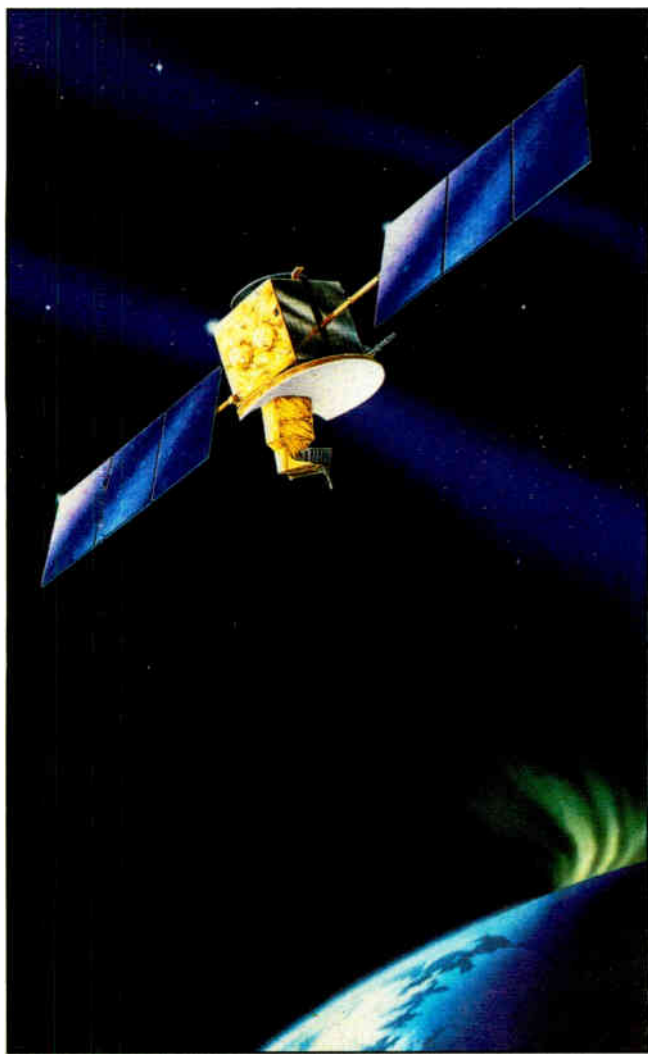
might include C-band and Ku-band options, digital or analog services and added-value services such as 24-hour monitoring, reference carriers and comprehensive restoration plans.

Your needs may also include a quality programming neighborhood—a crucial factor if your goal is to reach a large number of network affiliates cost effec-

programming neighborhood options carefully in order to make the choice best suited to your goals.

□ □ □

For more information, contact Fred Cain at GE American Communications in New Jersey at 609-987-4200; fax: 609-987-4517; or circle Reader Service 85.



GE Americom's SATCOM C-5, which carries Digital Audio Transmission Service, allows radio networks to deliver interference-free, concert-hall-quality audio to affiliates.

affiliates via satellite, outdating many ground-based alternatives.

Digital Audio Transmission Service (DATS) is a digital satellite service technology that delivers both high audio quality and transmission flexibility. It employs pulse code modulation (PCM) and time division multiplexing (TDM) techniques.

This approach, which uses a single carrier to saturate a satellite transponder, is designed to avoid potential inter-satellite and terrestrial interference problems. Signal-to-noise ratios and harmonic distor-

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# Which type of CD player is right for your station?



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With its hugely successful DN-970 and DN-950 CD Cart™ Players, Denon helped make CDs the broadcast media of choice. Given the success of these industry-standard players, there were only two things Denon could do: 1. Make a CD Cart player that is smaller, faster, smarter and better; 2. Make a pro CD player that is *not* a Cart player. Denon did both.



ACD-5B CARTRIDGE WITH ATS BAR CODE.

The new DN-961FA Drawer-Loading CD Player is Denon's answer to the many broadcasters who *formerly* had to choose between the drawer-type player they needed and the Denon performance they wanted.

Its Eject-Lock during play adds another most-wanted feature to its list of attractions. Meanwhile, the new DN-951FA CD Cart™ Player dramatically improved functionality with its Auto Track Select (ATS) system, which reads bar-coded carts to *lock-in, lock-out* or *auto-cue* to a specific track.

That's not all; three-in-a-rack mounting, true instant start, and end-of-message signals with selectable time-to-end are just a few more key features of these cost-effective new players.

The DN-961FA and DN-951FA. Denon just made it twice as easy to decide which CD player is right for you.

**DENON**  
The first name in digital audio.



## USER REPORT

# Dataworld Maps Out Station Boundaries

## Maps and Census Data Help Broker Get the Whole Picture When Settling Station Border Negotiations

by Mark Jorgenson  
President  
Jorgenson Broadcast Brokerage

**TAMPA, Fla.** As a nationwide broadcast broker, I work with radio and television station owners all across the country. Because there are so many more radio stations and because they change hands more often than do TV stations, most of my transactions are in radio.

Marketing radio properties in a country as geographically and ethnically varied as ours requires quite a bit of homework as a broker in order to accurately and professionally represent the station owner. I subscribe to most of the trade publications, several market resource services and a computerized database that tracks stations, their technical facilities, formats and ownership.

As quickly as our industry is changing, it is absolutely critical that we all be armed with as much up-to-the-minute data as possible.

### The most useful

One of the most useful resources I have found in marketing radio stations is Dataworld of Bethesda, Md. In particular, I find the company's maps to be a terrific tool in working with both sellers and buyers of radio stations. They have, on more than one occasion, amicably settled conflicting claims on station coverage.

Using Dataworld and its daily updated

**I find the company's maps to be a terrific tool in working with both sellers and buyers of radio stations.**

database as an unbiased third party, buyers and sellers quickly get past the claims and counter-claims of coverage and move on to the non-technical specifics of the dealmaking. While I would never suggest that studying a "predicated contour" on a computerized map is a substitute for on-site diligence by a competent engineer, the old adage that a picture is worth a thousand words seems to hold true in the case of a custom-made map. I routinely order them as part of my due diligence before marketing a station.

In some cases, a Dataworld map is crucial to the transaction because of the new intended use of the station. For example, last year I sold 107.1 FM in Ventura (northwest of Los Angeles) and 107.1 FM in Fallbrook (southeast of L.A.) to Douglas Broadcasting, owner of 107.1 FM in Arcadia (east of L.A., midway between the other two stations).

A Dataworld map not only showed how the three signals would create a "trimulcast," but by adding ethnic population data to the contours, we confirmed the logic of simulcasting the Asian-language format of the Arcadia station on its new

sister stations. The results for the new operation have been impressive.

### Narrow the field

Last week, on behalf of the owner of a troubled suburban major market FM, I ordered a map from Dataworld, identifying potential LMA partners in the inner city. By seeing where the in-market stations' coverage is lacking in the suburbs,

we should be able to narrow the field of potential match-ups. It is a very convincing map for both the lessor and the lessee. It is, or course, only one factor in determining whether or not an LMA is in order, but it is an important one.

Whether it is for a radio combo in the mountains of West Virginia or a Spanish-language station on the coast of Florida, the more information I as a broker can provide about a radio station and its market, the more options I have to sell the stations. The radio, television and the brokerage businesses are facing pressures

and challenges like never before.

Changing demographics and a new regulatory climate have dramatically changed the old rules of the game. Dataworld's maps and census data help expand the thinking of what can be done with a radio facility to help determine its "highest and best use" and to maximize its value for both the seller and buyer.

□ □ □

For information on Dataworld, contact Bob Richards in Maryland: 800-368-5754; fax: 301-652-8822; or circle Reader Service 81.

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## TECHNOLOGY UPDATE

# Who's running the ship?

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## "RCS Works!" Integrates with Master Control

by **Kenny Lee**  
Project Manager  
Radio Computing Services

**SCARSDALE, N.Y.** If you want to know how to knock down the walls of your radio station, read on. This article, however, is not about crowbars and sledgehammers. It describes a new digital audio system that also distributes digital sound and other vital data throughout your radio station.

"RCS Works!," an integrated, digital radio station for the future, breaks down communication walls by allowing staff and management to access key information when and where it's needed. It's also a complete digital audio broadcast system.

A central component of RCS Works! is our Master Control program. Its new digital audio option stores and plays music and commercials with full digital quality. The system even provides instant access to sound effects or jingles at the press of a button. Master Control interfaces with CD jukeboxes and satellite network services, and can operate in either a live-assist or fully automated mode.

### Master Control workstation

Music, commercials, promos, jingles and other audio data are loaded into the system from a Master Control workstation in your production studio. The program features a computer "cart wall," which allows you to store and retrieve

audio using a familiar concept. For each audio element in the cart wall, you can define a "label" to show information such as title, artist, client, start date, stop date, out cue and so on. You can even create rotation instructions directly within the cart wall.

Master Control can accept new audio at any time, even while it is playing on the air. Unlike some systems, you don't have to switch the system off the air to enter new audio. Master Control can even upload different audio from two or more studio workstations simultaneously.

The program automatically senses the beginning of sound to ensure that all audio elements respond precisely and consistently to a start command.

Master Control is a production workhorse, too. It provides comprehensive digital editing functions such as audio "scrubbing" and cut and paste editing, making it easy to produce creative, imaginative spots and promos. The production module also features time expansion and compression functions, a digital filter to remove unwanted background noise and an audio "scratch pad" for storing and manipulating audio "work parts."

The Master Control air studio module is the focal point for your on-air operations. The monitor shows a schedule containing all broadcast elements in exact chronological order. The DJ can easily change the schedule, but only if you allow it. A schedule adjustment must

conform to your policy, or it won't be executed.

### Electronic copy book

Master Control eliminates studio paper clutter, too. The system's electronic copy book displays live commercials, tags, liners, promos, weather forecasts, event calendars and other station features. The information is shown in large, easy-to-read type on a scrolling video display.

Master Control also provides full audio playback information. The system includes date and time displays, count-up and countdown timers for each audio element and complete status information for each audio channel.

Master Control's air studio module can be configured for use with up to three video displays—one for the log, another for copy, scripts and messages, and a third for digital audio status. You also can assign all system data to a single video display.

Master Control is just a part of RCS Works! The system integrates your traffic system and many RCS products, including Selector, the music scheduling system; Linker, the schedule management system; SongTrack, the radio research system; MUSICbase, the music information system; and Pro-Rate, the mega-rates software system.

RCS Works! enhances information flow by effectively removing the walls of your radio station. For example, the PD can edit the broadcast schedule any time without entering the air studio. Master Control's log is instantly updated to reflect the change.

### Even more power

The audio networking option of RCS Works! provides even more power. As soon as a sound element is added to Master Control, it is available at all other audio workstations in the building. The PD can hear any song while working at  
continued on next page ▶



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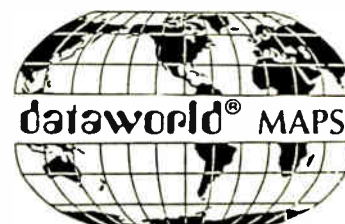
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► continued from previous page  
Selector, or audition the promo for an upcoming contest without leaving his desk.

RCS Works! can support any number of audio workstations at strategic locations in your station. This means that an account executive can play a new spot for a client directly from the workstation in her office, without bothering your production director for a cassette copy.

RCS Works! provides automatic and accurate reconciliation of all scheduling components, too. Master Control keeps a log of the schedule as it airs, including any changes, and electronically updates the schedules in Selector, Linker and your traffic system. And RCS Works! provides an open architecture, meaning any other computer, such as a traffic system, can be easily integrated.

**Electronically connected**

For years RCS has envisioned a radio station that's electronically connected and controlled. We've gathered ideas and opinions from broadcasters around the world. We've built "handshaking" into our product line, allowing programs to interconnect and communicate. This planning has culminated in RCS Works!, the link that bridges, integrates and empowers our complete product line.

RCS Works! is modular and can be custom configured. You don't have to commit to all the component parts. You start with as basic a system as you like, and then expand it when your needs change. If you've been dreaming of an integrated, digital radio station, wake up. RCS Works! can provide a technically superior on-air sound and complete digital sound and data networks.

□ □ □  
For information on RCS Works!, contact *Kenny Lee, project manager, at RCS in New York: 914-723-8567; fax: 914-723-6651; or circle Reader Service 70.*

**TECHNOLOGY UPDATE**

# GTE Spacenet Offers Variety of Services

## *GTE Spacenet's Satellite Based Network Services Can Help the Broadcast Industry Operate Economically*

by **Harry Mahon**  
**Director Satellite Service Sales**  
**GTE Spacenet**

**McLEAN, Va.** Since 1984, GTE Spacenet has served the broadcast service community with a wide variety of high-quality, satellite-based communications services.

**GTE Spacenet operates one of the world's most extensive commercial communications satellite networks.**

GTE Spacenet operates one of the world's most extensive commercial communications satellite networks, with nine operational spacecraft that will offer capacity well into the next century.

GTE Spacenet's satellite services can help the radio industry operate more economically.

Through digital transmission of compressed audio, group station owners and regional networks can now affordably distribute CD-quality stereo programming to member stations. This efficient use of resources can be the difference between profitability and losing money for a radio station.

Traditional analog single channel per

carrier (SCPC) and FM2 technology often are too expensive or impractical for small networks. Affordable digital transmission technology has changed that. Now, a network as small as two stations can cost effectively be programmed from one location.

GTE Spacenet's commitment to the satellite industry, combined with its experience in the broadcasting and telecommunications industries, allows GTE Spacenet

to provide effective solutions to the radio programming industry. As a total communications provider, GTE Spacenet has the ability to provide high-quality transmission and end-to-end service with systems planning and architecture, engineering services, implementation, operations and facilities maintenance.

□ □ □

For information on GTE's satellite communications services, contact *Don Gabriel, account manager of broadcast services, in Virginia: 703-848-1342; fax: 703-848-1011; or circle Reader Service 128.*

## THE RUGGEDNESS OF OUR CD PLAYERS ISN'T A RETROFIT.

From the get-go, we designed our Industrial Strength CD players to stand up to the kind of heavy-duty use that typical consumer CD players can't handle.

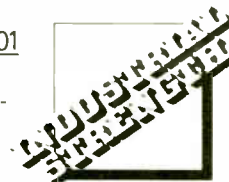
That's why every TASCAM CD player is rack-mountable. And why both the CD-301 and CD-401 feature balanced XLR and unbalanced RCA outputs for added flexibility.

The economy-minded CD-301 (\$549\* including hardwired remote) offers the high reliability required for heavy-use applications, plus precision playback capability. The CD-301 also features a single-play function to automatically stop playback at the end of a song, allowing DJs to concentrate on voice-overs or to make a clean start for the next track. And a link function to permit hookup of multiple CD-301s for automatic back-and-forth sequential play.

The high-performance CD-401 (\$849\*) incorporates TASCAM's award-winning ZD circuit to eliminate low level distortion and ensure sound quality that meets the most demanding standards.

The CD-401's fader-start feature allows play to start automatically on fade-in and stop at the completion of a fade-out. The CD-401 is available with optional hardwired or wireless remote.

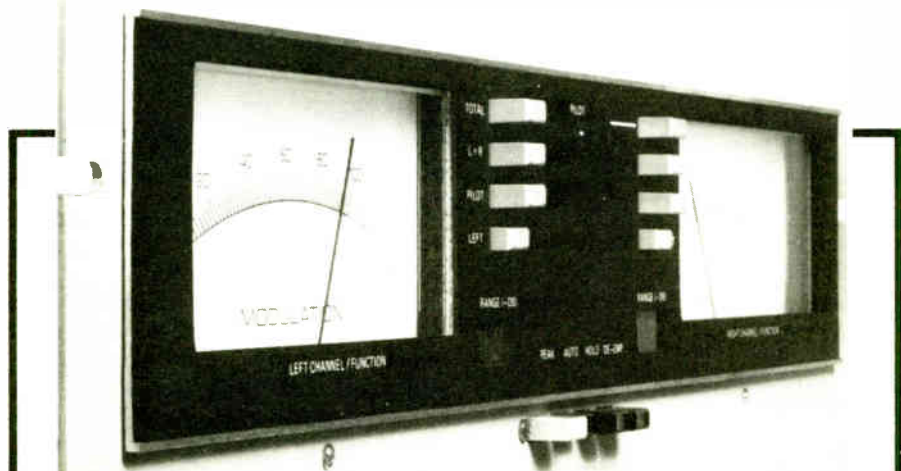
For more information, call or write TASCAM, the company whose Industrial Strength product line also includes cassette decks and mixers.



## TASCAM



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## Bring your station into the 90's with CAT-LINK—the digital STL/TSL.

*"It's a dream system—we get specs like the microwave wasn't even there. CAT-LINK has completely eliminated the STL delay."*

Jeff Andrew, WGCI-FM, Chicago

*"CAT-LINK solved all our problems in 4 minutes—2 minutes to install each end. Performance has been impeccable."*

Paul Christensen, WIVY-FM, Jacksonville, FL

*"CAT-LINK makes money for us, and it improves the sound of the station."*

Mike Callaghan, KIIS-FM, Los Angeles CA

*"CAT-LINK has held up through extreme heat, a hostile RF environment and nasty summer lightning storms."*

Dick Byrd, WZGC-FM, Atlanta GA

### Two-way multi-channel communications

CAT-LINK digitizes the entire composite signal with no data compression, so you can run the stereo generator and processing at the studio, where they really belong. At the same time, CAT-LINK sends and receives up to four customized auxiliary channels with no crosstalk—SCAs, control channels, voice communications, RS232 data, AM audio, transmitter readings and satellite or remote program feeds. What's more, CAT-LINK gives you extra capabilities like transmitter building surveillance via closed circuit TV and an analog telemetry channel.

### Transparent digital transmission

CAT-LINK encodes the fully processed composite signal, then decodes it at the transmitter. You always get full stereo separation, without the phase or amplitude variations that plague two-channel STLs. Dynamic range is up to 84 dB, and your processed composite signal can use virtually all of it. You hear clear, clean, undistorted audio—all the time.

### No audible delays

CAT-LINK's real-time digital encode/decode process doesn't introduce audible delays as data compression can. Jocks can monitor on-air without problems.

### Flexible signal path options

- 23 GHz

Stations across the country are avoiding 950 MHz problems by using 23 GHz with CAT-LINK. They've stopped worrying about frequency congestion and interference, repeater-induced signal degradation, and fresnel zone clearance fading. 23 GHz dish sizes also reduce wind loading and tower space requirements.

- DS1 (T1) Data Line

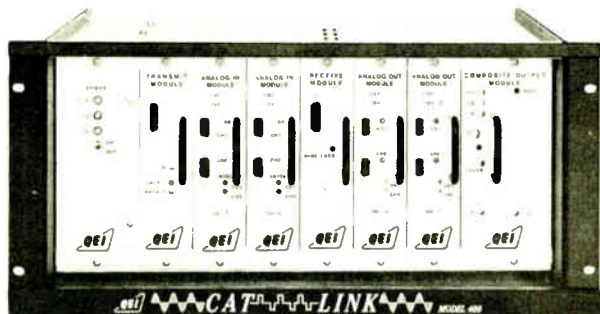
CAT-LINK is cutting phone bills for stations that don't have a clear microwave path. With CAT-LINK, a single bidirectional DS1 line replaces multiple Class A telco lines, providing multi-channel STL and TSL over the same link. Already available virtually anywhere, DS1 service is getting cheaper every day.

- Fiber Optic

CAT-LINK and its optional fiber optic modem provide direct connection to discrete fiber.

- Twisted Pair

CAT-LINK will drive up to 5000 feet of twisted pair wire without repeaters. Four wires provide full two-way multi-channel capabilities.



### Turn the weak link in your signal chain into one of the strongest.

Call QEI toll-free at 800-334-9154 for more information on CAT-LINK—the digital STL/TSL for the 90's...and beyond.

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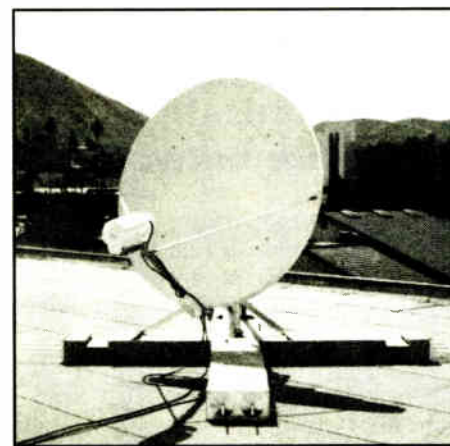
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## TECHNOLOGY UPDATE

# ComStream Digital Networks Streamline Radio Operations

by John Puetz  
Marketing Manager  
Audio Products  
ComStream

**SAN DIEGO, Calif.** There is a better way to transmit CD-quality audio from place to place, and the way to do it is using the latest in compressed digital audio satellite networks. These integrated networks can streamline your radio group operations, cut your satellite transponder costs by half, build new profit centers, get your audio where it couldn't get to before, or customize business audio applications.



KSGN 1.8m ComStream audio uplink in Riverside, Calif.

The digital age is here in the computers on our desks, the information we process and the music we listen to. The new digital audio network takes advantage of that new technology to cut the costs and boost the quality of using satellite. And once the signal is up there, virtually no location is unreachable, either physically or economically.

That may seem like a lot of benefits



The ABR200 Audio Broadcast Receiver from ComStream

from a single network, but the new integrated digital audio network from ComStream is accomplishing those things every day.

### Three main components

There are three main components to the audio network, which usually is set up for point-to-multipoint broadcast. The first component is a single hub where each audio channel from your studio or other audio source is encoded, multiplexed and modulated for transmission over the satellite. At the other end of the satellite transmission is the second component, the integrated receiver-decoder (ABR200). Third is the Audio Network Management System (ANMS), a PC-based system that monitors, configures and controls the network and keeps a log of the activity.

What can the new digital audio network do for you? Several users throughout the world already have discovered innovative answers to this question.

One of the most interesting applications is that of Radio Netherlands. The network was faced with several hurdles in provid-

ing radio broadcasts to its Dutch Antilles territories in the Caribbean. Poor audio quality, long distances and escalating costs of leased Intelsat circuits meant declining listenership and a lack of timely news for its Antilles customers.

But now with the new compressed digital audio, news and public affairs programming play the same day—within minutes or hours of the time they are produced at Radio Netherlands International in Hilversum.

Radio Netherlands even had an additional problem in that no satellite footprint could cover the entire Netherlands-to-Caribbean expanse. But because the ComStream products operate at C- and Ku-band, the link could be made by hopping first to Florida via Ku-band and then from there to the Antilles via C-band.

Even with two uplinks, transponder lease charges are reduced by 50 percent per month over the system that was being used. Guy Pappot, CE at Radio Netherlands, says the network will pay for itself in 24 months.

### Narrow niche format

Another application where a network is producing efficiencies is embodied by The Rocky Mountain Radio Network, installed by National Supervisory Network (NSN), a ComStream distributor. This is a network supplying 24-hour programming, commercial inventory, news, sports and weather from a central studio in Vail to stations in Breckenridge, Aspen, Steamboat Springs and Telluride—all ski resorts in Colorado.

The Rocky Mountain network shows how this new system is a perfect fit when there is a narrow niche format, in this case targeted to skiers, that can be distrib-

uted to many locations with only a slight variation in programming. The ComStream network and ANMS enables broadcast group operators to gain the economies of originating from a single studio, but still customize the broadcast by inserting regional commercials, news and weather information.

Remote broadcasts also lend themselves to the new network. California Digital, another ComStream distributor, implemented one of the first VSAT audio systems about three years ago to bring Rick Dees to listeners of KIIS in Los Angeles—whether he was broadcasting from across town at the zoo or from hundreds of miles away in Puerto Vallarta.

Greater Media, another California Digital customer, is also using the new network to pipe Howard Stern from New York to L.A. Both the remotes and the inexpensive coast-to-coast link are at a far reduced cost and at a far superior quality than leased land lines or an expensive backhaul using a conventional satellite system.

Broadcasters also gain a secondary ben-  
continued on page 46 ►



## TECHNOLOGY UPDATE

# A View of the Future with "VISION"

by Muffy Montemayor  
General Manager  
National Supervisory Network

**AVON, Colo.** It's not often that a new FCC ruling and new broadcast technology converge. But with new radio station ownership limits and new cost-effective VSAT technology, that is exactly what is happening. As a result, broadcast groups are expanding their holdings while streamlining costs.

With VSAT (Very Small Aperture Terminal) satellite technology, any member station can take advantage of all the resources the group has available—meaning better management, programming and production, and increased continuity throughout the group. VSATs allow for integrated station programming, production, operations and management—without increasing personnel requirements.

National Supervisory Network calls it "VISION" (VSAT Intelligent Satellite Integrated Operations Networks). VISION services combine NSN's comprehensive basic service with satellite digital audio program distribution and high-speed data service, giving station groups cost-effective tools for better programming, operations and management.

## Vision applications

NSN provides broadcast groups with network design services, satellite hardware options and sales, installation options and space segment.

Let's look at VISION applications by departments.

Program audio distribution via satellite has been around for years. All the major programming networks use it, but because of high recurring monthly satellite spacetime fees, satellite audio has not been a practical alternative for programming smaller groups of stations (three to 20 or so). Using today's MUSICAM-based ComStream VSAT digital audio products, the cost of sending high-quality digital programming across the U.S. is an affordable \$1,260 to \$2,500 per month in the Ku-band.

The point-to-multipoint networks use low-power VSAT satellite earth stations to transmit and receive the programming. Equipment at each transmit site consists of a VSAT antenna with a solid state power amplifier outdoor unit and an indoor unit, which houses the RF interface and satellite modem. This terminal serves as a hub to send information to multiple receive locations.

A digital audio codec, also located at the hub, converts monaural or stereo audio to a digital, MUSICAM-compressed format and transmits it as data at between 64 kilobits per second (kbps) to 128 kbps per channel. Receive sites consist of a VSAT antenna with LNB assembly, and an integrated audio broadcast receiver, which reconstructs and reproduces the full 20 kHz audio bandwidth on each channel.

ComStream's ABR200 audio receiver is

specifically designed for broadcast use. In addition to MUSICAM audio reception, the unit provides eight relay closures available for program control from the uplink. The closures can be used to trip liner carts, roll tape decks for network feed recording and advance automation systems.

## Traffic and logs

A 2400 baud async data port allows data transmissions for traffic and logs, playlists or in fully integrated VSAT/automation systems, for automatic downloading of daily program logs, automation control packets and systems management.

Each uplink RF channel can be configured for 128 kb stereo (12:1 compressed), 192 kb stereo (8:1 compressed) or 256 kb stereo (6:1 compressed). Each of these stereo channels also can be used for two separate monaural programs.

As mentioned, control signals for automation systems require no additional satellite bandwidth. There are several excellent computer hard disk-based broadcast automation systems on the market today. By selecting a system capable of simultaneous record and playback, you can actually use network idle time to distribute commercial material while spot sets are running at the remote station.

## Off-premise control

NSN's trained operators offer an economical, FCC legal, quality alternative to

local control for broadcasters across the country. The NSN system uses 0.95 meter data VSAT terminals to establish links with remote stations.

For smaller station groups, NSN provides operations staff from our Command Center in Colorado. For larger groups, group headquarters becomes the control center for the outlying stations, with group staffers performing remote operations with NSN software.

At program audio receive sites, the data and programming can often share a single dish.

In addition to monitoring and control, the bi-directional data VSATs used for operations can be used to centralize and streamline group management functions. By adding ports to the data VSAT, telephone, fax and modem charges between station group members can be slashed.

Data ports also can interconnect traffic and billing systems, exchange commercial copy and scheduling orders, exchange news copy, exchange files, memos and electronic mail. The fax and voice-over-satellite options give you satellite access to your station group members and their local dial tones without long distance charges.

National Supervisory Network is an authorized distributor of ComStream Corp.'s VSAT products and offers NEC America VSAT products as a representative of AvData Systems Inc. NSN offers Ku-band and C-band space segment options on GE Americom satellites.

□ □ □

For information on VISION, contact Muffy Montemayor at National Supervisory Network at 800-345-8728; fax: 303-949-4364; or circle Reader Service 21.

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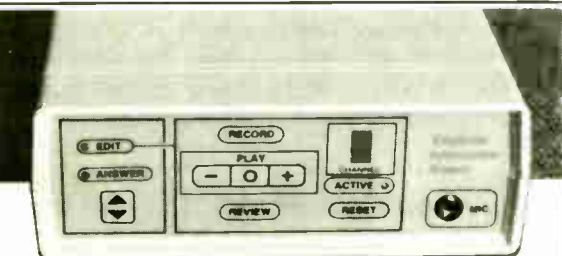
For information regarding the BSL Guardian or "Smart Software," contact Gary Schmidt at:

**Broadcast Software Ltd.**

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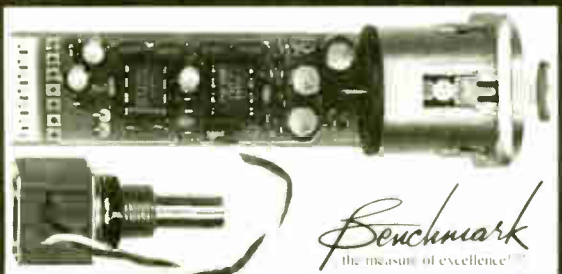
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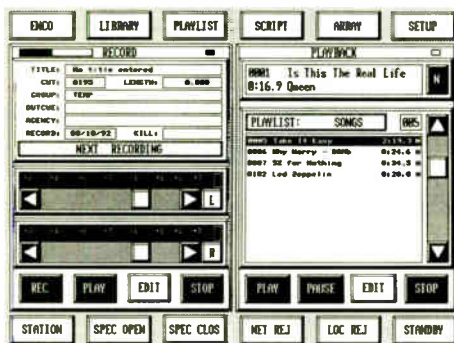
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# MARKETPLACE

Radio World's Marketplace, a compendium of new and recently introduced radio broadcast products, appears monthly in Buyers Guide.



## Enco Digital Audio Distribution

Enco Systems' DAD486x Digital Audio Distribution System provides radio broadcasters with a unique method of creating and customizing a powerful system for the storage and manipulation of audio program material.

The DAD486x is supplied as computer software and a DSP PC board, which will operate on commonly available PC/AT (486) computer systems. DAD486x, based on an intuitive graphics user interface, may be operated on single workstations or multiple networked stations integrated with supervisory, accounting or monitoring program options.

Standard features include stereo audio recording and playback with multiple sampling rate and data compression selections, graphic waveform editing and unlimited playlist manipulation capabilities. Playlists also may be created or edited using common relational database or traffic scheduling software programs.

For information, contact Gene Novacek at Enco Systems in Missouri at 314-453-0060; fax: 314-453-0061; or circle Reader Service 31.



## PC-Companion Plus

Cybox's PC-Companion Plus allows users to add an extra keyboard, monitor and mouse up to 250 feet away from a system unit with a single 3/8-inch cable.

PC-Companion Plus consists of a transmitter and a receiver linked by the cable. A four-foot input cable assembly connects the transmitter unit to the keyboard, VGA video and mouse ports of the system unit.

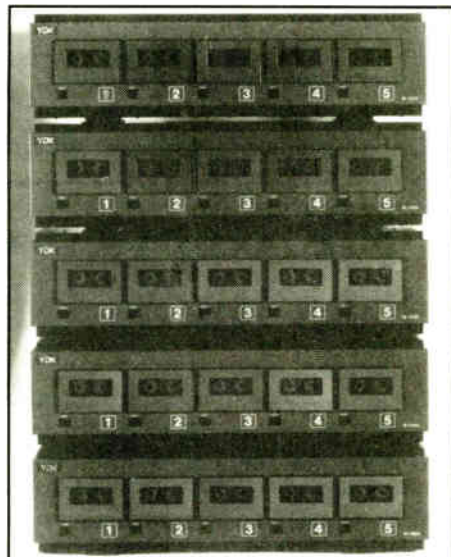
A 9 VAC wall-mount transformer powers the remotely located receiver unit. Both the transmitter and receiver units contain a mouse port. (Both attached mice must be of the same type, either PS/2-style compatible or Microsoft serial.)

The extension cable utilized in PC-Companion Plus is the same type used by other Cybox Companion and Extender products, but with a different pinout. When upgrading existing installations, best results are obtained if the cable is repinned to the CMB pinout.

Three LED indicators give a visible display of power status, to simplify installation and trouble-shooting.

play of power status, to simplify installation and trouble-shooting.

For information on the PC-Companion Plus, contact Stewart Culbreth at Cybox in Alabama at 205-534-0011; fax: 205-534-0010; or circle Reader Service 167.

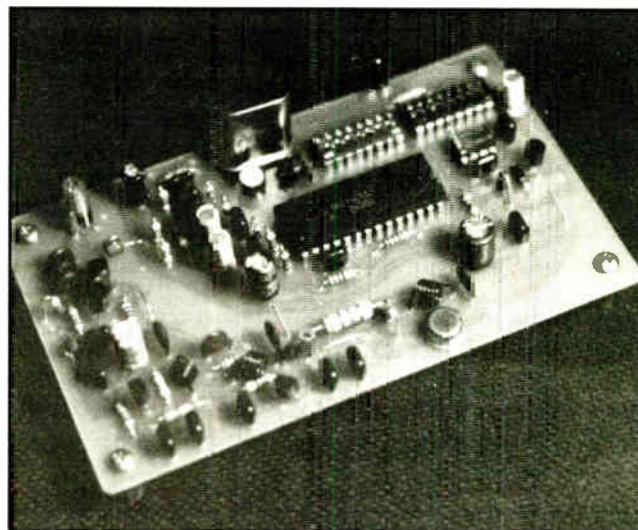


## Recording Duplication

Now! Recording Systems provides a range of innovative real-time recording and duplication services utilizing Mothers recording deck technology. Each Mothers recording deck can produce 10 master-quality audio cassettes. The Mothers decks are portable and compact, making the decks unobtrusive in any recording environment.

Units can simultaneously record from one to 10,000 master audio recordings of any live event and distribute the original master recordings instantly at the conclusion of the event without the need for high speed audio duplication.

For information on Now! Recording Systems, contact Gary Schonfeld in New York at 212-768-7800; fax: 212-302-6024; or circle Reader Service 39.



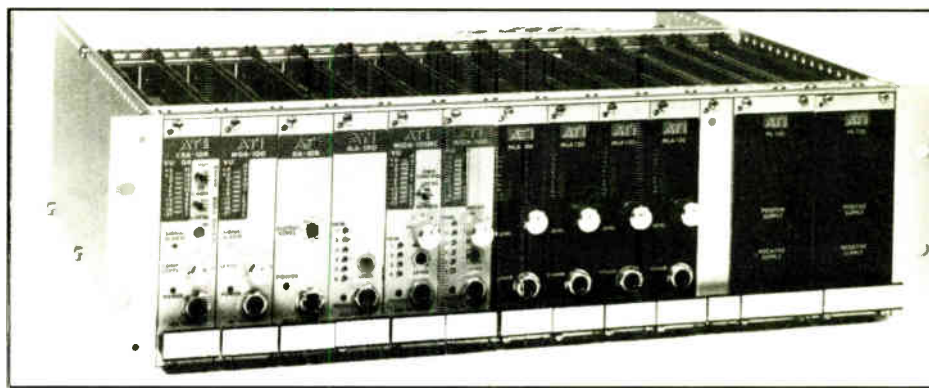
## Replacement Exciter

JT Communications' PLFM-100 replacement exciter is designed to replace the modulated oscillator. PLL and crystal reference portions of older transmitters with new technology, all on a single PC board.

The PLFM-100 is a 3x5-inch PC board and contains a direct FM modulated oscillator, which utilizes digital PLL technology with a single crystal as the reference. Frequency adjustment is controlled with DIP switches.

The PLFM-100 meets all FCC broadcast specs for frequency drift, noise, distortion, has both a composite and pre-emphasis input, and is fully stereo compatible. The maximum output level is +20 dBm and operates from a single +12 VDC power source. The PLFM-100 operates in 100 kHz increments from 87 MHz to 109 MHz.

For information, contact Jim Trapani at JT Communications in Florida: 904-236-0744; or circle Reader Service 114.



## ATI Adds Modular Systems

ATI has expanded its product line to include the LA10000 and MA10000 modular systems.

Besides plug-in mono and stereo DAs, the company offers plug-in microphone and line amplifiers, single and dual units with or without metering, transformer or

active-balanced outputs and optional VCA with remote DC gain control—all using the same rack frame as its DA10000 system, thereby allowing for intermixing of all plug-in module types.

For information, contact Sam Wenzel at ATI in Pennsylvania: 215-443-0330; fax: 215-443-0394; or circle Reader Service 122.

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# BEXT

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## TECHNOLOGY UPDATE

# FirstCom Meets Marketing Challenges

by **Cecelia Garr**  
**President/CEO**  
**FirstCom Broadcast Services**

**DALLAS** FirstCom Broadcast Services offers radio stations a number of solutions to marketing challenges, including sales, programming, promotions and productions.

FirstCom's guaranteed Custom Production Library is affordable, flexible, varied—and it sounds like custom scored music. FirstCom helps stations build the library they need from more than 2,300

original titles, 5,500 tracks and more than 1,400 production elements in the Sound Designer, Maximum Impact and Digital Production Libraries.

Member stations also can add to their Custom Production Library from any of the 10 new update CDs released each year.

With FirstCom's Direct Results Radio Advertising, stations receive a proven sales program that works, through sales people who understand that the real mission is creating increased business for advertisers. This, in turn, generates rev-

enue for the station.

FirstCom's offer: We'll bring it to you, show you how to use it and if it doesn't make you enough money, we'll rip up the contract and you won't owe a dime.

FirstCom recently announced the availability of Double Whammy (Call & Win, Listen & Win), a marketing tool that builds the station's listener database and advertiser's store traffic.

Also available from Firstcom: Sound Ideas' new Series 6000, "The General," as well as the 2000 Series.



For information, contact Carol Rowden at FirstCom Broadcast Services in Texas at 800-858-8880; fax: 214-4004-9656; or circle Reader Service 157.

## ComStream Audio Network Links Radio Group Operations

► continued from page 42

enefit from using the digital audio satellite network when they discover it can become a profit center of its own. In the just-mentioned case of remote broadcasts, users are finding a market in leasing out their turnkey system to other broadcasters when they aren't using it themselves.

### Around the world

Other digital audio satellite networks are installed in the Far East, Canada and Australia, and are coming soon to more of Europe, South America and Latin America.

**ComStream's new digital audio network takes advantage of new digital technology to cut costs and boost the quality of using satellite.**

The new network provides its benefits through a combination of the latest in audio compression techniques and the best in satellite transmission technology. Together, these two produce cost savings

of 35 to 65 percent over other satellite transmission alternatives and deliver CD-quality digital audio to virtually any location. Compression means a full 20 kHz stereo channel can be transmitted in as little as 128 kilobits per second (kbps), which translates to 160 kHz of satellite bandwidth, while retaining CD-quality sound.

### Flexible and expandable

The compression technique by ComStream is the MUSICAM algorithm. MUSICAM enables the ComStream network to be flexible and expandable without costly hardware replacement. It features multiple digital bit rates (64, 96, 192, 256 or 384 kbps). Users can start with a single channel and build to 50 channels by simply adding more encoder/muxes and satellite modems at the hub. Any future upgrades in the algorithm will be implemented in the encoder as well, so once the receivers are in place, all changes in configuration or channel additions are simply programmed in by the user.

This digital audio distribution network promises to continue to bring improved, efficient broadcasts to listeners around the world.

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For information, contact John Puetz in California at 619-458-1800; fax: 619-552-0488; or circle Reader Service 181.



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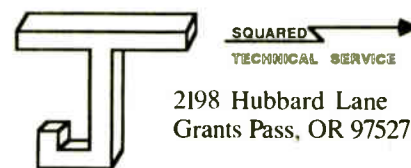
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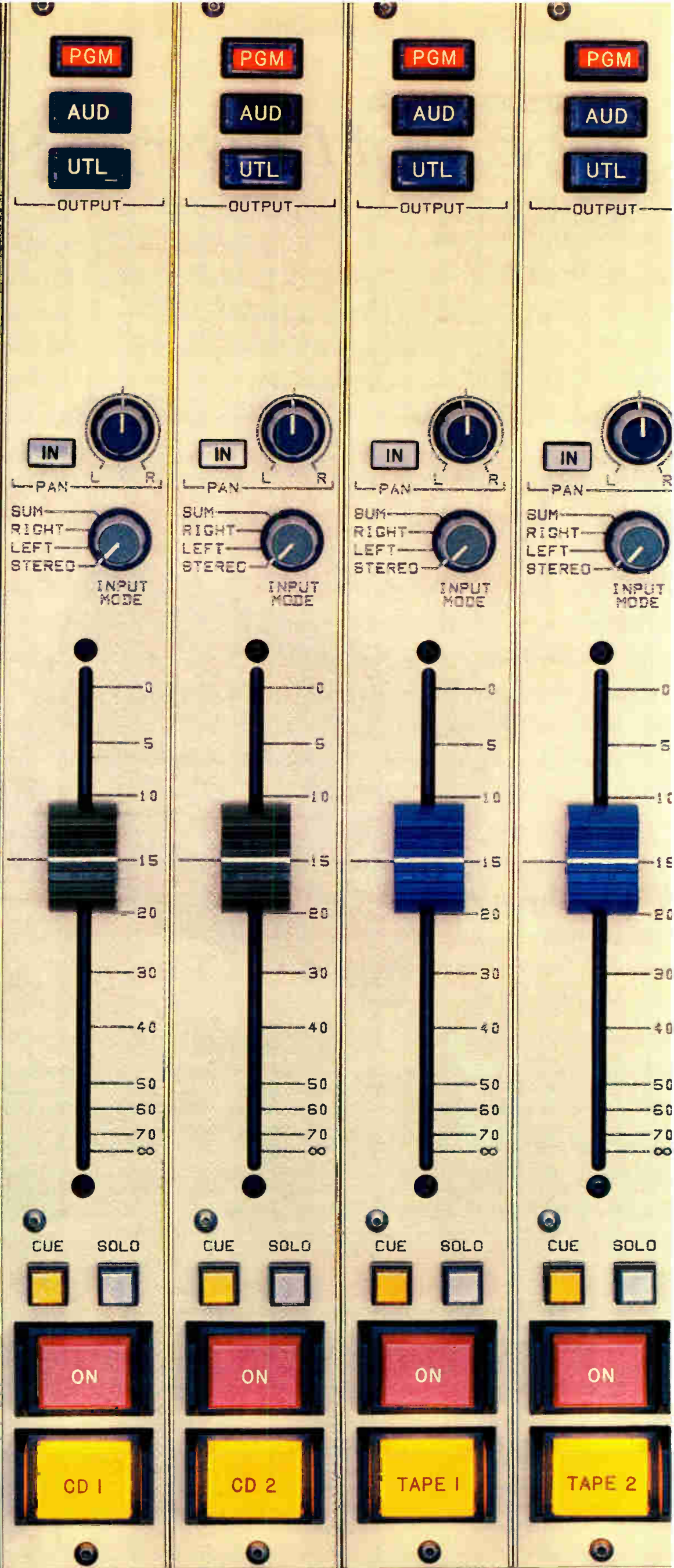
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**DESIGNS THAT MAKE THE DIFFERENCE**





## TECHNOLOGY UPDATE

# BP Digital Delivery a Satellite Alternative

by John Carlile  
VP Sales and Marketing  
Broadcast Programming

**SEATTLE** The challenge: Find a music program delivery system with the advantages of satellite, but without the disadvantages of programming from a "bird."

Four years ago, we began hearing the complaints. Satellite companies tied up valuable spot inventory, offered no flexibility of music mixes and didn't fool any listeners into thinking they were local. Yet stations felt compelled to go to the music networks

because they needed 24-hour walkaway and substantial staff cost reduction.

About that time, Edie Hilliard, GM of the tape syndicator Broadcast Programming, was talking to Lee Hurley, head of automation manufacturer Sentry Systems. Hurley commented that he believed Sentry could duplicate everything good about satellite if Broadcast Programming could do the music programming on CDs.

## Joint effort

Over the next year, the two companies worked to perfect their parts of this next

generation of 24-hour walkaway programming. Sentry developed an automation system that works with any CDs on the market, requiring no special tones or cues. The company developed a hard disk audio system for voice tracks, spots, network delay and other non-music elements. And they even made the system capable of interfacing with most traffic and music software now on the market.

"The key to our system philosophy is wide compatibility with existing technology," according to Hurley. "We avoided

making a 'black box' that only worked with its own custom equipment. Instead, we developed a controller that interfaces with virtually all older automation equipment, while having the capability of automating the most modern digital gear."

The resulting system holds the entire CD library on line at all times, eliminating handling by the operators; CDs are rotated by music software just like the most sophisticated major market live playlists.

Meanwhile, Broadcast Programming went to work developing libraries of music on compact disc, and the playlist system to support that music. BP's consultants studied a variety of research sources, picked the best music in each of a dozen formats, and perfected rotations that will work for both large and small

**"The key to our system philosophy is wide compatibility with existing technology."**

—Lee Hurley

markets. For fully automated operations, the company devised a unique voice linear system that allows "local" announcing of the music titles and other program material by Broadcast Programming announcers.

## Best market sound

"Our goal was to give stations the best major-market music sound, at prices affordable even in the smallest market," according to Hilliard. "Whether stations use one of our basic formats or totally customize their own music blend, our program consultants will manage their music mix and help with the other programming elements, eliminating the cost of doing so at the station."

The equipment and programming were combined into BP Digital Delivery, a system that delivers on its promise to retain all the advantages of satellite while eliminating the disadvantages.

The system allows total hands-off operation in live, live-assist, and fully automated modes. Music rotations can be customized to each market and each hour of the day.

BP Digital Delivery is now on the air at several dozen stations, many of which have used it for almost two years. At least one new station, KUKN in Longview, Wash., is operating with a staff of only three people, using the total walkaway automation, yet they are number one in the latest local ratings and billing. Stations in competitive markets, like Portland, Ore., and Lexington, Ky., use the system for live days and evenings, then operate fully automated overnights and weekends.

BP Digital Delivery, including all equipment, CDs and weekly programming rotations, costs less than \$1,400 per month—not a bad total programming cost in any size station.

For information, contact John Carlile at Broadcast Programming in Washington state: 800-426-2741; fax: 206-441-6582; or circle Reader Service 75.

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**Record Line**. Shows what DCS is currently recording.

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The 4000 provides transparent limiting with any source. Blind tests confirm that the sound of the Orban Transmission Limiter 4000 is virtually indistinguishable from the original source when driven as much as 15dB into limiting—even to trained listeners. Try it for yourself and hear what your facility can deliver when it is protected, not just restricted.

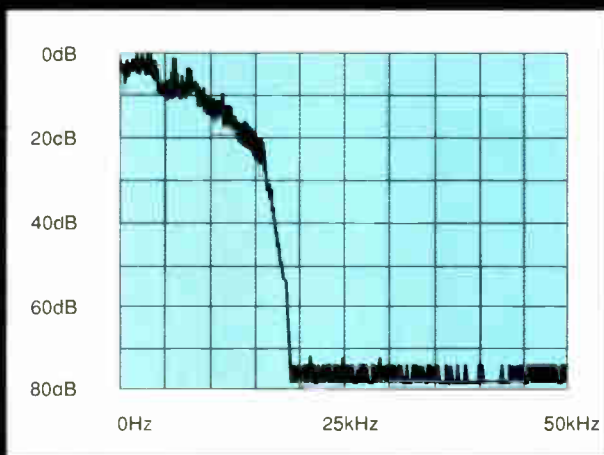
### Sophisticated, Easy to Use.

Orban engineers took years to develop the complex algorithms which permit the 4000 to protect inaudibly. Yet, they kept the front panel of the 4000 clean, clear and businesslike. The precision LED displays indicate any action of the compressor or HF limiter circuitry. The only adjustments are for INPUT level and OUTPUT level. The built-in tone generator and test mode permit rapid system setup and alignment.

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The Transmission Limiter 4000 is one of a family of reliable, quality Orban products designed for demanding broadcast applications. Call your local Orban dealer

for a hands-on demonstration of the Orban Transmission Limiter 4000—another breakthrough product from the leaders in broadcast audio processing.



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Circle (113) On Reader Service Card

World Radio History



## USER REPORT

# Radiosoft Plots Terrain on Paper

by Edward A. Schober  
President  
Radiotechniques Engineering

**HADDON HEIGHTS, N.J.** I received a jewel in the mail last week. It was an amazing piece of software for terrain and VHF radio propagation evaluation from Peter Moncure at Radiosoft. The program was the latest version of HT3D, which draws the contours of the earth in 3D. At least that's what the early versions did.

The latest HT3D will read from the keyboard or the Radiosoft FM database the details of a hypothetical or actual FM station. It will draw a 3D representation of the terrain surrounding the antenna location, and color the elevations. It then draws a scaled antenna tower on the map in the correct location. This view may be rotated to look from any cardinal direction.

## Power to paint

What really gives the program its power is the ability to paint on the map false color scales showing terrain limited shadow depth, shadows corrected for earth curvature. Bullington calculated field strength attenuation or absolute field strength from a station.

In this mode, the program does not calculate signal contours, but calculates and displays field intensity values for each 30-second by 30-second (approximately half-mile square) spots on the 3D map. Other programs have calculated this type of information, but they run on main-frame computers or take hours to run, then only give a flat picture of the data.

HT3D gives you an airplane's eye view of the situation, and the rotation and offset option let you "fly around" the service area to see where the problems are. I get a "radar sweep" of the field strength values from a site in eight seconds on my 386-33 with a Cyrix coprocessor. With this power and speed, it becomes possible to identify the best possible location for an

FM station to serve a market. If you operate a station, you will be able to identify your areas of weak signal, and the areas of weak signal of your competitors.

If you wish to see FCC F(50,50) contours, the program also will oblige by drawing the contours on the mountains.

HT3D is only one of the family of programs for FM allocations from Radiosoft. Its oldest sibling is MAPFM, which is a very fast FCC allocations finder. It operates using the same FM database as the

**HT3D's rotation and offset option let you "fly around" the service area to see where problems are.**

other programs and simply generates FM studies. Once the study is complete, it plots the preclusion circles. If your study is short spaced but there is an allowed area outside the preclusion circles, you can move a cursor to that location and read off the coordinates; that's neat, but you can also get these features (for more money) from others.

## Shows the terrain

STL is another useful Radiosoft program. It takes coordinates, a bearing and distance, frequency and antenna heights at the transmitter and receiver, and shows the terrain over a microwave or RPU path. The terrain can be adjusted for 4/3 earth or any other fraction, and the path is traced, along with Fresnel clearance. Where the path is obstructed, the terrain is colored red, and where a clear path exists the terrain is colored green to help visualize the path possibilities.

CHARTFM does a similar job to MAPFM, but for Educational and FCC Rule 47 CFR 73.215 contour protection assignments, and with a good measure of elegance. CHARTFM requests frequency,

location, antenna height and power for a proposed FM station. The program retrieves all pertinent records from the FM database and loads them into an editor.

Individual stations may be adjusted to maximum facility in accordance with FCC Rules and Regulations 47 CFR 73.215, or duplicate records may be deleted. Then you hit "C" for chart, and the magic begins. The terrain is displayed in false color and bas-relief.

Then each of the stations are plotted on

the map, along with their appropriate service and interfering contours. The program automatically takes into consideration terrain variations, and can accept directional antenna information from data files. It completes all this work on a typical five-station allocation in less than a minute on my computer.

## Color printer drivers

Radiosoft has color printer drivers for a few printers, and can provide hard copy results for those who need them. Peter also says that the Laser Printer grey scale output is quite readable, but not so colorful.

Radiosoft does not price this software out of reach of the working station group. The terrain database from Radiosoft takes up only 17.7 megabytes (17.7MB) for the entire country (including border areas) and the FM database takes up about 1MB. Availability of this information can be so valuable to a group owner that one of my clients asked if we could pay Peter not to release the program to anyone but him.

Even if you have allocations software from another source, you should get HT3D. It gives the clearest view of service areas ever.

For information on Radiosoft, contact Peter Moncure in New Jersey at 914-246-4912; fax: 914-246-0261; or circle Reader Service 175.

## USER REPORT

# Canary's Effects Fly

by Scot A. Combs  
Production Director  
KS95 FM

**ST. PAUL/MINNEAPOLIS** Heart, punch, soul, edge...Whatever you want to call it, don't expect to find it in most production libraries.

Isn't it about time that someone mentioned how boring a lot of these libraries really are? The time when any vacuous production track would do is gone. If it doesn't have attitude, it's not going to make it.

I'm sure you know that the right piece of music will make a well-written spot really jump. The music propels the commercial, helping to create heightened awareness. The only problem is that the vast majority of the production music available is lame. And lame is lame no matter what the tempo or style or how many of them you get.

For the past couple of years, I've been using the Canary Collection CD library, produced by Andrew Mark and the bunch at Philadelphia Music Works. Finally, I've found stuff that cuts through the mind-numbing clutter of lifeless production music.

Combine that with the fact that it's a buyout. You only pay for it once. I've had it with these leases—it's no bargain to have 5,000 tracks when only about 10 of them are of any use to you.

By and large, it's Canary's stuff that really does it for me. I could tell you I love the stuff Philadelphia Music Works puts out, but I think it's more telling to say I use it every day.

□ □ □

For information on Canary Productions, contact Andrew Mark at Philadelphia Music Works at 800-368-0033; fax: 215-825-8310; or circle Reader Service 142.

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World Radio History



## TECHNOLOGY UPDATE

# Wake Up Your Station with Thompson

by Ben Freedman  
VP/GM  
Thompson Creative

**DALLAS** While Thompson Creative supplies radio ID jingles for almost every format, this article will focus on one of radio's top formats—adult contemporary.

I have had the privilege of monitoring the radio ID jingles scene since the late 1950s. In the 1950s and 1960s, the AC format was better known as MOR (middle of the road). There was a striking difference between the promotional sound of MOR and the upsurging top 40 format. In those early days of "contemporary radio," the ID jingle was a must for top 40, but many times more of a "back burner" option for MOR.

So what's happened since the '50s and '60s? In the 1970s and 1980s, radio, in effect, grew up. We made the switch from AM to FM for music. Now, thousands more stations compete for an audience that has only grown by about 50 percent in 30 years.

### The big winners

One of the big winners is AC. The commanding lead by CHR (top 40) has, in many cases, declined dramatically. A large percentage of today's hot AC/AC-lite AC listeners are transplants from the top 40 of the '60s and '70s. Thus, the type of station promotional and image-building styles of top 40/CHR are now regularly incorporated into AC.

In the last few years, our AC subscribers have included many of the up and coming "buzzword" stations, including "Mix" and "Variety." Perhaps the most impressive client of Thompson is the highly respected Nationwide Communications Group. In 1991 and 1992, we have been honored to produce four custom AC packages for Nationwide.

One of the premier hot AC stations for Nationwide is KHMJ/Mix 96.5 in Hous-

ton. Under the direction of Operations Manager John Clay, PD Guy Zapoleon and Production Director Bob Vance, CEO Larry Thompson and our production staff created a new custom package titled Houston Mix I.

The music tracks feature the sound of the 1990s, matching the music mix and the image of the station. In fact, Mix 96.5 recently cut a follow-up package at Thompson Creative, Houston Mix II. Now, Mix 96.5 has a total menu of nearly 50 cuts and more than 100 additional mixouts. The concepts include transition cuts, image line cuts, shotguns, morning show cuts, jock cuts, legal IDs, weather cuts, traffic bed, news bed and more.

### Customized package

Another custom AC package by Thompson Creative is for Nationwide's KDMX/Mix 102.9 in Dallas. Under the direction of PD Pat McMahon, the Thompson Creative production staff customized a new package targeted for a hot AC/AC audience. Mix 102.9 continues to air the 1991 "Dallas Mix" and has recently updated with various jingles from three other Thompson AC packages.

The fourth custom package created for Nationwide is for Variety 104.7 KVMY in Phoenix. This package has a soft AC touch, suited to the needs of the KVMY image. Nationwide's WOMX in Orlando also features recordings from various Thompson Creative AC packages.

On the lighter side of AC, Thompson Creative recently completed a package for CBS O&O WLTT in Washington, D.C. Under the direction of PD Chuck Morgan, Thompson has produced a menu of image cuts that target lite AC listeners at home and at work.

Thompson Creative also recently created two additional custom AC jingle packages. We were pleased to welcome to our Dallas studios Bruce Gilbert from Variety 96 WVTY in Pittsburgh and Bob DeCarlo

from W101 (WUSA) in Tampa. The styles were contemporary, but the use of "live musicians" was more upfront.

Other AC subscribers leasing "re-sings" from Thompson packages include WTMX Chicago, WMJX Boston, CKFM Toronto, KSTP Minneapolis, CJFM Montreal, WLAC-FM Nashville, WWMX Baltimore, WBSB Baltimore, CHFM Calgary, WQAL Cleveland, KSRR San Antonio, WOKY Milwaukee, WMXC Charlotte, WYYY-FM Syracuse and WIVY Jacksonville.

The high growth of AC and its offshoots

## TECHNOLOGY UPDATE

## Halland Library Recreates the 1980s with Today's Technology

by Hank Landsberg  
President  
Halland Broadcast Services Inc.

**GLENDORA, Calif.** Halland Broadcast Services Inc.'s new CD library for broadcasters, "The Eighties Plus," is a compilation of AC and CHR hits from 1980 through 1992. The library features 768 songs on 44 compact discs.

Selecting the songs to be included on The Eighties Plus was definitely not a trivial matter. Simply using all of the No. 1 hits doesn't produce a valid playlist, because record sales statistics do not provide an accurate picture of what listeners actually want to hear years later.

### Audience testing

Many times a new record will run up the charts, but is never requested after its initial popularity falls. For this reason, audience testing was used to find songs that are playable and programmable even several years after their release.

After much research and testing, The

have shown that there is a stronger need than ever to promote the positive image of the station with musical identification. Radio IDs are captured in the minds of the listeners and also serve as signposts for station features, weather, news and traffic.

ID jingles have a strong future in the world of adult contemporary radio. Thompson intends to lead the way by using the styles and textures of contemporary music to build positive image identification for today's ever-expanding AC format.

□ □ □

For information on Thompson Creative, contact Ben Freedman in Texas: 800-RADIO ID (800-723-4643); fax: 214-521-8578; or circle Reader Service 57.

Eighties Plus playlist was finalized. With 768 songs covering the years 1980 through 1992, that's about 62 songs for each year in the era. Our playlist includes all of the best AC artists, plus numerous, hard-to-find selections that broaden the scope of the library. The overall tempo of The Eighties Plus is just slightly "hot," making it appropriate for AC, Hot AC and CHR formats.

Another aspect of music selection is determining which version of a song to use. In the 1980s, most labels released several versions of a record, including the vinyl 45, the CD single, the CD radio edit single, the CD album, the extended dance mix and so on. In producing The Eighties Plus, Halland was careful to select the version most appropriate for airplay.

This was usually the radio-edited version, provided that it was available on CD (or studio master tape). Occasionally, the CD-album version was used, but only if it was of reasonable length. It's interesting to note that with the popularity of compact discs, the old 45 RPM time limit of 3:30 no longer applies to hit music; the average song length on The Eighties Plus is about 4:20.

Technical excellence was another requirement in producing the library. Of the source material used, 97 percent was digital. Only a few dozen songs were sourced from vinyl, because they weren't available in any other form. Advanced digital editing and other proprietary techniques were used to optimize audio quality regardless of the source.

### Double-checked

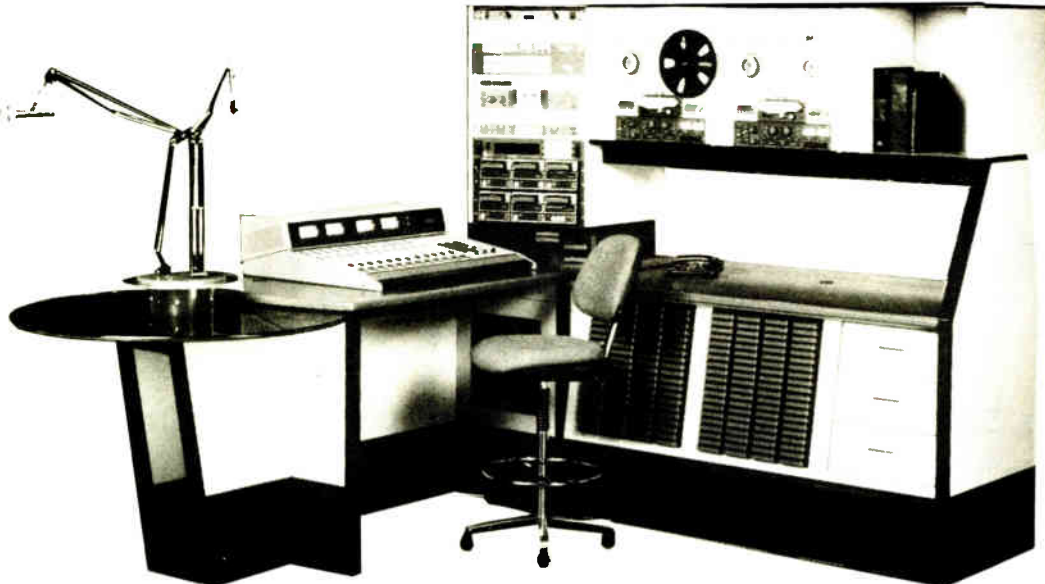
Everything was double-checked for mono compatibility and consistency in overall audio level and balance. To preserve all of the dynamics, no compression or limiting was ever used. Virtually all transfers were done digitally to prevent any distortion or noise during the mastering process.

All tunes were accurately timed, with intro times and end-type (fade or cold) noted. These times, along with other information, were compiled into a master database, which is supplied on floppy disk with each library.

□ □ □

For a complete song list or additional information, contact Steve Steinberg at Halland's Glendora, Calif. office: 818-963-6300; fax: 818-963-2070; or circle Reader Service 12.

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# BUYERS BRIEFS

**ST. PETERSBURG, Fla.** J.L. Ritter Productions' morning show image songs are designed to distinguish clients from the clutter.

They have a one-of-a-kind sound and have proven an effective tool for establishing an identity for the morning shows that use them.

The company offers a CHR, AC, country, oldies and urban package. Complete packages run from \$1,000 and up. All lyrics are written in close cooperation with clients and are approved prior to production.

J.L. Ritter is market exclusive and offers a turnaround time of seven days.

For information, contact John L. Ritter in Florida at 813-576-7965; or circle Reader Service 138.



**HOLLYWOOD, Calif.** The Hollywood Edge has created Cartoon Trax, a CD collection of cartoon and comedy sound effects. Cartoon Trax consists of high-energy cartoon sound effects created by some of Hollywood's most beloved animation studios.

Many of the sound effects in this library were under lock and key in film storage vaults for more than 40 years. The Hollywood Edge has digitally restored these priceless effects.

In addition, Cartoon Trax includes newly sampled musical cartoon sounds. Until November, the five CD Cartoon Trax can be purchased for \$395.

For information, contact Scott Whitney at The Hollywood Edge at 800-292-3755; fax: 213-463-3972; or circle Reader Service 102.

**MEMPHIS, Tenn.** Jefferson Pilot Data Services brings small market station management up to date and up to speed.

The JDS 850 PC-based sales/traffic/billing system for radio is fast, flexible and easy to expand to meet the demands of growth and change. Each report provides you with timely information for developing and reaching business goals. Critical information is on-screen or in your hands in seconds.

The JDS 850 is easy to install, easy to learn and easy to use.

For information, contact Nancy Willingham at Jefferson Pilot Data Services in Tennessee at 901-762-8000; fax: 901-762-8038; or circle Reader Service 185.



**RICHMOND HILL, Ontario** The General Series 6000 from Sound Ideas consists of more than 6,000 digital sound effects—50 hours of recorded sounds—on 40 compact discs.

The library includes new and expanded sound categories such as extensive animal collections, transportation sounds, crowds, long ambience effects from around the world, weather, aviation, military, foley sounds and more.

The result of extensive client research and two years in the making, the General Series 6000 will be the largest comprehensive library of its kind ever created.

For information, contact Brian Nimens at Sound Ideas at 800-387-3030; fax: 416-886-6800; or circle Reader Service 47.

## TECHNOLOGY UPDATE

# Orkin's Spot Package

by **Sandy Orkin**  
**Director of Sales**  
**Dick Orkin's Amazing Radio**

**LOS ANGELES** Dick Orkin's Amazing Radio is a syndicated spot package packed with comedy, production values and unique "selling" propositions offered to radio stations and their advertisers.

We researched and identified a select group of radio's big spenders all across the country—advertisers who offer the greatest spending potential for radio stations. Then we created Dick Orkin's Amazing Radio, a spot package that is designed to stimulate these selected advertisers to spend new money and more money on your station.

These eight-spot campaigns currently are available to auto dealers, banks and/or savings & loans, furniture stores, malls, TV news, supermarkets and downtown shopping associations.

The Amazing Campaigns are licensed exclusively to one advertiser per category in a market. The radio station need not pay for any of the campaigns until you have a commitment from the advertiser.

To date, more than 75 radio stations have garnered annual commitments from their advertisers with this new package from Dick Orkin. The Amazing Radio packages contain all original spots that are then customized for the advertiser.

This sales and spot package was conceived by Dick Orkin in a creative partnership with market researchers and radio sales managers. Brainstormed and tested at the front lines of the radio sales transaction, it focuses on what's needed right now in marketing and broadcast advertising. And it permits a radio station to become a creative leader in its market, by demonstrating to the advertiser that the station recognizes the importance of strategy, position and creative execution in the advertising equation.

For information and a demo, contact **Sandy Orkin** at 800-621-6949; fax: 213-460-4280; or circle Reader Service 51.

### Solution to September 9 Puzzle



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Business Telephone ( ) \_\_\_\_\_

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- B. Commercial FM station
- C. Educational FM station
- E. Network/group owner
- F. Recording Studio
- G. TV station/teleprod facility
- H. Consultant/ind engineer
- I. Mfg, distributor or dealer
- J. Other

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- B. General management
- C. Engineering
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# Broadcast Equipment Exchange

"Broadcast Equipment Exchange" accepts no responsibility for the condition of the equipment listed or for the specifics of transactions made between buyers and sellers.

## AMPLIFIERS

### want to sell

Altec plug in preamp, 1588C w/xfmr & phantom for Altec M53, M54 mic systems, 1588 w/xfmr, 1578A w/o xfmr, \$20 ea. J Newman, 401-847-0455

Gates M-2696 tube type mon amps, rack mount, anique, circa 1950s, \$250; RCA MI-12242 remote amps, single m.c., circa 1940s, dB meter, excel cond., \$250. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

Radio Systems PA-1 phono preamp, like new, \$50/BO. G Fulhart, WVKs, 4665 W Bancroft St, Toledo OH 43615. 419-531-1681.

Quad 50E 50 W, mono, new cond w/manuals & cords, BO. J Thomson, Maple Island Music, 1010 Hwy 104 S, Glenwood MN 56334. 612-762-1501.

Marantz 2130 quartz-locked tuner w/scope, 3250B control preamp, 140 amp w/VU meters, \$695; Mdl 2270 tuner, preamp & amp rcvr, \$125. J Price, 214-321-6576.

Decent, low-med wattage stereo audio, \$100-\$150. P KJQY, 625 Broadway #1200, San Diego CA 92101.

Shaffer/Ampex, (2) transistorized play elect for Ampex R-R, \$25 ea+s/h. D Morgan, KNXX, Box 969, Grand Junction CO 81501. 303-241-9230.

Marantz 7T pre-amp, \$125; Yamaha C3 pre-amp, like new, \$150. J Parsons, 904-532-0192.

Ecor 50 W mono PA, rack mount, \$65. G Wachtler, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Microtrak 6401, (2) phono pre-amp, \$50 ea. M Guidotti, Monument Media, 1170 Park Grove Dr, Milpitas CA 95035. 408-946-9466.

Radio Design STA-1 universal line amp, new bal/unbal stereo to mono, \$50. P Russell, Bowdoin Coll, Sills Hall, Brunswick ME 04011. 207-725-3066.

Marantz 8-B, excel cond, \$995; pair Mdl 9's, BO. Dave, 305-866-6048.

Apt-Holman preamp & Apt Pwr Amp One, \$500. P Wells, KJQY, 625 Broadway #1200, San Diego CA 92101. 619-238-1037.

BGW #100 30 watt stereo amps (3), \$150/BO each. 816-532-0460.

RCA, Altec tube mic pre's & tube amps & mixers; Langevin AM-16's, sale or trade. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

### want to buy

Tube & remote mixers, RCA, Gates, Collins, WE, 23-C. B Davies, Virgo Prods, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Looking for any cond blown tube amps, PA & musical instrument variety pref. Darren, 216-759-0579.

Cutter w/feedback to work w/Grampin cutter head, mono, up to \$300. H Sewell, Oakridge Music, 2001 Eltron Rd, Ft Worth TX 76118. 817-838-8001.

## ANTENNAS & TOWERS

### want to sell

Andrew 7/8" 150' foam coax w/female N conns on both ends, used less than 1 yr w/conns, BO; Cablewave 1 5/8" 60' air coax, never used, BO; (60) Cablewave angle member adapters, \$3.60 ea/BO; (55) Cablewave hangers for 1 5/8" cable, \$1.40 ea/BO; (36) Andrew angle member adapters, \$4 ea/BO. C Scherer, 215-370-9046.

AM insulator for heavy twr up to 42" wide, \$990+s/h. A Burgos, WVNZ, Carr Vieja del Viga #63, Ponce PR 00731. 419-588-3700.

Scala PDR-222/CX 4-wy pwr divider, equal split, 93.5 MHz, 100 W, 50 ohm input, 75 ohm output, N conns, \$120. P Regier, Pasco Comm. 2906 E Randolph, Enid OK 73701. 405-233-6808.

ERI G5CPS-8 on ground in Santa Fe, on 95.5, BO. J Curtis, KFRO, POB 4299, Longview TX 75606. 903-663-3700.

Hard Line Parts, 4 1/16", (4) elbows, (2) 3 1/8" to 4 1/6" adaptors, (2) field flanges, 4 1/16" hanger kits, \$1900+s/h; ERI G4CPH, tuned to 96.1 MHz, 10 bays ctr fed, 500 W operating heaters, mounting brkts, \$6500+s/h. C Murray, 503-484-9400.

## FM ANTENNAS

92.7 4-Bay Phelps/Dodge  
103.9 3-Bay ERI (Radomes)  
104.7 5-Bay Phelps/Dodge  
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414-482-2638  
FAX: 414-483-1980

Scala PR-450-U paraflectors (20, unused 940-950 MHz with (10 extra reflector only. M Bogard, 1-816-252-5844.

ERI 37CP6 circ polar 6-bay FM tuned to 102.1 MHz w/deicers. J Church, WULUM, 2500 N Mayfair, Milwaukee WI 53226. 414-771-1021.

Phelps-Dodge 42-158-50 FM harmonic filter for parts w/CSI FM 3000E, 1 5/8" flanged, 2" piped in, 6' long w/bullet & hdrw, \$75/trade. Sidney, WOME, POB 357, Dover ME 04426. 207-564-2642.

Anixter-Mark 4' & 8' grid 890 to 960 MHz, \$1500/BO. 816-532-0460.

Used towers bought and sold. Call 1-800-643-6988.

8 bay/larger tuned to 100.9, working cond. K Austin, KFXI, 1101 Hwy 81 N, Marlow OK 73055. 405-658-9292.

3-bay full wave FM on/near 94.1 MHz, gd cond, need immed. B Dunkle, WYTS, POB 777, Marianna FL 32447. 904-482-2131.

Dehydrator for air Dielectric cable. C Brescia, WNBZ, Box 211, Saranac Lake NY 12983. 518-891-1544.

770' FM on 92.7, 93.9, & 98.7 MHz. G Violet, Violet Comm, 331 Lookout Pt, Hot Springs AR 71913. 800-676-1736.

8-bay FM that can be tuned to 103.3 MHz. R Murphy, 800-582-7625.

101.5 FM 2-4-bay; 60-100' self-supporting tower/monopole. P Lopeman, 414-482-1959.

600', on ground, gd cond. K Austin, KFXI, 1101 Hwy 81 N, Marlow OK 73055. 405-658-9292.

## AUDIO PRODUCTION

### want to sell

ATI Emphasizer VGC, \$495+s/h. C Rouse, 617-461-2699.

Orban stereo synthesizer, \$200/BO. J Hansen, WYRQ, 62 E Broadway, Little Falls MN 56345. 612-632-2992.

dbx stereo NR unit, rack mount, \$100. M Guidotti, Monument Media, 1170 Park Grove Dr, Milpitas CA 95035. 408-946-9466.

CBS 443-Audimax R11Z tube-type auto-level control w/spare memory mod, BO/trade for broken UREI LA-3A, J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803. 812-877-2663.

Rane HC-6 6-chnl stereo headphone amp, \$200+s/h; (3) Gentner 96-BA-AB patch bays, loose jack on 1, 1 wired to Molex, \$350 ea/\$900 all+s/h; (3) Fostex 3010 RCA patch bays, 32 ea, in Crown walnut rack, \$70 per bay/\$210 all+s/h. D Crepps, IBS, 29672 Silver St, Val Verde CA 91384. 805-294-9441.

Eventide H910 harmonizer, gd cond w/manual, \$400. J Addie, WFMT, 303 E Wacker Dr, Chicago IL 60601. 312-565-5033.

**SAVE \$300 ON T T 144 POINT PATCH BAYS**  
brokers of fine and coarse used equipment  
audio village 619/320-0728

Ashley CL50, (2) peak detectors/compressors/limiters, superb cond, BO. Jim, Paragon Bdct Svcs, 509 3rd St, Peckville PA 18452. 717-383-1118.

Shure SR107 3rd octave audio, equalizers (3), \$100/BO each. 816-532-0460.

dbx 163X stereo strappable, over easy compressor/writer, HI-2 & line level inputs, single slides control, new, \$80. B Harwell, Compact Djs, 1861 Brown Blvd #630, Arlington TX 76006. 817-649-3535.

Ashly SC 66 stereo para EQ, great cond w/manual, \$300. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088.

TEAC A-1200 stereo, gd cond, \$3000; Fidelipac carts: 40 & 70 sec, \$1.50 ea; 3:30, \$2 ea. M Delgado, KLAT, 1415 N Loop W #400, Houston TX 77008. 713-865-4518.

Publison Infernal Machine 90 stereo in/out, stereo pitch shifting, dig delay, echo, .05 memory, excel cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

### want to buy

Altec 1628A auto mic mixer & 1588C mic preamp modules. A Clean, WMPG, 96 Fairmouth St, Portland ME 04027. 207-780-4974.

03B PPP Fairchild 600 conac or 602 Conex high freq limiters. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

## AUTOMATION EQUIP

### want to sell

Sparta 1052 10-source/52-event controller w/silent sens, (4) SMG Carousels, (2) 100B random select units, (2) Revox A77s, (2) 25 Hz det, (2) Tapeaster 700P w/EOM tone det & manuals, BO. R Hobbs, WMLR, 2009 Cromwell Dr, Nashville TN 37215. 615-373-2351.

Schaler 902 Sono-Mag Carousel w/4 Carousels, 3 big racks, BO. Bud, WYOAK, 4237 Airline Rd, Muskegon MI 49444. 616-733-4040.

Programmer 3A live asst sequencer for 4 R-Rs. J Hansen, WYRQ, 62 E Broadway, Little Falls MN 56345. 612-632-2992.

SMC DP-2 in 3 orig matching racks w/control head; (4) Otari ARS-1000 R-R; (3) SMC Carousels; (1) dual single play unit, all gd cond, \$5000. D Quinlan 503-882-4656.

Otari ARS-1000 (5), gd cond, \$750 ea. D Quinlan, 503-882-4656.

IGM Go-Cart 24 (2), excel cond, \$900 ea; Harris 9001 System w/keyboard & terminal; (2) Otari ARS-1000 R-R; (2) IGM Go-Cart 24, gd cond, \$5000. D Quinlan, 503-882-4656.

Bdct Auto live asst controller w/thumbwheel operation, 24 prog events, LEDs at a glance, 1 yr old, operates cart mchs, reels, CDs, \$1950. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Harris 9001 in 3 orig matching Harris racks w/keyboard & terminal; (4) Otari ARS-1000 R-R; (3) stereo IGM Go-Cart 24-tray; (2) ITC single play decks, all gd cond, \$8000. D Quinlan, 503-882-4656.

Systemation X7 Dig Brain (2) w/7-day memory, excel shape, (10) Nakamichi MR-2 decks for ea system w/all cables & printers, will part out, \$4500 ea. W Christensen, KIOH, Hwy 30 W, Pipestone MN 56164. 507-825-4282.

SonoMag MSP12 in great cond, 3 yrs old, \$12000. J Ferguson, WSKS, 131 W Hancock St, Milledgeville GA 31061. 912-453-9406.

SMC syst, MSP 1, 2000 event prog w/batt back-up, (3) 452 bi-dirc stereo Carousels, (2) 450 bi-dirc mono Carousels, (4) SMC stereo play carts, (3) cabs, wiring, books, extra boards, \$11000/BO. J Johnston, KREC, POB 747, Cedar City UT 84721. 801-586-9812.

IGM 400 w/cables & manual, \$250; SMC DP-1 w/control head, (2) AS-16 & AS-20 switchers, (2) LA-246, (2) MA-4, RAC controllers & 2 spare brains for parts, cables & manuals, \$1000; (2) Gates/Schaler RA-1 w/250 interfaces, (3) ACSO Schaler random access programmers, \$100 ea/\$400 all. K Carlson, KMUT, 1100 Blue Lakes Blvd N, Twin Falls ID 83301. 208-733-1100.

IGM Go-Cart (4) 42-tray, \$2500; (2) 78-tray, \$3000, stereo, 3-tone, in svc, working; Cetec 7000 w/all options, 16 inputs, dual pwr splys, extras, \$5000. R Klotz, WCNO, POB 3434, Lake Isabella CA 93240. 619-379-5636.

BE16 complete syst for tape/sat, 3000 events software, gd cond, \$6000. D Brown, KVLE, POB 832, Gunnison CO 81230. 602-645-8181.

Shaffer 903E (5) ITC 750 stereo PB, 4/48 cart audiofiles, (5) ITC singleplays, excel cond, BO. J Curtis, KFRO, POB 4299, Longview TX 75606. 903-663-3700.

X-7 Systemation. R Murphy, 800-582-7625.

## BUSINESS OPPORTUNITIES

### want to sell

Music service business with 2 complete format libraries plus recording equipment, tremendous potential, great price. J Gelo, 813-642-6899.

## CART MACHINES

### want to sell

TC R/P stereo, triple cue, new hds, \$2000/BO; (2) ITC S/P stereo, triple cue, new hds, \$800/BO, both very gd cond. R McManus, McManus, 4011 Orchard Ave, San Diego CA 92107. 619-223-1730.

Tapeaster 700 R/P w/pushbutton cart release, secondary due tone detector & gener, \$595. R Franklin, Franklin Studios, 1004 Dekalb Studios, Norristown PA 19401. 215-646-7788.

Spotmaster 505 mono/play, rblt. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

Spotmaster 505 plyr, recently refurb, gd cond, plays all sizes bdct carts, new gloss black paint, gd head & motor, \$225. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

Viking/Telex NAB-style bckgrnd music plyrs w/amps & cabs, mono, hds & spds changeable, pick up in IL. free. E Davison, 217-787-0800.

ITC RP series w/countertop R/P, mono, e-tones, great cond. Jim, Paragon Bdct Svcs, 509 3rd St, Peckville PA 18452. 717-383-1118.

ITC 99B, (8), new, \$1595 ea. J Addie, WFMT, 303 E Wacker Dr, Chicago IL 60601. 312-565-5033.

Fidelipac/Dynacart CTR 100 w/splice, erase tone func, stereo rec, BO. G Brown, WJBM, 1010 Shipman, Jerseyville IL 62052. 618-498-2185.

TC RP mono rec, rack mount w/new hds, \$500/BO. K O'Malley, 804-446-2731.

BE 5310 stereo rec amp w/aux tones for triple deck cart, gd cond, \$750. R Cowell, KNTR, POB 308, Ferndale WA 98248. 206-384-5117.

OBE 505 Spotmaster mono, play, BO/trade old cass deck, J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803. 812-877-2663.

Tapeaster X700RPS, gd cond, \$595; (2) Tapeaster X700PS, \$395 ea. A Ishkanian, Advent Dup, 132 Arbor Oak, Ashland VA 23005. 804-526-6942.

ITC 99B, (8), \$1595 ea. J Addie, 312-565-5033.

ITC 3D, (1) mono, single tone; (1) stereo w/new hds, BO. B Eddy, WRRR, Box 374, St Marys WV 26170. 304-684-3400.

BE 2100 & 2300 PBs & R/Ps, all mono w/tones & manuals. D Albanese, WEEI, 529 Main St, Boston MA 02129. 617-242-5900.

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

### want to buy

ITC/BE/Audicord, any cond. P Lopeman, 414-482-1959.

## CASSETTE & REEL-TO-REEL RECORDERS

Tascam 42B pro series " 2-trk w/remote VGC, \$850. Gary, 305-379-8391.

Revox PR99 (2), excel cond, \$500 ea. W Christensen, KIOH, Hwy 30 W, Pipestone MN 56164. 507-825-4282.

Otari ARS 1000 (7) 2-chnl w/25 Hz tone sensor & cue tone relays, excel cond w/manuals & racks, \$650 ea. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Ampex AG600-2 stereo deck in orig case, new hds in 1988, \$500. E Bruder, Man From Mars, 159 Orange St, Manchester NH 03104. 603-668-0652.

Scully 284-8 1" 8-trk, 3@3q-30 ips w/V576 var spd mod, all manuals, perf cond, \$3000. T Sherry, 415-969-3030.

Ampex PD-10 master+3 slaves, duplicator, will part out. H White, 612-888-5306.

Technics 1500 RS 2-trk, 15, 7-1/2 & 3-3/4 ips plus 1/4-trk, PB head w/remote, excel cond, \$950. L Wagner, Ardnigva Radio, POB 1788, Orlando FL 32802. 407-299-1299.

Otari 1000 (5) 25 Hz tone sensors & manuals, excel cond, \$795 ea/BO. J Hansen, WYRQ, 62 E Broadway, Little Falls MN 56345. 612-632-2992.

MCI 110B motors, boards, head stacks & parts. M Shea, Precision, POB 723, NY NY 10276. 312-989-2684.

Revox PR-99 MK II 1/2-trk stereo Play units w/25 Hz sensor, \$1100 ea, FOB. D Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

Otari 8-chnl multi-trk rec in console, \$2200; 2-chnl in port case, like new, \$1000; remote control for 8-chnl, \$150; MCS cass deck w/dbx, new, \$275; Revox A77 rec suitcase, parts only, \$150. D Curtis, Creative Sound, 2810 W 4th St, Appleton WI 54914. 414-733-2299.

Ampex MM1200 8-trk remote AL control box, \$4500; Otari MTR-10-2C stereo rec, \$3995; MCI/Sony JH110B stereo big reels in console, \$2000; MCI JH110A stereo in console, \$1295; Ampex ATR700 stereo, \$695/BO; Scully 280B mono in console, \$895; Ampex PR01-2 stereo w/354 elect, \$295; Ampex 440 transport, record bearings, brakes, \$395; TEAC X10R stereo rec dual capstan drive bidirect, \$395. J Price, 214-321-6576.

Technics RS1500 2 trk; Sony/MCI JH110C on roll around metal cabinet, both excel cond; LPB dist amp DA1-16, new & SAE 500A impulse NR sound system, new. J Gelo, 813-642-6899.

Otari MX55 1/2-trk 1/4" w/low hrs, 15/7ips w/rolling stand, perf cond, \$2800. A Jacobson, Work of Art, 197 Floral Blvd, Floral Park NY 11001. 516-328-6543.

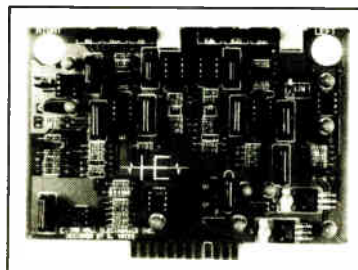
Ampex ATR-700 (2) 1 FT w/2T play, (1) 2T w/T play, 1 drive motor just rbt, \$800 ea/\$1500 pr. B Eddy, WRRR, Box 374, St Marys WV 26170. 304-684-3400.

Tascam 80-8 8-trk, 1/2", great cond, orig pkg, \$1000+freight. Katherine, Linden, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

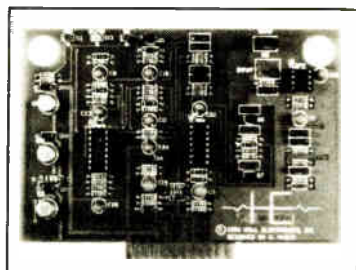
Tascam 32-2B, 1/2-trk, 101/2"; DX-20 dbx I NR; Taoco 4400 2-chnl reverb syst; Soundcraftmen RR 2212 2-chnl 10-band EQ; Paia 6790 dual limiter; TEAC PB 64 patch bay mounted in 51/2" rack w/wheels, \$1000; Marantz Superscope CD-330 port AC/DC dolby stereo rec w/slot case, \$150. C El-Amin, Antillana Syst Intl, 2548 W Division St Ste 200, Chicago IL 60622. 312-772-7707.

Scully 284B-8 1" 8-trk, 3-3/4-30 IPS w/V576 var spd mod, manuals perf cond, \$3000; MCI JH110A, 9 yrs old, 7 1/2, 15, 30 IPS, gd cond, \$2500. T Sherry, 408-244-3848.

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Ampex 600 full-trk, port, gd cond, BO. J Inghram, WGCA, POB 467, Quincy IL 62306.

Otari MX-5050B stereo 2-trk, excel cond, little use, remote & manual, \$1495 ea. B Mounjoy, 615-543-5849.

Tape-Athon play, 7" & 10 1/2" bi-dirc bckgrnd music plys w/spares, pickup in IL, free. E Davison, 217-787-0800.

Fostex 250-AV 4-trk, board combo w/Dolby C, \$400/BO+s/h; Otari CR-705 remote for MX-5050/MKII/2-1/2-trk, \$100. D Crepps, IBS, 29672 Silver St, Val Verde CA 91384. 805-284-9441.

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Otari MX5050 Bill-2, less than 25 hrs use, in box, \$2500. M Collazo, Carrier Plus, POB 171, Stewartsville NJ 08886. 800-755-3948.

ITC 99B/PPSE stereo R/P w/ELSA, mint, little use, \$2495; Delta III stereo triple deck, excel cond w/manual, \$1795. B Mounjoy, 615-543-5849.

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Denon DTR-80P port DAT rec, 4 mos old w/wired rem ctrl, leather case, AA batt pack, AC adapter, \$800. B Harwell, Compact DJs, 1861 Brown Blvd #630, Arlington TX 76006. 817-649-3535.

Ampex ATR700, \$800; TEAC X1000R, new cond, \$400; TEAC A3300SX, new, \$450; Pioneer RT701 w/new heads, \$300; TEAC A3340S, 4-chnl, 4-trk, \$800; Telex 230 & RP110, \$250. J Parsons, 904-532-0192.

Crown GCSX tube-type, bal inputs, excel cond, \$425. G Becker, 813-960-8153.

Scully 100-16 w/8-trk heads, \$2900. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

3M M79 24-trk, excel cond, \$9950. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Otari MX-70 16-trk 1", mint cond, \$10,500. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Ampex AG-440B 1" 8-trk, multi-trk in roll around console, gd cond, BO; Otari Mark II-V 1/2" 4-trk, multi-trk, mint, less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

**want to buy**

Otari/Tascam. P Lopeman, 414-482-1959.

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

MCI/Sony capstan & reel motors, any cond., recdg heads, most mtgs, 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 CDP3000 Pro w/(2) transports, 1 control console, scrub wheel, +4 bal XLR outs, \$1500. J Addie, 312-565-5033.

Denon DN950FA (6) plys, used 18 mos, \$750 ea. C Murray, 503-484-9400.

**want to buy**

Technics SLP 1300 good cond, single/pair, up to \$600-\$800 ea+s/h. J Burdick, DJays, 3603 St Andrews Ct #106, Racine WI 53405. 414-638-9077.

Hold-down spinner from junked plyr, any brand, prel door-mounted, top-loading type. Sidney, WDMC, POB 357, Dover ME 04426. 207-564-2642.

**COMPUTERS**

**want to sell**

Digital LQP02 (2) ltr-quality daisy wheel printers, serial port, \$25+s/h; Mac 820 (10) internal drives, pulls, excel shape, \$15 ea. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

CA APT term w/built-in modem & software, digital serial printer, gd cond, easy remote control & monitoring, \$249. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

Superior Elec Stabaline regulator, used 6 mos, \$150+s/h. B Lord, Lord Bldg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Mitsubishi AM-1301 color mon, 13" screen, RGB input, immac, \$150. S Lawson, KAK Prods, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

Mac 86 MS-DOS co-proc kit w/card for Mac, software & manual, new, \$235; HP 92286J Math/Erite font cart for HP LaserJet/Plus/500/Series II, \$25; Serial 8 port to 1 port auto switch, \$95; IBM PS/2 1 mb 80ns SIMM memory, \$23 ea/\$80 for 4. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

IBM Quietwriter 2 printer w/sheet feeder, Xerox Diablo daisywheel, P Wells, KJOY, 625 Broadway #1200, San Diego CA 92101. 619-238-1037.

**CONSOLES**

**want to sell**

SMC 6-chnl mono, very gd cond, \$200+s/h. F Smith, WBSU, 2408 Chamberlain Ave, Chattanooga TN 37404. 615-624-7126.

Neotek Series I 16, 4, 2 w/patch bay & wiring harness, \$3500. D Gaydos, UGFTV, 721 Broadway, NY NY 10003. 212-998-1663.

MCI JH-618 18 in/16 out, non-auto w/VUs & patch bay, gd cond, \$5000. B Petrucci, A-Z Music, POB 96192, Las Vegas NV 89193. 702-738-2303.

Ramko DC 8MS 8 chnl, 18 input, stereo bd, excel cond w/manuals & extras, \$2500. R Trumbo, KNLF, POB 117, Quincy CA 95971. 800-397-4146.

Gates Yard 8-chnl mono, tube-type mixer for parts, w/o pwr sply, mon amp, will trade for Gates Sta-4vl or Miratel EBS air alert, \$40+s/h. E Lightman, WEDL, 550 Merchant St, Ambridge PA 15003. 412-266-2802.

Yamaha MR1242 12-chnl/tape returns, 3 aux busses EQ, 4 subgroups, talkback syst, all docs, 1 yr old, mint cond, \$1000. C Yengst, WAWZ, Weston Canal Rd, Zarephath NJ 08890. 908-469-0991.

Auditronics 200 TEL hybrid for 200, \$150. P Hall, WOOD, Baylor School Rd, Chattanooga TN 37405. 615-266-5117.

Phase Audio DC-01 dub CD to cart/phone to cart, \$100. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088.

Neotek Series I 16x4x2 w/patch bay & wiring harness, BO. D Gaydos, NYU, 721 Bwy 11th Fl, NY NY 10003. 212-998-1663.

SoundWorkshop Loges 8 16-chnl rec/mix, \$1500. D Coffman, WSOR, 940 Tarpon St, Ft Myers FL 33916. 813-334-1393.

TEAC 2A like new, \$150; Pyramid PR8800, 8 in, 2 out, new, \$400; Sony MX16, 8 in, 4 out, \$200. J Parsons, 904-532-0192.

Eddor 4-chnl auto remote/field mixer, 1 rack unit high, \$145. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Auditronics 200 series blue face mods, (2) mic input, gd cond, \$125 ea; 1 mono line output, gd shape, \$125; (3) stereo line output, \$150 ea/\$750 all. M Guthrie, 813-855-5642.

Sparta M-15 5-pot mono w/#5 multiple input. D Morgan, KNZZ, Box 969, Grand Junction CO 81501. 303-241-9230.

Vintage mixer, TT combo, Scully R-R, antique remote controls, limiters, BO; high-pwr isocoupler on 902.5. BO. D Nadon, WLYT, 30 Howe, Haver Hill MA 01831. 508-374-4733.

Op-amp Labs 1604, 16 in 4 bus, \$4000; RCA BC-18, very clean, dual-chnl BC-18 board, 8 chris, 32 inputs, \$500. K Carlson, KMUT, 1100 Blue Lakes Blvd N, Twin Falls ID 83301. 208-733-1100.

Audio Technica ATC 820 stereo, 8 2-effects in flight case, \$795. J Price, 214-321-6576.

Gates Dynamote 70 4-chnl solid statesman mono mixer w/AC pwr sply, \$50. A Olean, WMPG, 96 Falmouth St, Portland ME 04027. 207-780-4974.

MCI 428 28x24, 336 pt patchbay, prod desk, \$7500. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Autogram IC-10B factory refurbished and ready for operation, \$4500. Call 806-372-5130.

**want to buy**

Svc manual & parts for Howe Audio 9000. K Austin, KFXI, 1101 Hwy 81 N, Marlow OK 73055. 405-658-9292.

Arrakis/Tascam/BE/Ramsa. P Lopeman. 414-482-1959.

**DISCO & SOUND EQUIP**

**want to sell**

Soundcraftsmen 10-band graphic EQ w/big APL meter, 600 in/out, mono, walnut cab, \$100. L Beigel, On-Cue, POB 85042, Los Angeles A 90072. 800-726-9813.

Fostex 4010 time code reader/gener, \$800; Roland M-160 16-chnl line mixer, \$500; (2) NAK MR-2B cass decks, \$500 ea; Valley People line matching interface w/rack kit, \$225; Fostex Metal 2 trk stand, \$150; Revox HS-77 R/PB, 2-trk, \$450; ARP Pro Soloist w/Anvil case, \$150; ARP string ensemble w/Anvil case, \$150. T Campana, 313-553-4044.

UREI LA-3A (2) in side-by-side r, excel cond w/manuals, \$800 both. B A, 615-543-5849.

Numar CD5020, new/used pro dual xport CD plyr w/19" mount, remote control 16x oversample, orig manuals & packaging, \$850; Roland DR550 great drum mach, 64 preset patterns, MIDI, tape interface, \$200+s/h. B Jon, KTTX, 659 FM 331, Belville TX 77418. 409-865-2000.

Duntech Sovereigns 2001 light oak, fine cond, \$6000+s/h. Dave, 305-866-6048.

dbx 208 NR system plus 216 & 224 systems, \$850. J Price, 214-321-6576.

EV HDJ board, Akai turntable, Audio Art Parametric EQ, EV mic, \$250. B Poole, POB 335, Cashtown PA 17310. 717-334-6039.

Klipsch Lascasas horns in road cases, will handle 300 W per chnl, excel cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

Dolby 361 (4) NR units, \$550 ea. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

**want to buy**

Fairchild studio equip, 740/750 turntables, amps, preamps, limiters, stereo disc recs, hi-fi tube gear, 45/78 records, disc recs. K Gutzke, Custom Recording, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

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**FURNITURE**

**want to sell**

Studio Technology, builders of fine studio furniture has available for immediate sale the 1992 NAB show room furniture at 50% off regular price, will fit a 10' 10" foot area. See the photo of the furniture on the Products/Services page in the 8/19/92 issue of Radio World. Call Vince Fiola for more information at 215-640-1229.

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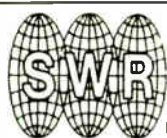
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|----------------------------|---------------------------|-------------------------|
| Acoustics                  | Consoles                  | Stereo Generators       |
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| Antennas & Towers & Cables | Financial Services        | Tapes, Carts & Reels    |
| Audio Production (Other)   | Limiters                  | Tax Deductible Equip    |
| Automation Equip.          | Microphones               | Test Equipment          |
| Brokers                    | Miscellaneous             | Transmitters/Exciters   |
| Cameras (Video)            | Monitors                  | Tubes                   |
| Cart Machines              | Movie Production Equip.   | Turntables              |
| Cassette & R-F Recorders   | Receivers & Transceivers  | TV Film Equip.          |
| CATV-MATV Equip.           | Remote & Microwave Equip. | Video Production Equip. |
| CD's                       | Satellite                 | Video Tape Recorders    |
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**Display Rates for Classified Advertising Effective January 1, 1991**

	1x	3x	6x	12x
1-9 col inch (per inch)	\$55	53	50	45
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Distributor Directory	90	85	80	75
Professional Card	60	55	50	45
Classified Line Ad	\$1.50 per word			
Blind Box Ad	\$10 additional			

To compute ad costs: Multiply the number of ad inches (columns x inches) by the desired rate schedule for your per unit cost. Example: a 3" ad at the 1x rate is \$165, at the 3x rate \$159, at the 6x rate \$150, at the 12x rate \$147, etc.



## LIMITERS

### want to sell

Gentner AFC-1 proc card for 8100A, perf cond w/instructions, \$100; Dorrough 310, clean w/manual, \$125; Hnat Hides A-Maze w/manual, \$525. P Hall, WOOD, Baylor School Rd, Chattanooga TN 37405. 615-266-5117.

Mod Sci Composite Clipper w/pilot restoration, \$750. T Kolnar, WAIT, 8600 Rte 14, Crystal Lake IL 60012. 815-459-7000.

**We buy Optimod 8000A's and 8100A's**  
414-482-2638

Moseley TFL-280 (2) stereo FM vgc, \$150 ea. M Guidotti, Monument Media, 1170 Park Grove Dr, Milpitas CA 95035. 408-946-9466.

CRL AM-4 system with SPF-300 pre-amp, filter, \$2500/BO; CBS Lab Audimax 4440 & Volumax 4000, BO; FM AFC-Peak limiter #310, BO. 816-532-0460.

Gregg 5-band stereo proc & AM 4-band proc, \$4500 for FM, \$3500 for AM. C Haynes, WJMI, 1850 Lynch St, Jackson MS 39203. 601-948-1515.

CRL APP-400 audio proc, \$200; CRL-PMC 300A peak mod controller, \$300, both excel cond. S Manuel, WWJB, 55 W Fort Dade, Brooksville FL 34601. 904-796-7469.

### want to buy

Collins 26U-1; UREI 1176 LA2, LA3 & 6386 tubes. K Keller, Chez Flames Rcdg, 1229 Annunciation St, New Orleans LA 70130. 504-595-8623.

Harris/Gates M-6629 solid statesman AGC amp. C Brescia, WNBZ, Box 211, Saranac Lake NY 12983. 518-891-1544.

Optimod 8000/8100, any cond. P Lopeman, 414-482-1959.

## MICROPHONES

### want to sell

RCA MI-6204C Varicastic poly-direc ribbon bdc, brown gloss finish, \$180; RCA PB-90 A1 bi-direc ribbon, gd cond, \$500; RCA omni-dynamic, omni-direc remote bdc from early 50's, \$100. R Franklin, Franklin Studios, 1004 Dekalb Studios, Norristown PA 19401. 215-646-7788.

RCA classic ribbon, B Davies, Virgo Prods, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

EV 664 dynamic, works well, \$35+s/h. R Zimmer, 602-326-2080.

RCA PB-90-A1 bi-direc ribbon, looks & works like 44, circa 1930s, \$500. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

Sennheiser 405 (2) cardioid condenser, XLR, no sply, \$400. J Newman, 401-847-0555.

Altec 639A recond classic, ribbon dynamic, \$350. L Beigel, On-Cue, POB 85042, Los Angeles CA 90072. 800-726-9813.

Sennheiser MD211, \$125; HME-WM 252 wireless w/SM58, \$195; Telex-WHM 500 wireless, \$150. J Price, 214-321-6576.

EV RE-20, \$300. K Thomas, Rebel Prods, 5555 Radio Ln, Jacksonville FL 32205. 904-388-7711.

AKG D224E (4), (2) new, excel cond, \$200 ea. P Russell, Dowdun College, Sils Hall, Brunswick ME 04011. 207-725-3066.

Crown PZM, \$60; Neumann AC phantom pwr sply for 4 mics, \$75. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

AKG D110 lavalier, new, \$35; Shure 571 lavalier, new, \$45; misc hand & desk paging mics, new & used, \$20 ea. E Davison, 217-787-0800.

RCA 88, mint cond, BO. R Miller, KUAA, Box 575, Lahaina HI 96767. 808-572-5534.

RCA 77DX classic, restored & new ribbon, \$700. K Carlson, KMUT, 1100 Blue Lakes Blvd N, Twin Falls ID 83301. 208-733-1100.

Nady 501 wireless w/2 mics, chnl D, 209.15 MHz, \$500/BO+s/h. D Crepps, IBS, 29672 Silver St, Val Verde CA 91384. 805-294-9441.

Desk mics (hiZ), EV-Shure mic stands, also baby booms (3); tubes, new (32) RCA, GE, Sylvania; Sams tube sub books #8 & #6; RCA tube manual; Sony head demagnetizer (new); jack femal connectors; EV 502 transformer primary/secondary. Mr. Oliver, 212-874-7660/0274. Call afternoons till 10PM.

Teletunken U-47, Neumann U-67, KM-54 mint; RCA ribbon mics (2) KU3A's 10,0001, (3) 77-DX, (1) 44-BX, (2) BK-5; Altec tube mics M-11, M-20, M-30; 639 film version mic ect. Trade or sale. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

### want to buy

RCA ribbon, any cond. B Davies, Virgo Prods, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

EV RE-20/Sennheiser 421/Neumann. P Lopeman, 414-482-1959.

RCA 77DXs/44BXs ribbon, chrome/TV grey, gd cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

## MISCELLANEOUS

### want to sell

Triad A-11-J (2) audio input xformers, 50/233/600 ohm input, 60K ohm output, \$36 bolt; (4) Ampex 15095 & (9) 4580116-20 plug in octal 8-pin xformers, 150/600 ohm input, 15K ohm output, \$18 ea. S Lawson, KAK Prods, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

Antique bdcg & elect equip, \$2/list. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

Up timers (3), new, 2" readouts, counts to 9:59 & resets, momentary closure resets to 0:00, \$57.50 pcd; Audio Dig TC-2 dig delay unit, new w/o manual, \$950 pcd UPS; audio & RF tech manuals for Sparta Elec Corp equip. D Peluso, KJUL, 2880 E Flamingo Rd Ste E, Las Vegas NV 89121. 702-732-2200.

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# 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: \_\_\_\_\_

## POSITIONS WANTED

DAT w/2-1/2 yrs in CHR/AC w/news/prod seeks long term FT pos in CO, gd pipes, attracts audience, team plyr. Laura, 303-824-3948.

Well-seasoned pro & coll instructor seeks pos in Cape Cod/East MA, com/crtable w/all aspects of radio & TV, pref mgmt pos, open to any offer w/upward mobility. J Imler, POB 10078, State College PA 16805. 814-867-1657.

Former CATV Chief Tech w/over 16 yrs exper in RF, A/V equip maint, syst design & ops seeks challenging tech pos. J Powers, 607-272-7717.

Engr w/25+ yrs major mkt exper & excel refs, seeks stable long term employment. C Wilkinson, 214-544-3799.

Energetic & spontaneous prof team ply w/8 yrs on air/prod/prom exp seeks pos at AOR/AC/oldies/country, pref West. Robin, 602-461-8209.

Ambitious air personality sks FT pos, any format, in SE Mich/NNW Ohio, reliable team plyr. H Byrne, 614-772-6886.

Looking for personable air talent? Not a robot/screecher, 12 yrs exper, top 50 mkt, ad lib easy. Art, 517-288-2664.

Experienced, Christian manager/announcer/public relations director w/10 years experience. Strong administrative, technical and production skills. Seeks position in NE or SE. Write to: Radio World, POB 1214, Falls Church VA 22041. Attn Box #09-23-01RW.

Witty DJ relocating to N VA, 3 yrs on air exper, any shift, tape avail. M Hart, 4107 Conrad Rd, Alexandria VA 22312.

Bright, hardworking marketable AT w/3 yrs on air, 2 in drive time, seeks pos in rated rock/country midwest mkt. Jared, 612-693-2817.

Engr w/25 yrs exper seeks FT perm pos w/stable, well-managed organ. Jeff, 719-633-5092/5125.

Freelance engr w/heavy duty exper for any job, anywhere w/great refs, audio, RF, auto, xmtrs, anls/construction, US/inil. 813-849-3477.

1 yr 2 wks exper on air & 1 mo prog dir exper, seeks pos in radio anywhere in US. 814-266-1173.

## HELP WANTED

NEW start-up 25KW FM in central VA seeks sales oriented Manager to direct sales and assist in management of new station. Must have strong sales background and references. Excellent new facility. Send resume to: WFXQ, POB 305, Chase City VA 23924. 804-372-3996. EOE.

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**Schafer Digital**  
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Attn. Ms. Wymore.

**SPACE AVAILABLE**  
Call Simone Mullins  
at 1-800-336-3045

# EMPLOYMENT SECTION

**HELP WANTED:** Any company or station can run "Help Wanted" ads for \$1.50/word or buy a display box for \$55/column inch. Payment must accompany insert, use your MasterCard or VISA; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$10. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for details.

**POSITIONS WANTED:** Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 2 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$10 fee which must be paid with the listing (there will be no invoicing). Responses will be forwarded to the listee, unopened.

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Ampex 985 Music Ctr AM/FM tuner & 3-sp stereo R-R in orig wood cab, new hds & belts in 1990, 33x9x16", \$500. E Brouder, Man From Mars, 159 Orange St, Manchester NH 03104. 603-668-0652.

Rek-o-Kut chrome headshell, gd cond, for 12/16" Rec-o-Kut tonearms, \$25 ea; Audio-Technica ATP-12 12" prof transcription arm, gd cond, \$150; Simplex (2) 20" resettable clocks, new, \$150 both; Alertlife WL-3 (2) vertic on-air lights lettered on 3 sides, \$65 ea; price list on antique bdcg equip, \$2. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401. 215-646-7788.

SCA rcvr crystals, 90.1k, 91.7, 100.3 FM, other freq avail in small quantities, \$1. Chris, 309-794-7500.

Radio Systems RSTM-2R timer to 9:59:59 front panel/remote controls, 1/2" dig readout, mint, \$95; Ampex spkrs from 622 port spkrlamps, no rear bolt, excel cond, \$25/ea; Ampex input xfms, (5) 4580200 for 440 recs, (1) 4580116-01, \$30 ea; Sony C-38-B large diaphragm condenser, phanton/batt, cardioid/omni, grill corner dented, \$300; Han-D-Mag THIN-P 2-sided probe demagnetizer, \$35; Altec/Peerless plug-in line xfirms, (7) red 15095 150/600 to 15K, (2) green 4722 38/150 to 50K, (2) black 15356 150/600 to 600, \$30 ea; (2) University HF-206 spkrs w/hypersonic tweeters; T-30 mid range drivers w/H-600 horns, \$30; Altec 8272-01GG fader slide, 600/600, new w/spec sheet, missing 1 mounting plate, \$20. J Newman, 401-847-0455.

Pearsons (3) 4-chnl programmers w/auto feature & cables, \$300 ea. W Christensen, KIOH, Hwy 30 W, Pipestone MN 56164. 507-825-4282.

Henry Matchbox Interface amps (2), \$95 ea; (2) Superrelays, \$110 ea; Telecart II, \$125+s/h, all used 6 mos. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Triad A-10-J, (2) audio input xformers, 600 ohm input, 60K ohm ouput, \$36 pair; (2) EV T-350, 1040A & N3 hi end & mid range hom spkrs & 3-way crossover ntwk in walnut cab w/o woofers, new cond, \$250; UTC pri 50/125/200/333/600 ohm input, sec 50/125/200/333/600 ohm, \$40 pair. S Lawson, KAK Prods, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

BE subcarrier gener, 67 kHz, excel cond, \$500; SCA mon, nds repair, \$100. G Kauffman, 319-243-1390.

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Microwave Filter Co 2903-7/13 phase-attenuator box, using 2 ants, \$150. S Marshall, CE, WDME, POB 357, Dover-Foxcroft ME 04426. 207-564-2642.

Symetrics T101 tele interface, new, \$250; Henry Mix-Minus, new, \$75. S Manuel, WWJB, 55 W Fort Dade, Brooksville FL 34601. 904-796-7469.

Altec 15095 & 4588 1588B plug ins, 1579A. J Parsons, 904-532-0192.

Road cases, (3) military built, 19" mountings, BO. R Meyers, Benchmark, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963/FAX 305-264-2357.

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Viking RP10-22, (2) tape head pre amps, solid state, \$35 ea; Telephones w/headset jacks, 6-button key & one line, TT & rotary, \$50 ea. E Davison, 217-787-0800.

Echo Plate #2, gd shape, \$500; Fisher reverb units w/3 spring ea, \$100 ea. H Sewell, Oakridge Music, 2001 Elton Rd, Ft Worth TX 76118. 817-838-8001.

JBL D16R2405 replacement diaphragm for #2405 tweeter, new, \$50. J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803. 812-877-2663.

FM 5 kW RF load, \$595.00. 1-5/8" connectors, \$50 each. 505-522-4162.

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Belar AMM-1 AM mod mod; EBS mon/gen, TFT/eqv, R Miller, KJAU, POB 575, Lahaina HI 96767. 808-572-5334.

101.5 stereo/mono mod, Belar/McMartin; EBS. P Lopeman, 414-482-1959.

Belar AMM-1/AMM-2 working AM, mod tuneable to 1570 kHz, under \$500; TFT 7604 EBS RX/gen, under \$500. R Miller, KJAU, Box 575, Lahaina HI 96767. 808-572-5334.

Any older McMartin mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

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Bell & Howell 500 & 1500 series 16mm proj, (1) autofeet, (2) manual, \$150 ea. Katherine, Linden, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

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Yaesu FTC-2025 25 W VHF, 10-chnl, PL encode, mobile brckt, \$50. P Russell, Bowdoin Coll, Sills Hall, Brunswick ME 04011. 207-725-3066.

Magnum/Dynalab FT-101 FM tuner for rack mounting, modified for super sensitivity w/Toko 110, 150 kHz ceramic filters, \$425+\$65/s. B Elving, box 336, Esko MN 55733-0336. 218-879-7676.

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Moseley TRC-15A, excel cond, \$795/BO. J Hansen, WYRQ, 62 E Broadway, Little Falls MN 56345. 612-632-2992.

Moseley MRC 1600 pkg, D Siddall, WLOI, 902 Lincoln Way, LaPorte IN 46350. 219-362-6144.

Motorola Tough Talker cell phone, transportable, bag phoe, 3 hrs talk time @3 W pwr, 1 yr old, excel cond, \$275+s/h. G Violet, Violet Comm, 331 Lookout Pt, Hot Springs AR 71913. 800-676-1736.

Moseley MRC-1600, nds work, \$1000; Marti RMC-20, removed from svc, \$300. G Arroyo, 407-830-0800.

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RPU system/STL, prof Moseley 505/606. P Lopeman, 414-482-1959.

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Sci Atlanta DAT-32 300-1 LNA, 7300 unit complete, 7325 unit complete w/(2) 15 kHz dual chnl cards & (1) 20 kHz dual chnl card Sedat, manuals, BO. R Hobbs, WMLR, 2009 Cromwell Dr, Nashville TN 37215. 615-373-2351.

Wegener 1601 mainframe, oldies, very gd cond, \$3500. Mark, KQWB, Box 1301, Fargo ND 58107. 218-236-7900.

Wegener 1601 mainframe w/pwr sply, new cond, little use, \$200/BO. John, 509-826-0100.

LNB 25°, C band, \$155. G Wachter, KFVY, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

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Scotchart IIs (575) 3-1/2 min, oldies rec from CD, \$2 ea+s/h. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

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

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Gates TE-3 exciter, solid state, 10 W output w/Optimod interface, \$500. K Carlson, KMUT, 1100 Blue Lakes Blvd N, Twin Falls ID 83301. 208-733-1100.

Marti 40 RPU 40 W solid state, 170.15 kHz, \$995. G Erway, KKS8, POB 40309, Santa Barbara CA 93140. 805-967-6672.

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#### want to buy

3 phasor for 5 kW FM, 220 V, 60 Hz, rotary/coil. J Cunningham, KEOR, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

10 kW FM gd cond, pref Continental. R Wesley, WKDO, POB B, Liberty KY 42539. 606-787-7331.

RCA BTF 3E1 FM. A Burgos, WNZN, Carr Vieja del Viga #83, Ponce PR 00731. 419-588-3700.

10 KW FM gd cond, single phase but will take 3-phase. K Austin, KFxl, 1101 Hwy 81 N, Marlow OK 73055. 405-658-9292.

Collins 300G-1 minor parts & advice for restoration. M Corson, 202-736-9548.

250 W FM w/ or w/o exciter. Bill, 904-678-8943.

GE XT1-A clean & collectable; any AM 250/1000 W, will remove & pickup, clean & complete. M Heiman, 602-537-2450.

Harris MW1A AM, H Hoelicker, KRFS, Rt 2 Box 149, Superior NE 68978. 402-879-4741.

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

5/10 kW AM, gd cond, tuned to 1470. Tony, 203-634-1470.

CSI/CCA 1-15 kW AM. J Wilkinson, KONY, POB 2588, St George UT 84770. 801-673-1210.

Modulation xformer for RCA BTA-10U/BC-10P, gd cond. G Arroyo, 407-830-0800.

Collins 831 10-25 kW FM, gd working cond, pref Continental/Harris. R Wesley, WKDO, POB B, Liberty KY 42539. 606-787-7331.

1930s/1940s vintage AM, not more than 250 W, cheap. George, 419-529-8427.

100 W FM, late mdl. R Murphy, 800-582-7625

2.5 to 5.0 kW FM, ltd budget, can fix broken one; exciter, pref QEI 675/Harris MS/MX-15 or BE FX-30. P Lopeman, 414-482-1959.

10 kW, gd cond. G Spicer, RPV, Box 8085, Mitchell IL 62040. 618-797-2299.

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

#### want to buy

Eimac/Varian 3CX1000A7, new/pulls for rsrch proj, full output. R Stankus, Mid-Lo Bdcg, 10616 Savoy Rd, Richmond VA 23235. 804-320-1130.

3CX3000A7. P Lopeman, 414-482-1959.

### TURNTABLES

#### want to sell

Technics GSL 1200 MK II, (2), excel cond, covers still on, \$275 ea/\$500 all; SP 25 (2), unmounted w/ATP-12 tone arm, \$300 ea; ATI P100 (4), pre-amp, new cond, \$150 ea/\$500 all. J Travis WC/K, POB 506, Bath NY 14810. 607-776-4151.

### SPACE AVAILABLE

Call Simone Mullins at 1-800-336-3045

Neumann SX-15 disc cutting head, stereo w/heli-um cooling, excel cond, \$3000. S Kimball, Glen Glenn Sound, 900 N Seward St, Hollywood CA 90038. 213-962-4082.

Technics SL-1200 MK2 great shape, w/o dust cover & cart, \$250+s/h. D Morgan, KJYG, Box 969, Grand Junction CO 81501. 303-241-9230.

Technics SP-25 direct drive, gd cond, w/ATP-12T arm, \$350. R Franklin, Franklin Studios, 1004 Dekaib St, Norristown PA 19401. 215-646-7788.

#### want to buy

Technics SL 1200 MK2 pair, gd cond, up to \$200 ea+s/h. J Burdick, DJays, 3603 St Andrews Ct #106, Racine WI 53405. 414-638-9077.

Tone arms for QRK drilled for Shure M-232, cheap, Sidney, WDME, POB 357, Dover ME 04426. 207-564-2642.

### VIDEO PROD EQUIP

#### want to sell

Onyx JS-05, (4) video amps for CCTV cams, \$25 ea. P Russell, Bowdoin Coll, Sills Hall, Brunswick ME 04011. 207-725-3066.

### VIDEO TAPE RECORDERS

#### want to sell

JVC CR4400LU port 3/4", \$150. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088.

Sony VQ-4800, BO, John, 509-826-0100.

## ACTION-GRAM

### Equipment Listings

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply send your listings to us, following the example below. Please indicate in which category you would like your listing to appear. Mail your listings to the address below. Thank you.

Please print and include all information  
Contact Name: \_\_\_\_\_  
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City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
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  - A Commercial AM station
  - G TV station/teleprod facility
  - B Commercial FM station
  - H Consultant/ind engineer
  - C Educational FM station
  - I Mfg, distributor or dealer
  - E Network/group owner
  - J Other
- II. Job Function**
- A Ownership
  - D Programming/production
  - B General management
  - E News operations
  - C Engineering
  - F Other

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Make: \_\_\_\_\_ Model #: \_\_\_\_\_

Brief Description: \_\_\_\_\_

Price: \_\_\_\_\_

WTS: \_\_\_\_\_ WTB: \_\_\_\_\_ Category: \_\_\_\_\_

Make: \_\_\_\_\_ Model #: \_\_\_\_\_

Brief Description: \_\_\_\_\_

Price: \_\_\_\_\_

\*Closing for listings is the first and third Fridays for the next month's issue. All listings are run for 2 issues unless pressed for space or otherwise notified by listee.

## Broadcast Equipment Exchange

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system. Our unique track monitor section will speed your production pace, allowing simultaneous stereo mixdown during the multi-track bed session.

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A-6000