Radio World®

Part II of **License Renewal** Series, **See p. 7**

Vol 18, No 14 | Radio's Best Read Newspaper | July 13, 1994

Radio/PC Prospect Excites NAB Board

by Randy Sukow

WASHINGTON A group of prominent broadcasters has begun promoting the idea of integrating AM/FM radio receivers with personal computers and other high-tech communications devices.

The National Association of Broadcasters' Radio Futures Committee, led by Richard Ferguson, president and chief executive officer, New City Communications, Bridgeport, Conn., proposed the initiative last month during a meeting of NAB radio board (see **RW** editorial, June 29).

The board approved the Future Committee's plan to establish a subgroup charged with approaching electronics companies with radio/high-tech convergence ideas.

Ferguson credits Alan Box, president, EZ Communications, Fairfax, Va., as the prime mover behind the strategy.

"I've just had this notion for the last six months now that there is a huge opportunity for the industry if we can get receivers in PCs, fax machines and perhaps even cellular telephones," Box told **RW**. "We could not only deliver our entertainment services, but do point-to-multipoint data distribution through RBDS (Radio Broadcast Data Service)."

Box said the plan gelled in his mind during the NAB Futures Summit in Carlsbad, Calif., last January, as representatives from Microsoft described plans for future TV/computer products. "It hit me like a bolt of lighting, 'Where is the radio?'" he said.

Pursuing agreement

Since that meeting, EZ Communications has been talking to Microsoft on its own about possible radio/computer applications, but Box said he could not provide more detail on those talks due to a nondisclosure agreement with MicroSoft.

Futures Committee members have also been discussing potential consumer and business applications among themselves in recent months and plan to continue gathering more ideas in the immediate future.

"If local area networks in offices were able to receive radio stations, the radio station could pump radio down through its subcarrier signals," Ferguson said.

"If Domino's Pizza wants to send out 10,000 faxes for the lunch hour special,

continued on page 3 ▶

Stern's Cleveland FM Affiliate Briefly Silenced by Vandalism

by Alan Haber

CLEVELAND It may have started out as just another funeral for his competition, but Howard Stern's June 10th on-air, ritual "burial" of WMMS-FM's Morning Zoo and WMJI-FM's morning man John Lanigan in Cleveland may turn out to be as memorable for the alleged sabotage that accompanied the event as much as the event itself.

First, Stern's satellite signal, which is transmitted to several major U.S. radio markets via local stations, was allegedly jammed while the self-proclaimed "King of All Media" was broadcasting before an estimated crowd of over 10,000 enthusiastic supporters gathered outside of the Rock and Roll of Hall of Fame. Stern has made it a ritual to personally take his morning air entourage to a live event in the market where he has overtaken the morning competition in the ratings race.

No show

Later, an unidentified person allegedly yelled obscenities to apparently disrupt the live show, according to Walter Tiburski, vice president and general manager of Stern's Cleveland station, Metroplex Communications' WNCX-FM. Tiburski said the comments did not air because of a broadcast delay

Then at 8:42 a.m., according to a Cleveland Police Department spokesperson, the satellite feed cable was allegedly cut while Stern was broadcasting from Tiffany's Cabaret, a "gentleman's club" located in Cleveland's entertainment area called the Flats. The program had to be routed through a cellular telephone link until the satellite could be brought back on line.

A Cleveland Police Department spokesperson confirmed that WMMS engineer William Alford was charged with breaking and entering, disrupting a public service, and possession of criminal tools in the alleged wire cutting incident. A spokesperson for the Cleveland Municipal City Court said Alford posted a $10,000 bond, and the case was continued to June 22.

While lawyers for Infinity Broadcasting were not pursuing the incident as of June 15, WNCX's Tiburski confirmed the station was working closely with the FCC's

Howard Stern and Co.

Detroit field office to investigate the matter. Paul Mako, acting engineer in charge at the FCC's Detroit office, confirmed that "the FCC has the incident under investigation."

Wayne McKee, associate chief of the FCC's enforcement division, Field Operations Bureau, in Washington, D.C., said the level of the FCC's involvement in the matter has yet to be determined. "The bottom line is, we're looking at two possibles—the potential, deliberate interference to a microwave transmission of some sort... and then, secondarily, if there was another licensee involved," he said.

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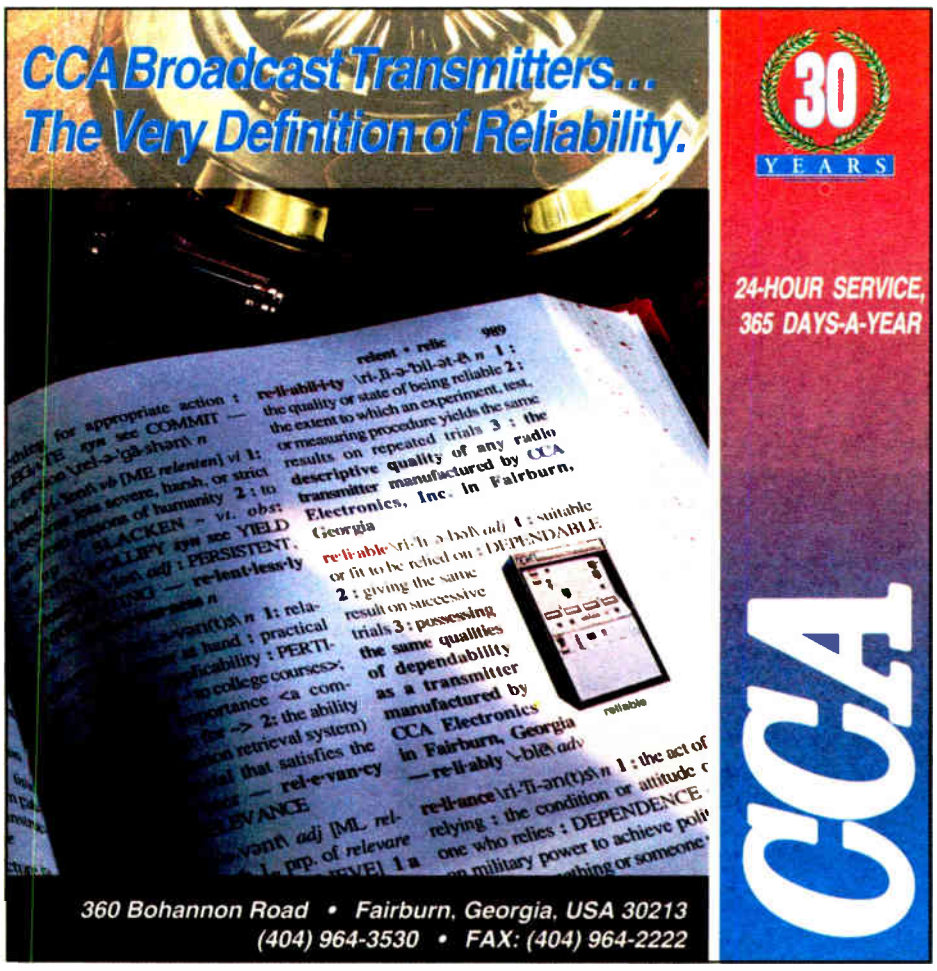

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World Radio History

NEWSWATCH

Liberty, Griffin Combine Stations

NEW YORK Liberty Broadcasting and the Griffin Group have reached an agreement that combines both group's radio stations, which now totals 17 stations.

The stations include: WXTR-FM, Washington, D.C., Liberty; WHFS-FM, Baltimore-Washington, Liberty; WBAB-FM, WGBB(AM), WHFM-FM and WBLI-FM, Long Island, N.Y., Liberty; WHJJ(AM), WHJY-FM, Providence, R.I., Griffin; WSNE-FM, Providence, R.I., Liberty; WYSR-FM, WPOP(AM), Hartford, Conn., Griffin; WHCN-FM, Hartford, Conn., Liberty; WYPX-FM, WTRY(AM), Albany, N.Y., Griffin; WGNA-AM-FM, Albany, N.Y., Liberty; and WMXB-FM, Richmond, Va., Liberty.

NAB Asbestos Removal

WASHINGTON The National Association of Broadcasters of the joint board, meeting here last month, approved a plan to remodel the association's national headquarters. D.C. health regulations forced NAB to decide between a rebuild or permanently moving the headquarters, after asbestos was found last year in many of the building's walls. (Air quality tests indicate that it is currently safe to work in the building.)

NAB expects to move into temporary headquarters in about six months.

AsiaOne Expands

CHICAGO Eleven stations scattered throughout the U.S. offer the Asian language network, AsiaOne, in response to a rapidly growing Asian American population that now numbers more than nine million.

Douglas Broadcasting created the network in order to "provide a responsive, innovative vehicle to reach Asians with culturally-relevant native language programming," Douglas Broadcasting President John Douglas said.

The network is divided into four geographic regions with 300 hours of weekly programming. In the West, California stations include a northern San Diego County to Los Angeles FM "trimulcast" on KMAX, KBAX and KAXX, all on 107.1; KWIZ-FM in Orange County, a simulcast on KEST(AM)-KOBO-FM, from San Francisco to Sacramento; and KSJX(AM) in San Jose.

In the Southwest, the network feed is broadcast by KGOL(AM) in Houston, while WVVX-FM and WNDZ(AM) in Chicago represent the Midwest. In the East, AsiaOne programming is broadcast via WNJR in New York.

Variable Tuning SCAs

ADOLPH, Minn. FM Atlas, a company that offers a comprehensive U.S. station list and map, is offering a SCA modification of the GE SUPERADIO III, that enables variable tuning from 57 kHz to 92 kHz.

According to company owner Bruce Elving, he offers the variable tuning as an option for blind listeners who tune into more than one reading service. Although the FCC usually frowns on variable tuning SCA radios being sold to

continued on page 9 ▶

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

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World Radio History

Stern Silenced Briefly by Vandalism

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WMMS, which along with WMJI is owned by OmniAmerica Group, issued a one-page press release on Monday, June 13, to address the situation (through a spokesperson, station officials declined to be interviewed for this article). The release said that "WMMS did not and does not authorize, encourage or condone the interruption of another radio station's broadcast," and that the station "will not tolerate any such conduct from any of its employees." The release also noted that "the individual allegedly involved in the incident... has been suspended pending further investigation of the allegations against him."

The release added that: "It may be possible that the reported action was nothing more than a publicity stunt engineered by our competition," and said that "Among other coincidences and facts, the individual in question reportedly received restricted area access to the Stern show from current WNCX (and former WMMS) employees."

Tiburski called the release's publicity stunt comment "laughable and ignorant." He further said that he did not think Alford acted alone, but admitted he had no proof that Alford did not act alone.

Looking for access

Tiburski said that Alford had "made numerous attempts" to obtain press credentials prior to the event, and noted that when he personally saw Alford "hanging around the fence" the morning of the event, he asked him to leave.

Noting that the event carried "extravagant security," Tiburski said he recognized Alford instantly (Tiburski ran WMMS on an interim basis for a while recently before going to WNCX).

According to Tiburski, WMMS made attempts to disrupt the Stern broadcast in other ways, including trying to arrange for a parachute jump at the broadcast site, and flying a helicopter over the crowd, which was chased away by a Cleveland Police helicopter.

As the dust settled June 14 on Stern's Cleveland appearance, Tiburski said "the hype that we hoped to get was the hype that we created, specifically to bringing Howard to town and giving a professional stage show. The improper and illegal activities of jamming our signal by somebody... and... the cutting of the wire... that's, you know, regrettable, and... that's a sideshow."

Tiburski also told **RW** that a granite tombstone, inscribed with Stern's name, was delivered by courier on the day of the Stern broadcast to WNCX from WMMS and WMJI.

Tiburski said he was not amused. "I mean, you know what I tell all these people? 'Why don't you all grow up?'"

Doug Podell, WNCX's program director, thinks that WMMS wasn't "prepared to go up against (Stern)... and, you know, I don't think they should have. I mean, if it would have been reversed... I'd have stayed away, let the guy come in, do his thing, and it would have been over."

Stern, for his part, barrelled his way through the broadcast in typical fashion. When all was said and done, Stern thanked everyone on the air for making his show number one in Cleveland.

Before leaving the air, he added that the other stations can try to pull the plug on his show and try every dirty trick in the book, but they can't replace talent.

Combining PC and Radio

▶ continued from page 1

why couldn't that be done on FM?" Box asked.

Perhaps the most exciting aspect, both Ferguson and Box said, is radio's mobility. Any application designed for home PCs or fax machines could be integrated into portable radios, laptop computers, car audio systems, cellular phones and future personal communications service receivers.

At press time, the organization and aims for the new NAB radio/computer project were still unsettled, but the potential technical problems and regulatory barriers to radio/computer development are expected to be key issues.

"If there are challenges and hurdles, as there undoubtedly will be, we can address those," Ferguson said. "There may need to be some standard setting or there may be some sort of research needed to help develop the systems, but my sense is that private industry can do all that."

There is a sense of urgency about the project. Ferguson has already appointed Box to chair the radio/computer subgroup and was planning early meetings with him to discuss the subgroup's next step. "There is nothing scheduled immediately, but the intention would be to move on with it," Box said.

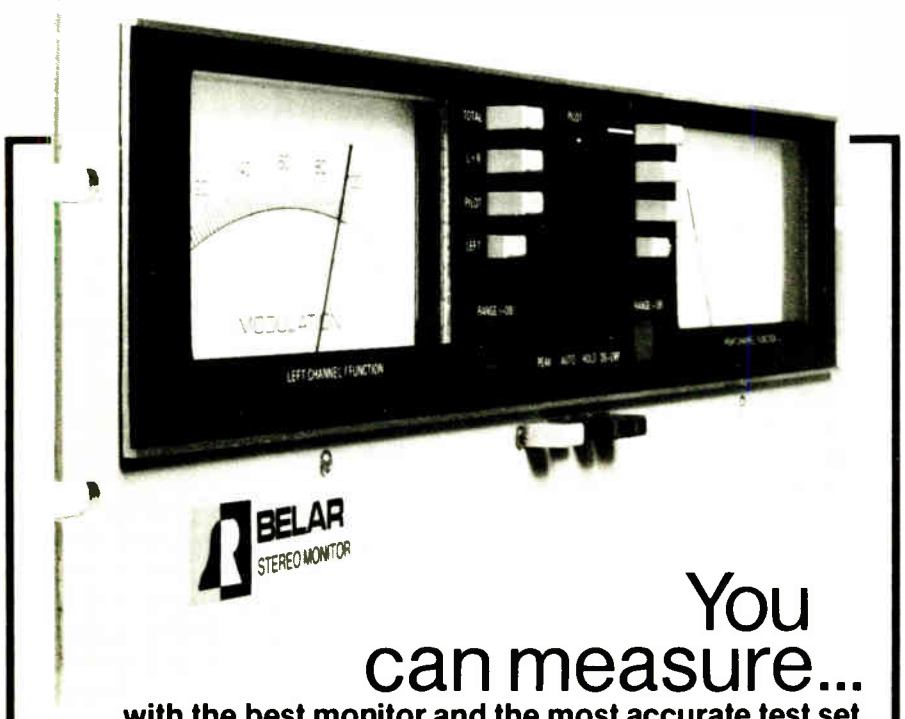
Futures Committee will also redouble efforts to encourage standards for high-speed FM data transmission services and, ultimately, in-band, on-channel digital audio broadcasting (DAB).

The completion of new digital audio and data transmission standards could be key to the ultimate success of radio/computer convergence. "If this is great in RBDS, it's even better in DAB," said Box, who is also chairman of NAB's digital audio broadcasting task force.

"People should not be taking a ho-hum attitude. We should move as fast as possible," Ferguson said. "Having said that, it is also true that there is only so fast you can go."

A DAB standard appears to be at least a year away. The Electronics Industries Association (EIA) and the National Radio Systems Committee (NRSC) are in the midst of laboratory testing of proposed DAB systems at NASA's Lewis Research Center in Cleveland. The tests were originally expected to extend into the fall, but have fallen slightly behind schedule, Box said.

DAB tapes recorded in Cleveland will be sent for subjective assessment at the Canadian Research Center (CRC) in Ottawa starting this fall. EIA and NRSC also plan field tests of the proposed systems following the lab tests.



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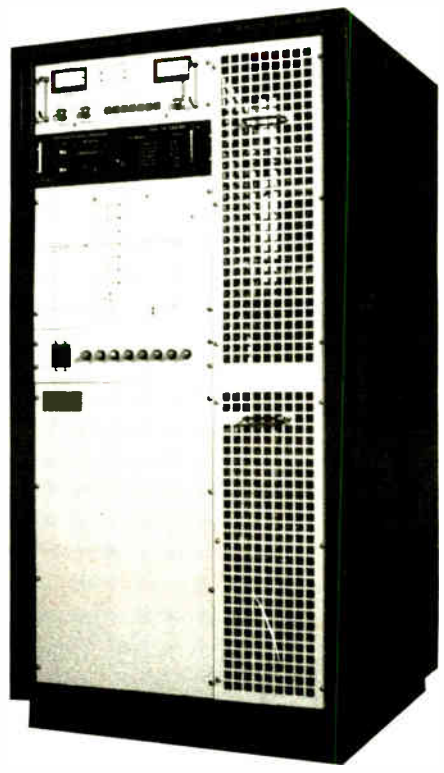

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World Radio History

Keeping Radio on the Leading Edge

WASHINGTON Technology is a wonderful thing. Radio is a wonderful thing. Together, cutting edge technology and a good broadcast journalist on the prowl can make for some riveting stuff. Look no further than the pursuit and arrest of famed football player O.J. Simpson for the alleged murder of his wife and her friend.

I have to hand it to television—the overhead video from the helicopters as Simpson and Al Cowling led the California Highway Patrol on a slow but lengthy chase was riveting. It transformed each viewer into a pursuer, sharing the anxiety and the loss, with the troopers

pacing behind the now-famous white Bronco.

I too numbered among the armchair pursuers, hoping all would end well. I too noticed the crowds out on the highway that the CHP tried to clear. The circus-like atmosphere of people trying to approach O.J. and wish him well was fascinating. Where did they all come from? What were they thinking?

As I viewed the crowds from my helicopter/armchair, I once again was faced with the importance and prominence radio plays in the lives of many. Radio was their messenger, and they responded in droves.

Once the chase ended at the Brentwood estate of O.J. Simpson and darkness engulfed the Bronco and the lawmen, audio/radio had the chance to shine again. The channel I was watching had a reporter broadcasting from near the police radio monitor. She was off-camera, but became our eyes. We did not need to see her—her narration was almost as riveting as the police chase had been. By the tone of her voice you knew when her interruptions of the on-air anchors mattered.

Broadcast journalism at its most potent and compelling carries with it tremendous responsibility. Most Californians, law-abiding citizens that they are, cleared out of the way. Perhaps the well-wishers needed a gentle reminder from the sta-

Tom Leykis broadcasts the national Westwood One radio show live from the media frenzy outside O.J. Simpson's residence.

tions they were listening to that this was a tragic moment in the life of a man. Public persona or not, O.J. Simpson was in no condition to be cheered on by onlookers.

Reporters were there to do a job, and through it, bring us the news of events as they unfolded. They did it well. It was unfortunate that the crowds felt compelled to participate as well.

★ ★ ★

As evidenced by this issue's *Buyer's Guide*, the pace of development of new technology and software is frantic. The category this time out is automation equipment and software. It also encompasses live-assist programs. A few years ago, this category did not exist by itself—it was subsumed by source gear.

The editorial inclination of Radio World has always been to encourage the development and implementation of new technology—provided it made good business sense and made life better for radio. RDS/RBDS continues to be such a technology.

Our fourth RDS/RBDS Roll Call page is scheduled to run in the next issue. The number of stations using the technology recently leapt up (see story on Denon, page 6). The number is roughly 150 stations—with the rate of joiners picking up pace.

As part of our continuing effort to cover new technology, in the coming months **RW** will be running "Product Evaluations" on a number of products that have become available for RDS/RBDS, such as the Denon tuner for home/studio, the Delco prototype car receiver, and the Denon car RBDS/CD receiver.

★ ★ ★

There is a lot of "people news" to share with you this time out. Andy Butler, who many of you probably know, is leaving the NAB Science and Technology division to work for Broadcast Electronics. My understanding is that Andy is joining to fill the position that Geoff Mendenhall used to have (Geoff has since moved on to Harris Allied).

In other people news, Burk Technology snagged Dan Rau as sales manager, after a four-and-a-half year stint at Marti as sales and marketing director.

Closer to home, I have some news for you about one of my predecessors—Judith Gross. Judith, who had been VP and head copywriter at MediaScan has branched out on her own.

JG Communications is based in the New York City area, and offers writing expertise and communications consulting to companies specializing in radio and broadcast technology and related products.

More importantly, Judith will be working with me and the folks here at **RW** to bring you a technical newsletter (*J.G.'s Earwaves*) that will keep you on the cutting edge of news and information about the industry. Paid subscriptions will be offered to all **RW** readers. Look for more information in the next issue of Radio World.

Jane Steinberg joins ABC Radio Networks as vice president of syndicated programming sales. Steinberg had been eastern region director of marketing for Westwood One Radio Networks in New York.

Sam Benrubi was named executive vice president director of sales for Westwood One Entertainment. Benrubi moves to Westwood from Infinity Broadcasting's WYSP-FM Philadelphia.

BSW added two product specialists to cover the Northeast and Southeast regions. The Northeast office, located in Stafford, Va., is headed up by Craig Klein. The Southeast region office is headed up by George Pupala. Craig joins BSW from WAVA(FM) Arlington, Va. (Washington) and George joins the company from the Pacific Mountain Network in Colorado.

Ruth Domboski Macris was named marketing communications manager for the broadcast division of Associated Press.

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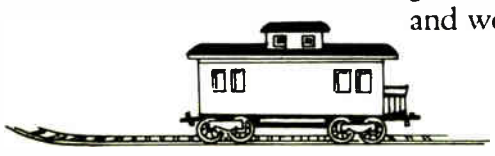

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READERS FORUM

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Contractor concerns

Dear **RW**,

I've been a reader of **RW** for many years, and have always found each issue to be of great interest and value. I have been involved with contract engineering services since the mid-1970s and have been through it all, enjoying the ups and really hitting bottom.

RW is missing the boat by not including columns dedicated to the contract engineering world. There appears to be a very big problem in a lot of areas with how to approach this type of service: What should be done about rates, time limits, and, most of all, getting paid.

These are the everyday things that a contract engineer must really consider or sink fast. Your publication would benefit by a column, be it bi-weekly, monthly or as space permits, dedicated only to contract engineering services. To the best of my knowledge, this is not being done.

Your publication would be the ideal place to have something like this.

Dave Schmidt, Mid Atlantic
Radio Service, Wilmington, Del.

Editor's note: **RW** *has, in fact, started a "Contractors' Corner" column as of the beginning of this year. It has run four times so far. The most recent installment, in the June 1 issue, deals with the problems contractors have getting paid.*

Contributors are still needed for this column. Any contract engineer interested in writing for **RW** *should contact the editors at the address given in the masthead below.*

Soap dope found

Dear **RW**,

This is in response to the "no soap" joke mentioned in your column a few months back (**RW**, March 23).

The joke originated on the streets of New York City about 50 years ago. It is supposed to be told to several people who know the joke and someone who doesn't. Then, when the joke reaches the nonsensical punch line... "No soap radio"... everyone, including the person who doesn't know the joke, laughs.

Incidentally, no soap is also the name our company. No Soap Productions is a full-service audio production company specializing in music, sound design and direction for radio and TV commercial tracks. We have operated in New York City for the past 24 years.

Dan Aron, owner
No Soap Productions, New York

Dear **RW**,

A few months ago, someone wrote in about the origins of the phrase, "No soap radio." He missed two cultural references. One was a short-lived comedy series that ran on ABC-TV in the mid-1980s. The other was a slightly different version of that humorless joke, explained in Carrie Fisher's "Postcards from the Edge."

In 1987, I toured an AM station in Jacksonville, and met one of the old timers running it. I told him the joke and the story behind it, and he told me that the term meant an unsponsored radio program. I guess the inference is no soap ads. Think of it—soap was such a prevalent sponsor of radio programs that an entire category of them, the soap opera, is named for the product.

I have also heard that it was a joking reference to dead air, meaning it is the only time one does not hear a pitchperson.

I have yet to get any independent confirmation, and I am just as curious about the term as the letter writer.

Does anyone else out there have any ideas?

John P. Maycumber,
WXTL(AM) Jacksonville, Fla.

NAB's right

Dear **RW**,

The National Association of Broadcasters did exactly the right thing in pressuring the FCC to delay action on the proposals to "repair" the Emergency Broadcast System.

Contrary to the thinking of the various manufacturers in this loop, there has yet to be a proven "general failure" of the existing EBS.

If it were simply a matter of having broadcasters transmit some sort of signal and immediately having the public respond in the requested manner, perhaps commission action at this time would be appropriate.

What has yet to be fully explained by the manufacturers are the results of the field tests in which the actions of the respondents did not appear to be significantly different from the results that could have been had from the existing system.

All of the manufacturers and many of the consultants involved in the testing in both Denver and Baltimore have yet to address the basic question of whether you can effectively "technologize" public response. Without this part of the equation, any change will yield no result.

You can technologize an industry. Manufacturers and consultants hovering near the flame can hear the sound of ringing bells and the whir of the money pump as it ticks over once again.

To that end, there is also the unanswered question of when the FCC (or whoever in government) plans to force the entire radio and TV audience and receiver manufacturers in the U.S. to manufacture, purchase or retrofit their receivers to decode the highly technologized EBS material.

The problem with EBS, if there is one, is not the technology. It is the application and the simple fact that there are 260 million basically ornery Americans on the other end.

When the old ConElRad system was in place, the pure fact that there were only two radio channels in the whole country transmitting anything at all worked to resolve any listenership and response problems. Of course, the fact that we had just finished World War II and had entered both Korea and the Cold War did not hurt public perception either.

The existing EBS system was not established because of a failure of the ConElRad system, but as the result of growing political clout by the NAB (which later resulted in some almost disastrous deregulation debacles.)

EBS was never implemented to fill an identified need in public emergency notification. The broadcasters simply wanted more control of the system and what was carried on it. They did not want people to get into the habit of tuning away from their stations for this hard-core information.

Sound a speck self-serving? So does the proposed new system.

Somebody unbiased needs to find out if the existing EBS really works. It is too easy to decide that it does not work, particularly if you have a new box to sell.

Most of us who have had the privilege of major disasters (Hurricane Andrew in my case) will tell you that the system works and is valuable, but profoundly misunderstood and misinterpreted by the public.

Perhaps weekly testing over the years has made it difficult for the public to take the thing seriously. It is like the boy who cried, "Wolf."

As an industry, we would serve the public better and be better advised to work to make the existing system better, perhaps by changing the weekly tests to monthly or quarterly on-air tests with mandatory weekly logged inspections of the gear, and by incorporation of other communications services, like cable, telephone and cellular into the overall information loop, rather than simply throwing money into technology that has little, if any, chance of actually repairing a problem that might not exist.

James L. Sorenson, Chief Engineer
WTPX(FM) Fort Lauderdale, Fla.

Good digestion

Dear **RW**,

You have a wonderful magazine. After I digest the articles (the ones I can understand), I'm usually cutting out pages, posting them, photocopying for them AEs, our promotion department and basically anyone who could benefit from them.

There is always something new to learn and your contributing authors are terrific. Keep up the great work.

Tom McCarthy, afternoon air
personality, KOMO(AM) Seattle

No Doubt About It

How can there be any doubt that the radio industry will develop digital services to offer the public and create for itself lucrative new revenue streams?

Half of that battle will be software development and the integration of new digital services into the hardware and daily routines of the radio industry.

But this should be no problem. Radio broadcasters and the software developers and equipment manufacturers that serve them have already proven they can navigate through cyberspace.

Witness the alacrity with which station automation software, a fledgling business less than five years ago, has been accepted by broadcasters. Competitive music and news/talk stations find they almost cannot do without software packages that did not exist a short time ago:

- Live-assist programs that allow a talk show host to know everything about the listener waiting on the line. Name, address and various other demographics (as well as the topic the listener wants to talk about) are all flashed up on a computer screen, which also tells you when to play the commercial.
- Systems to automatically record and store satellite program material and integrate it into prepared broadcast schedules which may be programmed and ready weeks or months in advance. Some systems are capable of receiving and processing data files for later retransmission by Radio Broadcast Data Service, FM subcarriers and other means.
- Software to keep track of traffic and billing, ad sales and station maintenance schedules that is often flexible enough to fit in any sized operation, from a small rural station, to a multistation duopoly/LMA and sometimes a national group.

Innovative programmers, with suggestions from their radio customers, are continually making it easier to broadcast high-quality programming with significant long-term savings.

To be sure, high-tech efficiency sometimes costs people their jobs. It takes a little more work and imagination to reconfigure the radio business and find places for those people again.

That is all the more reason why radio should seek to expand itself by finding ways to convert its already-demonstrated mastery of computer technology into new digital services for the consumer and business.

—**RW**

Radio World

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Next Issue of Radio World July 27, 1994

World Radio History

Denon Equips NPR with RDS Gear

by John Gatski

PARSIPPANY, N.J. Denon has donated about 30 RE America RDS encoders and tuners to mostly National Public Radio (NPR) FM stations in order to spur interest in the fledgling technology that can display call letters and scrolling messages equipped radios.

Already a major player in the RDS (Radio Data Systems) receiver and tuner products, Denon is hoping to spark station interest in RDS by equipping NPR stations with RDS. With the Denon donation, about 150 stations now have encoders—with most radio transmitting the RDS subcarriers.

The RDS technology is capable of not only call letter display and scrolling messages, but the 57 kHz digital subcarrier can also find stations by format, provide traffic and emergency alerts (RDS is being considered as a new technology to replace the old EBS), and automatically find alternate frequencies that contain the same programming.

National Public Radio stations are ideal for RDS, according to RDS proponents, because listeners can take advantage of the alternate transmitter switching feature. Receivers equipped with the alternative frequency can automatically search for another frequency with the same programming once the existing frequency strength wanes. Also, NPR stations can be scanned by the News or Public formats—another RDS option.

Denon TU-380 RD home/studio tuner

Although the many RDS stations are located in major markets, penetration has not been as fast as hoped when a standard was adopted in 1993. Most radio stations said they were waiting for more receivers while receiver manufacturers said they would push products faster into the market once a large number of radio stations were transmitting RDS. However, companies such as Denon, Onkyo, Grundig, Delco and others are now bringing products to the market.

And despite the RDS slow acceptance, many station engineers said that RDS encoders are in the budget for 1994 or 1995.

Labeling RDS radios as "Smart Radio" technology, Denon Vice President of Sales and Marketing Steven Baker said the company "is extremely proud to provide equipment for this breakthrough technology to NPR and its member stations."

NPR Director of Technical Operations Mike Starling said RDS "is the first wave in bringing to the listening public a host of new digitally-based services..."

Along with the RE encoders, stations were given Denon TU-380 RD home/studio tuners, which offer 64-character scrolling. (Look for a review of that tuner in the next issue of **RW**.)

Denon also plans to donate more encoders in additional markets, according to Denon Professional Sales Manager Michael Stelts.

Denon is hoping to spark station interest in RDS by equipping NPR stations with encoders.

The following are the stations that Denon has equipped with RDS encoders so far: WNYC, 93.9, New York City; KPCC, 89.3, Los Angeles; WBGO, 88.3 Newark, N.J.; WSHU, 91.1, Fairfield, CT.; WBEZ, 91.5 Chicago; KALW, 91.7, San Francisco; KKSF, 103.7, San Francisco; KDFC, 102.1, San Francisco; WHYY, 90.9, Philadelphia; WXPN, 88.5, Philadelphia; WAMU, 88.5 Washington, DC; WDCU, 90.1, Washington, DC; WETA, 90.9, Washington, DC; WBUR, 90.9, Boston, MA.; KUHF, 88.7, Houston; WABE, 90.1 Atlanta; WCLK, 91.9, Atlanta.

KUOW, 94.9, Seattle; KSJN, St. Paul, MN; KNOW, 91.1, St. Paul, MN.; WEAA, 88.9, Baltimore; WSFP, 90.1, Ft. Myers, FL.; WKSU, 89.7, Cleveland; WCPN, 90.3, Cleveland; KOPB, 91.5, Portland, OR; KCFR, 90.1, Denver; WGUC, 90.9, Cincinnati; WPKT, 90.5, Hartford, CT.; WAMC, 90.3, Albany, N.Y.; WUNC, 91.5, Chapel Hill, N.C.; WITF, 89.5, Harrisburg, PA; WKAR, 90.5, E. Lansing, MI; WETH, 89.1, Hagerstown, MD; and KTEX, 106.9, Bryan, TX.

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World Radio History

Make a Careful Review of Renewal Forms

by Randy Sukow

Second in a series

WASHINGTON Before anyone panics about the coming three-year round of AM and FM station license renewal proceedings, be aware that historically, loss of license is extremely rare.

Most licenses are renewed without much fanfare.

The FCC does not keep track of the number of renewal applications challenged, either in the form of a Petition to Deny or a competing application, according to Rod Porter, Deputy Chief of the Mass Media Bureau. Lawyers experienced in the renewal process say challenges are infrequent and almost always unsuccessful.

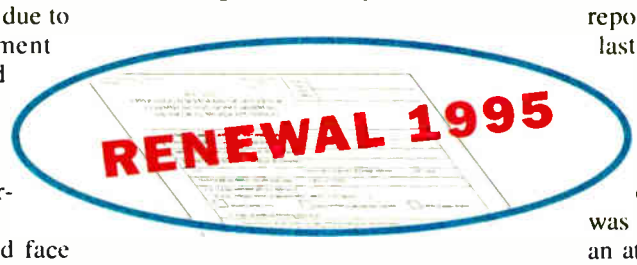
"The deck is stacked so seriously in favor of incumbents that anybody who would file a comparative renewal is either crazy or has a very good sense that the applicant is vulnerable," said communications attorney Harry Cole of Bechtel & Cole, Washington (who is also a regular **RW** columnist).

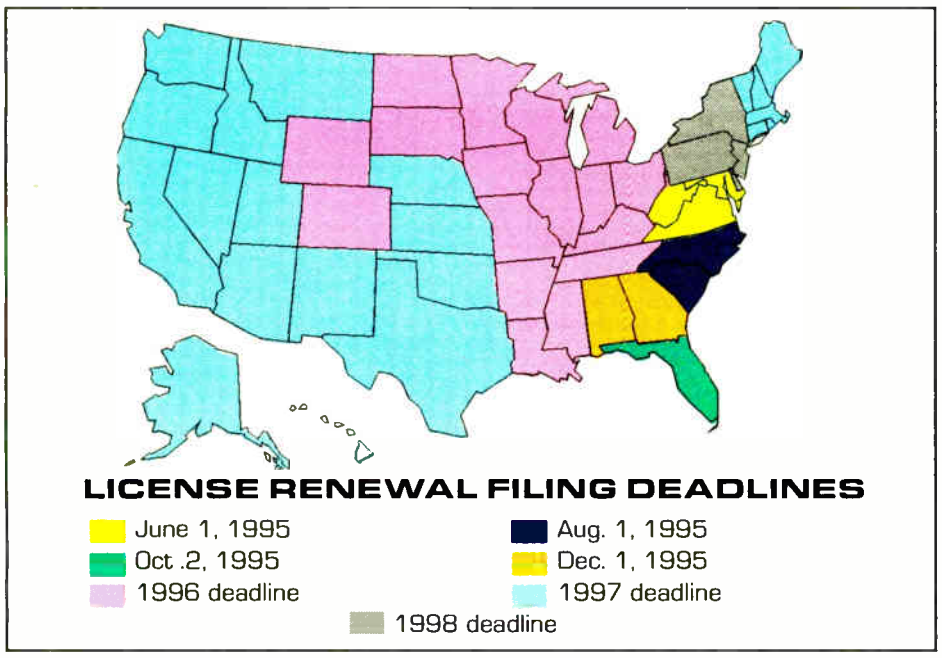
However, some communications attorneys suspect that starting next year there could be an increase in challenges due to complicated new equal employment opportunity (EEO) regulations, and the increase in local marketing agreements (LMAs), which raise new questions about compliance with the rules and the public interest standard.

Broadcasters that are challenged face long and expensive battles that are well worth avoiding, if possible. The best preventative measures are to establish a history of compliance with the rules as soon as possible, and to be ready for the various steps in the renewal process that lie ahead.

The center point in the renewal process is the filing deadline, which always falls four months before the station's license expires. The filing deadline for Maryland, Virginia, West Virginia and the District of Columbia, for example, is June 1, 1995, and license expiration date is October 1.

The filing deadline/expiration dates are staggered over three years according to the various regions of the country. (See map.)





About six months before the filing deadline, each licensee receives a packet of forms from the FCC, including the main renewal form (Form 303-S) and a "Broadcast EEO Program Report" (not to be confused with the annual EEO report, due every May 31).

The first thing a station owner or manager should do after receiving the packet is review the station's history of filing the required annual EEO (Form 395-B) and annual ownership reports (or ownership letters, which are required if there has been no change from the previous year).

The owner/manager should also carefully examine the station's public file to be sure it contains all documents required by the rules, and determine whether the station has filed all of its required quarterly reports to indicate its public service contribution to the community.

An attorney should be called in to help in filling out the form, which is more complicated than it looks. Most of the questions require a yes/no answer, but it is deceptively easy to check the wrong box. An incorrect answer is considered a misrepresentation of the facts, which can have serious consequences later.

Question four, for example, asks whether the licensee's annual ownership and EEO reports "have been filed with the commission." That question really means, "Have all EEO and ownership reports been filed every year since the last renewal, and have they been filed on time?"

"If you filed (the EEO report) on June 5 in 1992, the proper answer is 'No,' and there should be an exhibit explaining why in 1992 it was filed on June 5," said Brian Madden, an attorney with the Washington firm of

continued on page 11 ▶

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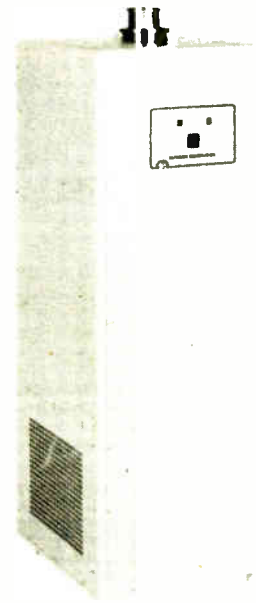

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Station Allegedly Left Unattended

Zby Dee McVicker

OSHKOSH, Wis. Apparently, the last one out of an AM station in Oshkosh turned off the lights, but forgot to turn off the transmitter. That, at least, is one explanation why WXOL(AM) broadcast programming in May through early June from a satellite network feed—24-hours a day with no spots and no station IDs.

It appears the station flipped on the satellite switch and ran non-stop programming from People's Radio Network through May and early June, until the station went dark on June 7, according to WCWC(AM) in nearby Ripon, Wis.

On May 9, personnel at nearby WCWC became aware of the situation when they were tipped off by a local listener that WXOL was broadcasting the Chuck Harder "For The People" program, a popular show distributed satellite by People's Radio Network.

Not authorized

WXOL was not authorized by the network to carry the talk show, and in doing so, infringed on the rights of WCWC to exclusively air the program in the immediate area. WCWC, owned by BBK Broadcasting, was the first station in the area to sign on with People's Radio Network, giving it exclusive access to the network's Chuck Harder show as well as about 25 hours of the network's weekly lineup.

WXOL has secondary access to People's Radio Network programming, according to the network, which means that WXOL can only broadcast network program that WCWC does not use. According to the network, an agreement to that effect was signed by Sunbright Broadcasting, Inc., which owns WXOL.

"Obviously our concern was that they were running the People's network, in particular the Chuck Harder program, which we run on our AM station in Ripon. They're not authorized to carry it, we don't want them to carry it, we have good listenership... on our AM station for that program, and we don't want to share the program," said Chris Bernier, an operating partner at BBK Broadcasting, which owns WCWC and WYUR-FM in Ripon and WMRH(AM) in Waupun, Wis.

When broadcasting, the 250W daytime/70W nighttime powered WXOL is at 690 kHz on the dial and is able to reach some areas of the market not covered by WCWC, which has a 5 kW signal on 1600 kHz.

When he discovered what WXOL was doing, Bernier tried to contact station personnel, but calls to the station went unanswered, he said, and a visit to WXOL's studios late in May also proved unsuccessful. The building was closed with shades drawn and doors locked, according to Bernier, who later was able to at least get through to access a voice message from the general manager.

People's Radio Network also was unsuccessful in its attempts to reach someone at the station's listed telephone number. Wyatt Cox, assistant to the director of affiliate relations with People's Radio Network, said network officials had not been able to contact WXOL for two months.

Radio World's calls to the station's listed number and to general manager likewise went unanswered as well.

Possible violation

There are potential legal ramifications for WXOL. If the station was left unattended without satisfactory remote operator access or remote EBS monitoring and activation, WXOL could be in violation of FCC rules, Section 73.1860 and Sections 73.926 through 73.937.

According to Bernier, his monitoring of the station during that May-June period revealed no local programming on WXOL. "We have monitored the station and they were not filling the breaks with anything locally. They were just letting the network run," Bernier said. "..they ran no IDs for a couple of hours, so that just illustrated to me that nobody was on the premises."

As of early June, however, the local FCC field office reported that no complaints were on file for WXOL at this time.

Despite the fact the station was running unauthorized programming, neither the People's Radio Network or BBK Broadcasting is planning to legally pursue the matter. "That's a last resort. We're hoping something's going to happen, a new owner comes in... or somebody takes it over and operates it responsibly," said Bernier, who had received in the mail some months ago a flier that indicated WXOL was for sale.

At press time, the station was still off the air. Incidentally, the station went dark, seven days after a write-up in The M Street Journal stated that Wisconsin Voice of Christian Youth planned to buy WXOL.

Cox said that he does not see the WXOL situation as a fluke. "I'm afraid that given the state of the economy, we're going to see more of this. People just can't (operate stations profitably), so they either turn off the station and walk away or, even worse, they leave it running and walk away," Cox said. "It's something that's snowballing. As businesses move out of town and the Kmarts and Wal-Marts start gobbling up small-town businesses, (station) operators are more and more on the edge and more and more on a thinner margin."

To protect themselves and their solvent affiliates, satellite programming services may need to install encode/decode systems that are addressable to only paying stations, according to Cox. People's Radio Network does not use such a system for its 256 affiliated stations, and Cox knows of very few networks that do. "It would be a horribly expensive thing to do for situations like this," he said.

But Cox suspects there are many more walkaways than those in the industry care to admit, although most of them, he believes, are situations in which operators step out to go to lunch or run an errand. "I would venture to say there are (stations) out there every day operating unattended," he said.

For stations that are forced to walk away from station controls because of bottom-line concerns, the alternative is to make "judicious use of the available satellite resources," Cox said. Station owners need to "be watching their bottom lines more carefully. Just because Joe at the hardware store is 90 days behind and he's paid you in the past, it doesn't mean he's going to pay you in the future."

NEWSWATCH

▶ continued from page 3

the general public, Elving said he has been assured that the FCC does not object to variable tuning SCA radios that are utilized by the blind. (At press time, the FCC had not confirmed the legal status of the radio to **RW**.)

Elving explained that it is inconvenient for the blind travelers to have to carry several radios to tune into reading services in different cities.

The 57 kHz to 92 kHz SCA modification does not sound as good as the fixed 67 kHz option, according to Elving. Both SCA modifications include LED frequency display. Cost is $106.95 for radio, modification and shipping. For more information, send inquiries to: FM Atlas, P.O. Box 24, Adolph, MN 55701-0024; or call 218-TRY-SO-SO.

Spectrum Fee Opposition

WASHINGTON Four members of the House Ways and Means Committee have begun a campaign to relieve broadcasters from the Clinton Administration's plan to charge a "spectrum royalty" fee to defray the implementation costs for the General Agreement on Tariffs and Trade (GATT) treaty.

Last spring the Clinton Administration proposed raising $4.8 billion over five years from broadcasters and other FCC licensees to help pay for GATT (**RW**, May 18). The administration plans to impose those fees on top of $72 million in proposed new "user fees" to fund the FCC.

The congressmen, including Dan Schaefer (R-Colo.) and John Bryant (D-Texas), who also sit on the House Telecommunications Subcommittee, say the fees are unfair because broadcasters will not benefit from GATT amendments. They also say the fee "would have a devastating impact on thousands of broadcast stations" because they would be unable to pass the cost on to subscribers, like print media or cable operators.

"A tax on gross receipts would put many of those stations out of business," with "approximately 70 percent" of all radio stations suffering net losses, the congressmen say in a letter to Leon Panetta, Director of the Office of Management and Budget.

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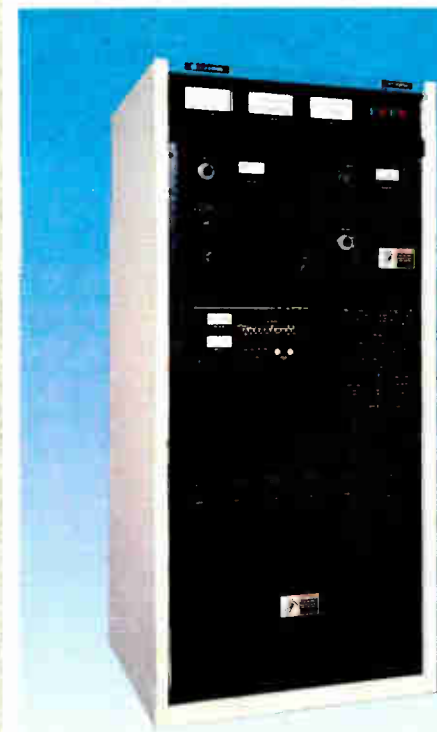

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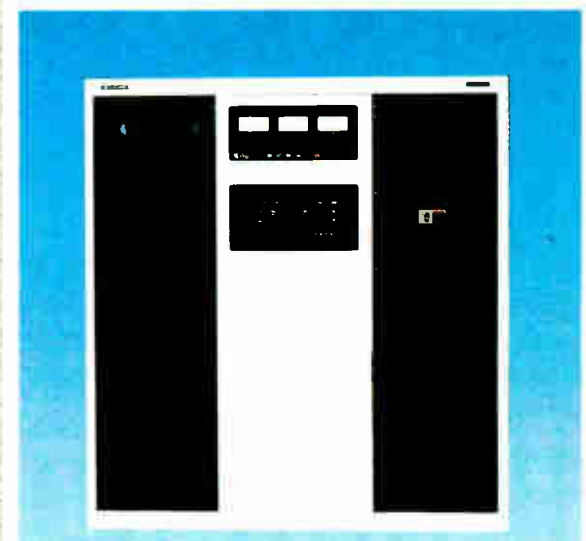

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World Radio History

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The Benefits of Equipment Leasing

WASHINGTON Leasing equipment for broadcast use is a growing business. According to Martin leasing Co.'s Ben Weingarten, at least 80 percent of radio stations in the U.S. lease a portion of their equipment. And the numbers are growing.

Hal Hayden, president, Priority Leasing Corp., has seen his company's broadcast leasing business grow to 25 percent of his total business—in just five years.

Both men agree that leasing is a growing and intelligent way for broadcasters to remain competitive and manage their money effectively. They outlined a variety of reasons why a radio broadcaster should consider leasing equipment instead of buying.

Manage your money

Station managers watching out for the bottom line should take note, says Hayden. Monthly payments on a lease are usually lower than payment, or a cash down payment required by other methods of financing. Lease payments are generally fixed for the entire term of the lease, and require no down payment.

A managers looking to minimize his or her demands on cash flow can take advantage of certain financial advantages of leasing. For example, a lease is usually considered an operating expense and can therefore be deducted from income and provide the station with a tax benefit.

In addition, while purchases are made with after-tax dollars, lease payments can be treated as a pre-tax business expense and as such may reduce a station's taxes.

Another tangible benefit to leasing, according to Weingarten and Hayden, stems from leasing's 100 percent financing. Leasing allows a manager to acquire and use needed equipment and still work within the operating limits of his or her budget; he won't need to go to a capital expenditure budget to get approval.

Leasing takes care of "soft costs" as well, according to Weingarten. Leasing contracts provide a station with more than just equipment. It can cover the "soft" cost of installation, training and delivery. Leases include everything it takes to put the gear to work for a radio station.

On the edge

Many station managers worry about purchasing equipment that may become obsolete. Leasing affords stations the ability to employ the newest technology and even upgrade continually on a dollars-per-month basis, because the monthly payment has been established in the budget.

Priority's Hayden points out that leasing offers advantages to municipalities, such as a fiscal funding clause that allows municipalities to cancel a lease contract if funds are not appropriated to continue.

Stations with a need for borrowing power can preserve their credit lines. Weingarten notes that lease payments have no impact on credit lines at the bank. In fact, Hayden notes that when equipment is leased, a business establishes an additional line of credit with the lessor, instead of lowering its credit lines when borrowing from the bank to buy equipment.

Another important consideration for stations that have a small staff, or an overworked staff is lease payments, according to both companies, that can help simplify a station's internal accounting. Lease payments are little more than line items, according to Weingarten, requiring a minimal bookkeeping effort—and frees the manager from working with a "time-consuming" depreciation schedule.

Overall

The ability to lease equipment for a radio station is something to consider, say both Weingarten and Hayden. Leasing can add up to "good business sense." Carefully tailored leases can allow stations to use equipment that is new, technologically advanced, with less risk of financial pressure.

Leasing minimizes demands on cash flow, eliminates investing in equipment that could become obsolete before a station is done paying for it, and leasing allows a station to preserve its credit lines with banks for other business purposes.

□□□

For information from Martin Leasing Co., contact Ben Weingarten at 9701 Wilshire Boulevard, Suite 102, Beverly Hills, CA 90210; telephone: 310-274-7988; fax: 310-274-1905; or circle **Reader Service 193.**

For information from Priority Leasing Corp., contact Hal Hayden at 4210 Spicewood Springs Road, Suite 203, Austin, TX 78759; telephone 512-345-5298; fax: 512-345-8650; or circle **Reader Service 216.**

License Renewal Forms

▶ continued from page 7

Leventhal, Senter & Lerman.

Attorney Mark J. Prak of Tharrington, Smith and Hargrove, Raleigh, N.C., suggested caution when answering Question 7. The question is phrased so that a "Yes" indicates the station is not in compliance with the FCC's RF radiation regulations. "No" indicates the station is in compliance, but it must explain how it determined it is in compliance.

"That (question) is something you need to handle with your counsel and your engineer," Prak said.

The attorneys also advise licensees to avoid using Form 303-S to spring little surprises on the FCC. Question 9 asks whether the station in question is "currently on the air," and, if not, explain why.

"The license renewal form is not the place to inform the FCC that the station is off the air," said Barry Umansky, deputy general counsel for the National Association of Broadcasters. Licensees are required to notify the commission shortly after a station suspends operation or goes dark permanently. It is a serious mark against them if they wait until renewal time.

During the two months prior to the filing deadline, stations are required to broadcast a brief announcement about the impending license expiration and the station's intent to file for renewal. "Each of the announcements alerts the public of their opportunity to participate in the renewal process," Umansky said.

The pre-filing announcement must air a total of four times, once each on the first and sixteenth of the month. (In Maryland, et al., the air dates are April 1 and 16/May 1 and 16, 1995.) At least two of the four announcements must air at 7-9 a.m. or 4-6 p.m.

After filing

By the filing deadline, the licensee must submit Form 303-S, the required ownership and EEO documents, other accompanying documents and explanations of 303-S answers, as needed. A check for the $115 filing fee should accompany the application. (The commission raised the filing fee from $35 just last month.)

AM-FM combos (and AM/AM-FM/FM combos, for that matter) must send separate applications and checks for each station. AM applications should be sent to FCC Mass Media Services, P.O. Box 358190, Pittsburgh, PA, 15251. FM applications should be sent to P.O. Box 358195.

More announcements

On the first and sixteenth of the three months following the filing deadline (June, July and August 1995 for Maryland, et al.), stations must air a post-filing announcement, informing the public that the renewal application was filed and that citizens have until three months after the filing date to challenge it. (The deadline is September 1, 1995, in Maryland, et al.)

Immediately after the commission receives the renewal application, it sends the station a post card acknowledging receipt. That card should be placed next to the current license in the public file. If the commission has not granted the renewal by the expiration date, the card serves to inform anyone looking at the file that the station is still authorized to broadcast.

That card will be needed in those few cases where a renewal is stalled by a challenge. The pitfalls of that eventuality are the subject of a future installment.

For more details on the renewal process, call the FCC at 202-254-9570 (for AMs) or 202-632-6908 (for FMs). Call 202-632-3337 with questions about application fees.

The NAB is holding a series of seminars nationwide to provide in-depth information on the renewal process. For more information, call 202-429-5350.

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World Radio History

STATION SKETCHES

Voltage Control Saves Transmitter Tubes

by Tom Vernon

HARRISBURG, Pa. Reducing filament voltage in your transmitter power tubes, you will find, goes a long way towards extending tube life.

Voltage reduction should be fit into an engineer's schedule next to other tube maintenance procedures described in "Station Sketches," such as seasoning new tubes, tuning and neutralization.

The first step is to determine what days and times your AC line voltage is lowest, and use these times to make your adjustments. It may be useful to rent or borrow a chart recorder and log AC voltage for about a week. If the line variation is more than 3 percent, a voltage regulation transformer must be added.

Reduction methods

There are two methods for optimizing filament voltage on AM transmitters. The first requires a distortion meter used in conjunction with an accurate RMS volt meter.

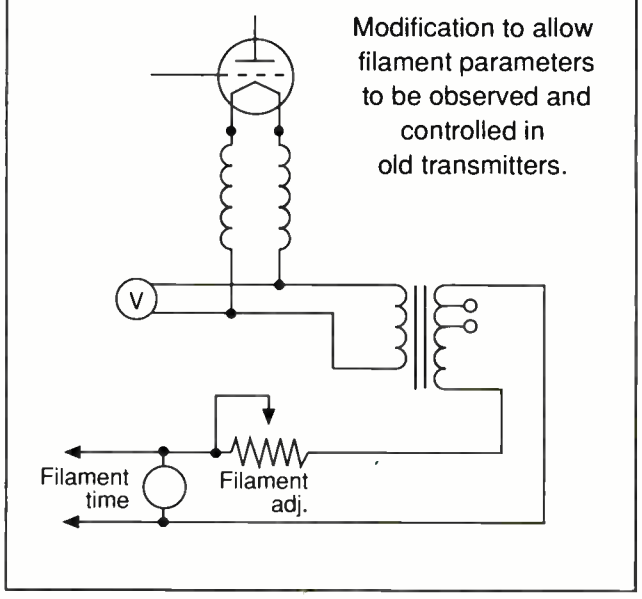
Begin with the filaments at rated voltage and modulate the transmitter with 400 Hz at 100 percent positive peak modulation. Slowly reduce filament voltage at 0.2-volt intervals, waiting about a minute after adjustments for emission to stabilize.

At some point there should be a marked increase in distortion. Note this point and begin increasing filament voltage. You should be able to set voltage just over the threshold for acceptable distortion figures. Recheck distortion figures in 24 hours to be sure filament voltage is stable at this point.

The alternate method is based on the premise that antenna current will increase 1.22 times the unmodulated value at 100 percent modulation.

Assume an unmodulated 1 kW transmitter has an antenna current of 4.0 amps. You can achieve 100 percent modulation by feeding a 400-Hz tone until the meter reads 4.88 amps (4.0 times 1.22). Gradually decrease filament voltage until antenna current begins to drop, and increase by 0.2 volts to cover line voltage variations.

Figure 1.



It does work

This method is not nearly as accurate as the distortion meter or oscilloscope methods, but will work if you have no test equipment. Remember, however, that it only works with thermocouple RF ammeters, and not the newer rectifier meters.

Power tubes for AM transmitters will give maximum life if they are cycled from the power amplifier (PA) stage to the modulator. Usually tubes that become marginal in the PA circuit still have ample emission for the modulator, because of the peak emission demand there. Incidentally, reducing filament voltage on modulator tubes often reduces distortion, as they achieve a better dynamic balance.

A similar procedure is used with FM transmitters, where recent research suggests that each 3 percent reduction in filament voltage will double a tube's useful life.

Operate at maximum authorized power, and slowly reduce from nominal filament voltage until efficiency or power output drops, as read on the wattmeter or forward power meter. Increase voltage enough to restore power and efficiency with a margin for power line variations.

These adjustments must be checked every two months. Filament voltage will have to be gradually increased as emission falls off.

continued on page 40 ▶

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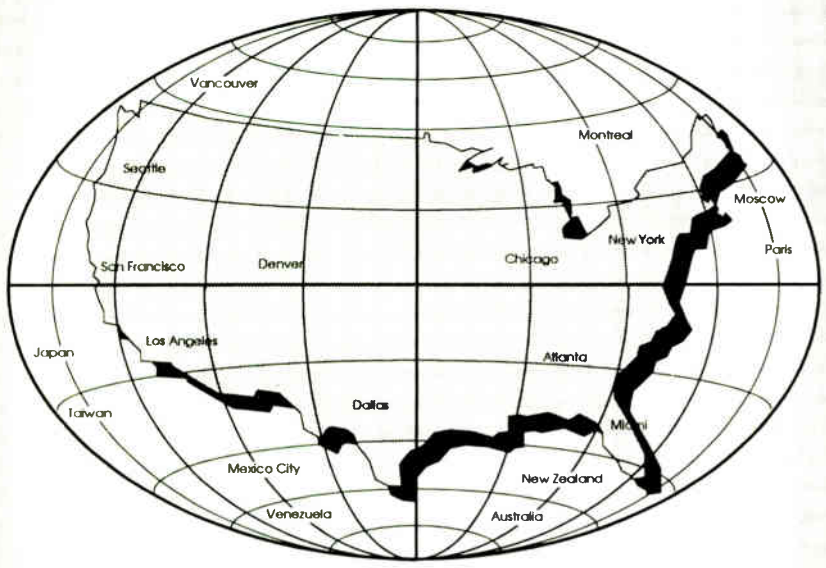

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World Radio History

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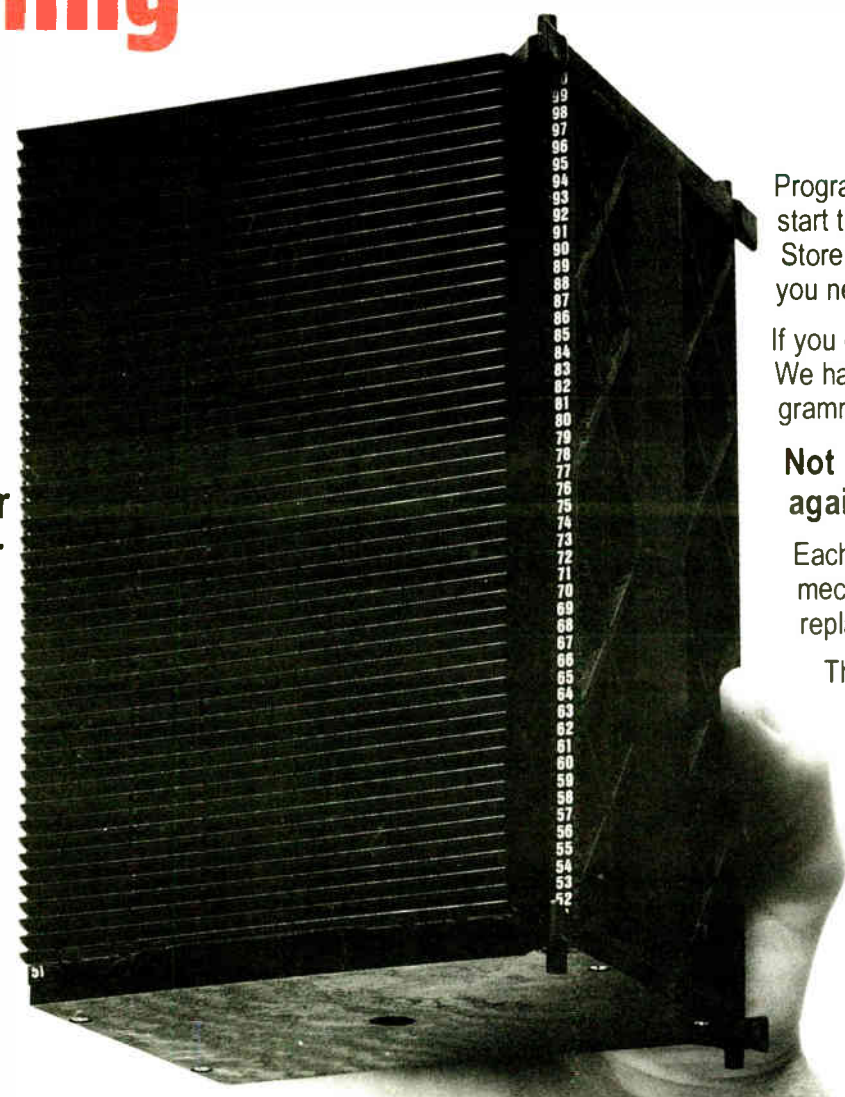

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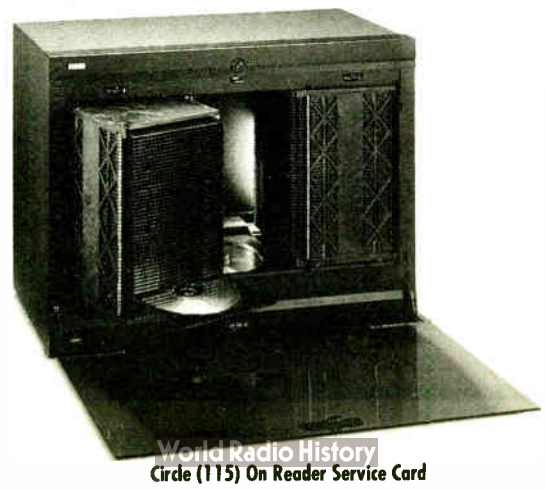

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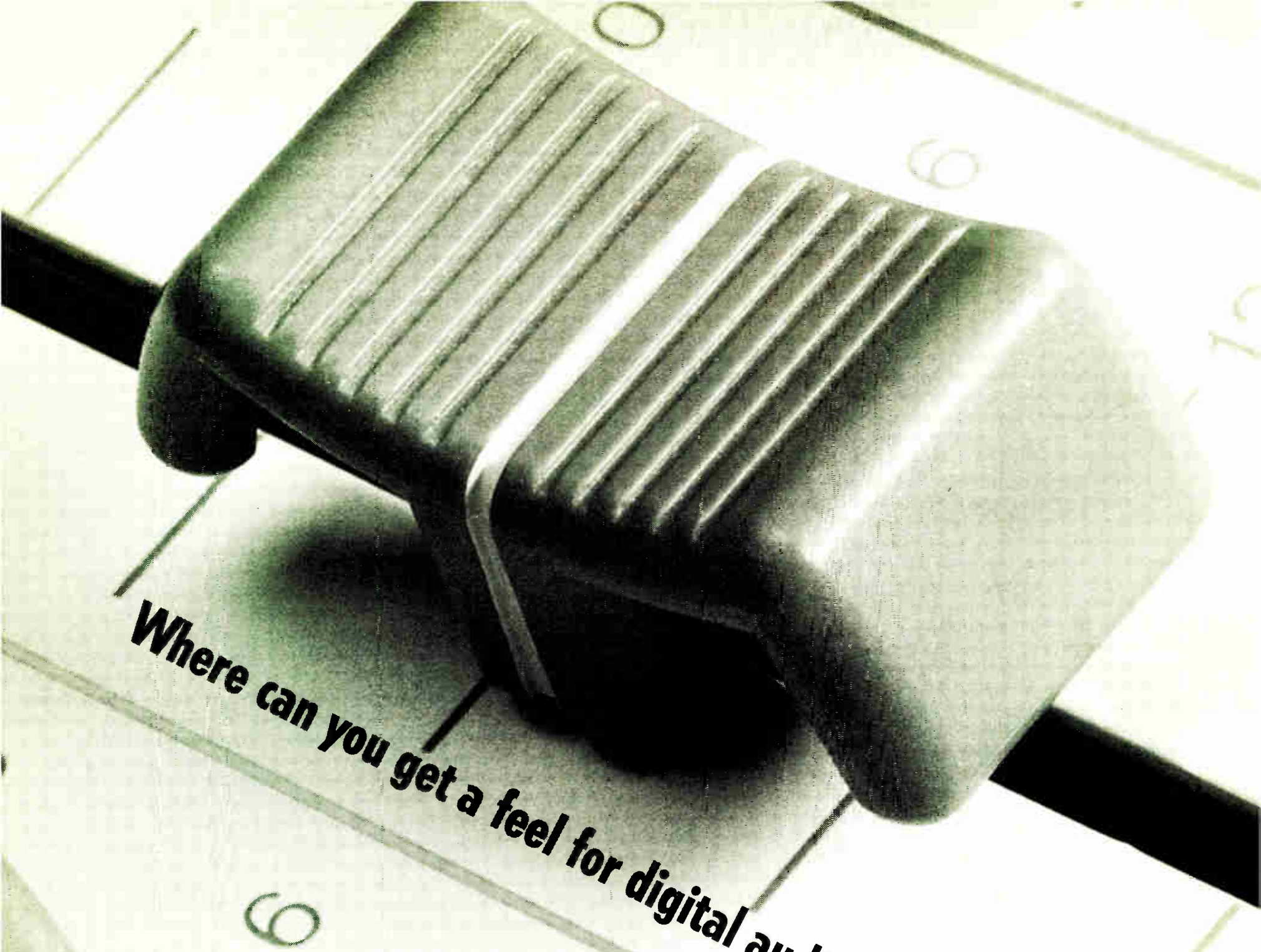

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Studio Sessions

Equipment and Applications for Radio Production and Recording

The World of **Binaural Recording,** See p 23.

PRODUCT EVALUATION

'Seamless' Editing with DATStation

by Rich Rarey

WASHINGTON How does one go about selecting and purchasing a DAT editing system? Until recently, the process involved selecting two professional DAT machines that could be controlled by a rather pricey editor, costing tens of thousands of dollars. The result was bulky electronic equipment installed and left in place until a wheelbarrow could be brought to move the components.

Thankfully, Sony has realized that a professional DAT editing system need not be cumbersome and costly to be useful, and has introduced the PCM E-7700 DATStation. The DATStation combines the compact size of a laptop computer with the power of high-performance DAT editors to create a editing system that, at $15,000 list, costs less than two high-end DAT recorders, and does more.

Studios will find its double-time DAT cloning a plus for preparing client dubs at half the time and easy editing on voice tracks and reference mixes. Stations will like the capability to edit DAT tapes, and can even use the DATStation as a conventional DAT recorder.

Sony's "laptop size" DATStation

Features

The analogy to a laptop computer is appropriate, as the unit fits the footprint of a typical laptop, but weighs 23 pounds. One expects to begin computing immediately upon seeing the display screen in the back-hinged lid, but instead of disk drives, there are two built-in, data-grade DAT transports—one play and one record/play.

Similarly, instead of a QWERTY keyboard, the DATStation has functionally grouped controls, including the familiar "function keys," arrow keys, a keypad, and a jog wheel. Mounted on the back edge are the XLR inputs, an AES/EBU digital input, a future-use serial port, and RCA analog outputs.

When powered on, the amber monochrome screen, measuring about 9 inches by 4 inches, flashes a version information message, and displays a blank editing list to the user. Its internal fan is louder than one would expect, but necessary to keep multiple V50 microprocessors cool. While the DATStation is powerful, its user interface is almost intuitive enough to guide navigation through the many functions and set-ups, but reference to the Sony manual is necessary. (There is no electronic on-line HELP.)

A setup screen, reached by pressing a function key, defines the user preferences. Parameters, such as which XLR-input pin is "+", the expected audio level, which edit list (if any) is active on start-up, the Date and Time setup, when the screen-saver should engage after a period of inactivity, the default parameters of an edit list item, and other settings are entered and stored in non-volatile memory.

The DATStation stores up to five such user setups and offers a non-erasable, "factory-default" reset as well. For the novice user, selecting the factory default setup is a good place to start.

Pressing the MODE key always brings the user to "HOME"; a place in the menu hierarchy where the user can choose to "open" one of the DATStation's main features. Above each function key, the screen displays the name of the major functions: Editing, Setup, Manual operations, ID recording. Depending on what the DATStation function is engaged, the purpose of each function key changes. But the display always prompts the user to choose a function key, or it displays the command associated with the key, so there is no ambiguity to its use.

Easy editing

The DATStation's forte is editing, and it performs well. However, there is one caveat: those users expecting response time of disk-based editing systems will be disappointed with the E-7700.

The editing technique uses a combination of digital memory and DAT tape synchronization to make each edit. While this economical method conserves resources, it is painfully slow when previewing and committing edits. On the other hand, disk-based editors are not as convenient; they cannot easily be hand-carried from room to room as needed.

The DATStation displays its active edit list in a tabular form, and not in an audio wave form, so ears count more than eyes. The resolution of the edit is within a few frames. The DATStation organizes the edits a user wants to make into "list." Up to five edit lists may be stored, and each list describes in detail up to 100 edits. Parameters include the stereo audio balance and level, in- and out-points location, edit length, edit point ID insertion, and edit source location.

By including a source tape parameter, the user can create an edited master from many different source DATs—as long as all the source DATs are recorded at the same sampling frequency. Source DATs must have "Absolute" time or SMPTE time code recorded on them, either from the original recorder, or by manually striping the tape using the DATStation.

Inserting a source tape into the play-only transport will prompt the user to enter an arbitrary tape number. The user must keep track of these numbers, as the DATStation cannot distinguish between source tapes; with multiple source tape projects, confusion could result. The source tape can be auditioned by the conventional transport controls, as well as SHUTTLE and JOG for fast and tight cueing.

Pressing the MARK button logs the

continued on page 41 ▶

Product Capsule: **Sony PCM E-7700 DATStation**

Thumbs Up	Thumbs Down
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✓ compact size	

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World Radio History

SIGNAL-TO-NOISE

The Re-emergence of Binaural

by Frank Beacham

NEW YORK The year was 1881 when Clement Ader decided to use the Paris Opera House to conduct a demonstration of three-dimensional sound reproduction. Ader set up a pair of closely spaced telephone transmitters on the stage linked to individual receivers in the lobby. When a listener held receivers from each microphone to the ears, the result was stunning realistic binaural sound.

Now, more than a century later, binaural sound seems to be going through another of its periodic rediscoveries. Some—who are experiencing this audio revelation for the first time—have even embraced it with the over-heated label of "virtual reality."

Record producer Larry Kraman is so impressed with binaural that he considers it "the first new viable recording technique" for the digital age. Kraman put his money where his mouth is. He recently produced a binaural compact disc that's so good it has become an instant classic.

Binaural CD

The disc—a 24 carat gold audiophile pressing—is on Kraman's new Newport Classic AUracle label. It includes two sonic warhorses: Richard Strauss' "Sprach Zarathustra!" and "Symphony No. 3" (Organ) by Charles Camille Saint-Saens. The recording—made by the Pasadena Symphony under the direction of Jorge Mester—was produced over two days using a Neumann KU 100 "dummy head" binaural microphone (a/k/a Fritz III) and a chain of the finest audio processing gear available. The recording was made direct to hard disk on a Sonic Solutions 20-bit digital audio workstation and edited in a 20-bit environment.

To say this recording is stunning is an understatement. It is by far the best binaural classical recording I've ever heard and may be among the best ever made. Hearing this recording on a high quality headphone system is a sublime aural experience. The opening to the Strauss work—so well known to modern audiences from Stanley Kubrick's "2001: A Space Odyssey"—begins with a low, opening rumble from a large pipe organ. This passage is guaranteed to rattle every bone in your body.

"On speakers the bass literally makes your toes tingle," said Kraman, who is so excited about binaural that he plans several more classical recordings using the process on the AUracle label. Another exciting new binaural recording comes from Tom Lopez at the ZBS Foundation in Fort Edward, New York. Lopez and company are among the very few American producers who record audio drama in binaural sound.

The new work, titled "The Maltese Goddess," is a film noir detective story/musical spoof with, as the ad says, sound "so real it can sneak up and bite you."

To create the recording, writer/director Lopez used his Neumann KU 81 binaural mic like a movie camera to record actors with all of the action orchestrated around the mic," Lopez said.

The Maltese Goddess, broadcast on National Public Radio in April, is now available on CD and cassette. It is also loudspeaker compatible.

Basically simple

Binaural technology seems exotic but is basically simple. The microphone is shaped like a human head and has capsules embedded in each ear. The idea is if a sound is recorded in this fashion and played back on headphones the listener will experience the same acoustic pressures at the eardrum position as would have occurred naturally. Thus, the recording technique yields a dramatic spatial quality not found in traditional stereo recordings.

For most of this century, binaural recordings could only be played through headphones. But in recent years, with advanced new equalization techniques incorporated into new products by Neumann and Head Acoustics, binaural recording can now be effectively played through stereo speakers.

Binaural is tailor-made for the era of digital radio. For more on this subject, check out the new catalog of binaural recordings from the "Binaural Source." It's free by calling (800) 934-0442. Also listen the week of August 4 to John Sunier's twice-annual binaural special on "Audiophile Audition." It's heard on 138 (mostly public) radio stations. For a station and broadcast time in your area, write Box 1621, Ross, CA 94957.

The AUracle release, limited to 5,000 numbered gold CDs, is available in record stores at $49.95 list. For info call (401) 421-8143. "The Maltese Goddess" is available from ZBS by calling (800) 395-2549.

Neumann's latest version of Fritz, the KU-100, lists for $6,495. For information, call (203) 434-5220. The Aachen Head HRS II by Head Acoustics lists for $9,710. For info call (203) 838-2650.

A lower priced binaural mic not equalized for speaker playback is Sennheiser's MKE 2002 binaural microphone ($689 list). It comes with a dummy head or can be worn like stethoscope earphones by the user.

□□□

Frank Beacham is a writer, director, producer and consultant. His address is 163 Amsterdam Ave. #361, New York, NY 10023. E-Mail: beacham@radio mail.net.

A Neumann KU100 was used in recording the Pasadena Symphony.

10

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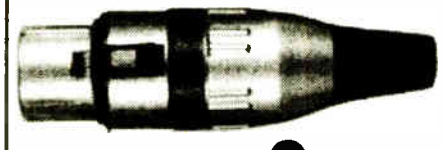

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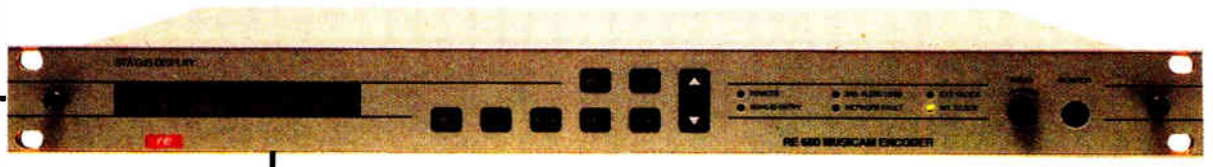

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PRODUCT EVALUATION

Studio 'Phones' Go Head to Head

by Bruce Bartlett
with Jenny Bartlett

ELKHART, Ind. Headphones are often taken for granted in radio production. We usually just slip them on to hear the mix between music and voice-over and don't give much thought to their features. However, headphones not only need to sound good, but also must be comfortable and durable. Accuracy and isolation during live, location mixes are also desirable attributes.

Recently, I reviewed four dynamic headphones intended for studio monitoring, each retail priced from $110 to $160. Most can bought for about or under $100. All are rugged and built to withstand the rigors of daily studio use. The ear pieces in all four units swivel to fit anyone's head. The models I tested are from well known electronics companies: the AKG-K240M, Audio Technica ATH-910, Sennheiser HD25SP and the Sony MDR-7506.

The players

The AKG K240M ($139 retail) is the least sensitive headphone of the group at 88 dB/mW, but it has many redeeming features. It's an open-back design, which some users prefer because they want to be in touch with studio conversations. A wide, soft leatherette headband and low weight (8.4 ounces) contribute to comfort. Large, soft leatherette ear pieces rest around your ears. Rated response is 15 Hz to 20,000 Hz (no dB limits given), and maximum SPL is 111 dB. The unit has a non-coiled, three meter cable made of oxygen-free copper, with a 1/8-inch plug and a screw-on 1/4-inch adapter, both gold plated.

Audio Technica headphones probably are not as well known to radio engineers as Sennheiser, AKG or Sony, but the company manufactures quality professional audio products including microphones. The ATH-910 Pro ($109 retail) is a closed-back design, which features a samarium cobalt magnet for high sensitivity (92 dB/mW). Rated frequency response is 20 Hz to 22,000 Hz (no dB limits given). Weight is 7.2 ounces. The unit has large, soft leatherette ear pads around your ears and a wide leatherette headband. Size adjustment is by a thumb-piece click-stop mechanism in the headband. Maximum SPL is 113 dB. Included is a non-coiled three meter cable with a 1/4-inch plug.

Another closed-back design, the Sennheiser HD25SP ($129 retail), has a single headband of flexible plastic with a foam-rubber head pad. Soft leatherette ear pieces rest on your ears. Weight is only 4.1 ounces. Click-stops in the ear pieces let you adjust the size. The neodyumium magnet assures very high sensitivity (105 dB/mW). Sennheiser rates the response at 20 Hz to 16,000 Hz with a tolerance (-3 dB). Maximum SPL is 120 dB. The cable is a non-coiled type, three meter long, with a 1/4-inch plug. Unlike many headphones, the HD25SP can be repaired with user-replaceable parts.

Sony MDR-7506, the most expensive of the four at $159 retail, is the professional successor to the popular Sony MDR-V6. A few years ago, the MDR-V6 was rated a best buy by Consumer Reports, and they have been popular with radio engineers because they sound good and are easily transportable.

The MDR-7506 has the same sound and construction as the MDR-V6—except that the cable is made of oxygen-free copper and has a gold-plated plug. A closed-cup model, the MDR-7506 has soft leatherette ear pads that go around your ears. The wide headband is covered with padded leatherette, and a click-stop in the headband lets you adjust the size. Weight is 7.8 ounces. The headphones fold for easy storage. At the end of the three meter cable is a 1/8-inch plug with a screw-on 1/4-inch adapter. Rated response is 10 Hz to 20,000 Hz (no dB limits given), while the sensitivity is a very high 106 dB/mW. Maximum SPL is a whopping 136 dB.

Headphones are often taken for granted in radio production.

It should be noted that the Sony MDR-7506's higher retail price is not the fault of the company. According to Sony's Professional Audio Division, the value of the Japanese yen has driven up the price in U.S. dollars. However, **RW** checked with some pro dealers and found them for as little as $80.

Sound quality

The subjective portion of my evaluation is my opinion, and does not reflect an endorsement or critique by **RW**.

The AKG K240M has a very pleasant sound with smooth, extended highs. Cymbals are crisp and sweet. Although there's a little mid-bass emphasis that makes vocals slightly tubby, the overall coloration is low. To my ears, the bass is good but not quite as deep as the Sony or Sennheiser. But the AKG is easy to live with for long listening sessions. Sensitivity is low, but this should not be a problem.

The ATH-910 Pro is a good performer. Bass is clean, not exaggerated—although the audible deep bass is weaker than in the other headphones. The upper midrange lacks edge, but the sound is gentle and easy. There is a slight "honky" coloration, like cupping your hands around your mouth. It appears to be a response bump around 500 Hz to 1000 Hz. Treble-wise, cymbals aren't as extended as the AKG. The headphones' sound does not contribute to ear fatigue over long periods.

With regard to the Sennheiser HD25SP, it had the deepest bass of all the units tested. In fact, on some material, they were a little too bass-heavy. Also, the edge or presence on voices and instruments is a bit muted, but some users prefer this. Cymbals are crisp but not quite as smooth and extended as the AKG.

By the way, I had to "burn-in" the HD25SPs for several hours before they performed at their optimum. Listening right out of the box revealed an even-heavier bass emphasis that seemed to lessen after several hours of unattended playing. Some speaker companies say they routinely do "burn-ins" for new products that are taken to shows or are used in demos.

The Sony MDR-7506 had the most forward sound of the group. Bass is deep, but is slightly exaggerated; however, the bass is tight. Mids and highs are clear, but the "s" and "sh" sounds are sometimes a little harsh.

Isolation

With its closed-cup design and relatively high pressure, the Sennheiser had the best isolation from ambient noise. I recommend them for monitoring at live concerts or in other noisy situations. Also, you can monitor very loud without creating feedback between the 'phones and your mic. The Sony also was a strong contender in this area. Audio Technica's offering was in the middle of the group, while the AKG had the least isolation.

Comfort

In spite of its low weight, the Sennheiser was the least comfortable of the group because of its moderately high pressure against the ears. This, however, is the usual tradeoff for a good ear seal needed for deep bass. The Sennheiser also has a narrow headband, which puts a pressure spot on your head, or at least it did on mine. The AKG and Audio Technica are very comfortable, well suited for long-term listening. Sony's comfort ranks in the middle of the pack.

Summary

I recommend the AKG K240M and ATH-910 Pro for long-term, fatigue-free listening. I especially liked AKG's smooth, elastic-band height adjustment. The Sony MDR-7506 is a good compromise between comfort, isolation, and accurate sound. The Sennheiser HD25SP and Sony offer the best isolation and deepest bass—especially the Sennheiser. In sound quality, I concluded that the Sony was the most accurate-sounding headphone, although many will prefer the AKG-K240M for its silky highs.

But depending on what type of audio you plan to monitor and how long you use the 'phones during a given listening session, any one of these products can do a good job.

For more information, contact Sennheiser at 203-434-9190 or circle **Reader Service 181**; AKG at 510-351-3500 or circle **Reader Service 162**; Audio Technica at 216-686-2600 or **Reader Service 70**; and Sony at 800-635-SONY or **Reader Service 130**.

□□□

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

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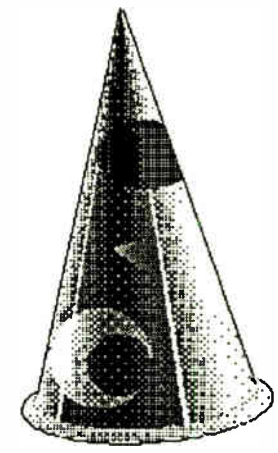

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World Radio History

PRODUCT EVALUATION

The 'Ideal' Field Mic from Shure

by Ty Ford

BALTIMORE Ever since I invested in a portable DAT machine, I've been on the lookout for a high-quality stereo mic that is easy to use in the field and doesn't cost an arm and a leg. My recent work with Shure's VP88 MS ($995) allows me to draw the conclusion that my search may be over.

The VP88 stereo condenser microphone is a hand-held, stand or camera-mountable mic that weighs 14.7 ounces, less battery and cable. It comes with a "Y-splitter" cable, foam windscreen, swivel stand adapter, battery and storage bag. Present options include; the A88SM isolation mount, Zeppelin windscreen kit (shock mount, windshield, wool wind muff and Windjammer), 25 foot extension cable, PS1A Phantom supply and S15 14 foot mic stand.

Mid/Side

So how do I figure this is really three mics? First there's the stereo mic, consisting of a front-facing cardioid element and a side-facing figure-eight. Because the "Y-splitter" cable divides the two elements, you get a single, cardioid mic on one leg and a figure-eight on the other. The VP88 creates its stereo image by combining the cardioid element with the figure-eight element to produce a Mid/Side output.

If you haven't worked with a Mid/Side configuration yet, the beauty of the design is that you record the two capsules on separate tracks. Then, back in the studio, you can combine the tracks to adjust the stereo spread of the signal to meet your requirements. Changing the stereo width during post-production is a handy feature for film makers. If the scene starts with a closeup, the stereo field is adjusted to a more reduced spread. Then, when the film editor cuts to a wide shot, the sound mixers can open up the stereo spectrum to create an aural reality to match the wider shot.

Decoding Mid/Side audio requires a matrix box, or you can use the "three fader" approach. In the "three fader" setup, you run the "side" element through a splitter. Then, reverse the phase of one of the lines and make it the right channel. The unreversed "side" signal becomes the left channel, and the mid element becomes the center channel. This configuration gives you two faders to control the side levels and one for the mid. As long as you have the extra input to spare, this method is cheaper than buying a matrix box.

If you don't need the Mid/Side capability, the VP88 MS also has a built-in, adjustable stereo matrix that provides three different stereo widths. You don't need any external boxes, all of the controls are mounted right on the mic. Also easily accessible is the battery on/off and bass roll-off switch.

Specs

As shown in the Shure documentation, the mid capsule is fairly flat, +/- 2 dB from 100 Hz to 15 kHz. The side capsule remains flat from 200 Hz to about 3 kHz and then rises to a +4 dB peak just past 8 kHz. It then falls off, crossing 0 dB at about 15 kHz, and keeps going down. The low frequency roll-off switch applies a 12dB/octave slope at 80 Hz. Stated output noise is 24 dB, A-weighted. The signal-to-noise figure is 70 dB (IEC 651) at 94 dB SPL.

Product Capsule: **Shure VP88 Stereo Mic**

Thumbs Up	Thumbs Down
✓ great sounding mic	✓ slightly pricey
✓ phantom or battery operation	
✓ multiple patterns	

For more information, circle **Reader Service 57**; or call Shure at 1-800-25-SHURE.

The two capsules are powerable by 9 to 52V DC phantom power or by a small 6V DC battery. Duracell, Eveready, Kodak, Panasonic, Radio Shack and Varta all make these batteries. A call to the local Radio Shack confirmed that they had a alkaline version in stock at just $4.00. Another electronics store stocked the lithium and silver oxide versions at $7.00 and $9.00 respectively. Their advice was to go with the lithium cell if the unit is only used occasionally, because lithium cells fade more slowly than the others. Shure claims 70 hours use from the silver oxide and lithium cells and 40 hours for the alkaline.

In the field

My first stop was at a friendly local music store. They're used to me walking in with strange pieces of audio gear attached to various parts of my body. The manager handed me a drum stick and pointed me at the percussion section. I spent about a half an hour recording various "strikables" (cymbals, bell trees, chimes, drums, blocks, and door jambs). You name it, I hit it. The properly stocked music store is a goldmine of great noises. Once you hear real cymbals digitally recorded, you will be unhappy with most of your keyboard samples.

If you plan to do this, and I hope you do, there are a few caveats. Make sure it's cool with the management. Don't go on a busy day if you want to get good isolation.

continued on page 22 ▶

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All 3 models operate on a single 9 Volt alkaline battery and provide a wide range level control which adjusts from mic to line levels.

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World Radio History

PRODUCT GUIDE

Companies with new product announcements for Studio Sessions Product Guide should send them to Radio World, c/o Studio Sessions Editor, 5827 Columbia Pike, Suite 310, Falls Church, Va. 22041

Panasonic's SV-4100 DAT recorder is said to be ideal for broadcast, live performance or studio production with its RAM-based quick start capability.

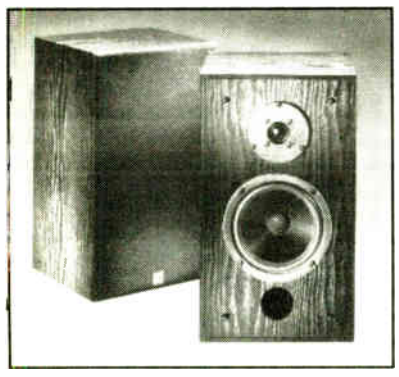
The deck also features, external sync capability, software-enhanced digital interface, AES/IEC I/Os and optical connector, programmable cue assignment, programmable output level, and remote control.

For more information, contact Panasonic Pro Audio at 714-373-7277; or circle **Reader Service 177**.

Jiri Donovsky ADAT Transfer Interface

Independent designer Jiri Donovsky has introduced an eight-channel data interface that enable digital transfer from the Alesis ADAT to the Mitsubishi X650 and X880, Otari DTR 900, Sony PCM 3324 digital recorders, and Yamaha DMC 1000 and DMP 7D digital mixers.

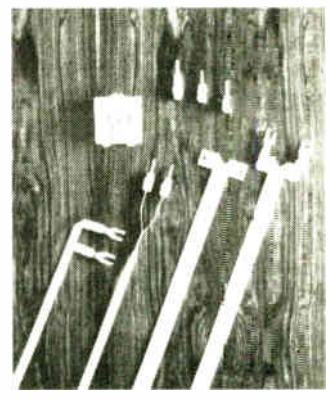
For more information, contact Jiri Donovsky at 213-960-9472; or circle **Reader Service 48**.



Yorkville YSM-1 Nearfield Monitor

Yorkville's YSM-1 monitor is a moderate-sized speaker (16 inches high x 10 inches wide x 9 inches deep) with a 6.5 inch woofer and 1 inch dome tweeter. The $280 per pair monitor has a rated frequency response of 40 hz to 20 kHz, plus or minus 3 dB.

For more information, contact Yorkville at 716-297-2920; or circle **Reader Service 211**.



Goertz MI Speaker Cable

Alpha Core has introduced a ribbon-conductor speaker cable that is said to provide "virtual elimination" of high frequency roll off, line frequency hum, emitted EMF and skin effect.

The twin-ribbon conductors are as thick as a penney for unobtrusive mounting along baseboards, wallpaper, under carpet, etc. They come in a variety of gauges and lengths. The company also provides various connector options including banana plugs, spades and pins.

For more information, contact Alpha Core at 203-335-6805; or circle **Reader Service 94**.

AKG C12VR Tube Microphone

AKG has brought back the C12 in an updated version, the C12 VR, which uses a modern version of the original capsule and tube electronics used from 1954 to 1963.

The one-inch, twin diaphragm system permits a choice of nine patterns and has been enhanced to reduce hum and noise components. The C12VR still uses the 6072 vacuum tube. Frequency response is rated from 30 hz to 20 kHz, plus or minus 3 dB.

For more information, contact AKG at 510-351-3500; or circle **Reader Service 170**.

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World Radio History

DIGITAL DOMAIN

Another Look at Compression Use

by Mel Lambert

LOS ANGELES I make few apologies for returning to a topic that I have covered before in the hallowed pages, and one that I am convinced in the very near future is going to surprise a number of broadcasters. Not wishing to stretch the metaphor, I am currently waiting for the other digital shoe to drop.

What has altered my attention? Simply the prospect that few chief engineers and program directors have first-hand experience of the types of problems resulting from multiple generations of digital audio data compression. Because, within a very short time frame, I'm convinced that we are in for some rude surprises.

A growing number of stations are accepting ads and other material via data modems. Since, to ensure improved transfer performance, most systems utilize some form of data compression; thus, at least one generation of encode-decode processing already exists on carts destined for broadcast. Add another generation for the disk-based automation systems, plus another for the digital STL, and we begin to appreciate the potential gravity of the situation.

Not to blame

Data compression, per se, is not the culprit. As many of us now realize, perceptual coders are very handy for enhancing the record capacity of hard drives and optical media, accelerating the transfer rates of such devices, or for increasing the data capacity of a satellite or terrestrial link.

Most currently available algorithms from APT, Dolby, Scientific Atlanta, MUSICAM licensees and others, do a fine job of removing redundant data from digital bitstreams, through combination of masking and related techniques. And with the growing application of Mini-Disc (ATRAC compression) and, to a limited extent, Digital Compact Cassette (based on TASC processing), the possibility of multiple and sequential compression stages becomes a virtual certainty.

Again, these algorithms, when applied one, twice, or possibly three times to audio material produce no discernible affects. Perform the process several more times, maybe between formats, and I predict that even the most tin-eared individual is going to realize that something just ain't right with the world.

All data compression systems are going to degrade, however slight, the audio quality. Some algorithms can produce noticeable artifacts on previously compressed material; post-compression signal processing, including equalization, will also alter the signal in predicable ways. So just what are the types of factors we need to consider in broadcast-related applications? They are:

A growing number of stations are accepting ads and other material via data modems.

The factors

• **Encoding delay.** The first to consider is encoding delay. Like most complex DSP functions, digital data-compression coders require a finite amount of time to analyze the waveform, delete redundant information, and then output the data-reduced bitstream.

On the receiver/replay side, time will be required to re-convert the 16-bit data. Delay time is directly related to the block length. Dolby AC-2, for example, features a delay of 45 mS for an encode/decode cycle, while MUSICAM involves an encode delay of around 20

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Shure Stereo Field Mic

▶ continued from page 20

The VP88 is very sensitive.

The output connector of the VP88 is a five-pin XLR. The "Y-connector" splits that signal to two standard three-pin XLRs. Depending on the switch position on the surface of the mic, you get M/S, or L (low), M (medium) or H (high) separation stereo. When used by itself, the cardioid (or mid capsule) on the VP 88 sounded very similar in frequency response to my Gefell, although just a bit noisier. On the Neumann/AKG scale, the frequency balance of the VP88 cardioid capsule sounded more like a U87 than a C414.

Two-voice spots

The figure-eight element is brighter than the cardioid. Consider using it to record two voice spots; with one person on each side of the mic. Using one bi-directional element will reduce phase cancellation problems normally caused when two mics are open in a small, live environment. Of course the mic has to be placed so that two people can get close enough to the mic and to each other to work properly.

As I switched to stereo, through the Low, Medium and High separation patterns, I noticed an increase in high frequency noise at each step. This happens because the level of the side elements is increased with the wider settings.

Shure KV100

In my next test, I put the mic in wide stereo mode and cut some voice tracks. At a distance of six to eight inches, the VP88 was fairly sensitive to slight changes in the position of my head. Turn too much to one side and the level drops off on the other side resulting in an "off-mic" sound. The mid position was much better; it was quieter and with enough stereo effect to give a sense of space without causing listener vertigo.

In the low position, turning my head a bit from side to side produced some panning, but nothing dramatic.

Other uses

Here's a "morning zoo" experiment. Try placing the stereo mic up so that it captures everything going on in the studio. Then use the individual announce mics to fill in the space properly. If you haven't done it already, try panning the announce mics slightly apart from each other in accordance with the spread of the stereo soundfield. Check the mix in mono to make sure the other mics are not causing phase cancellation. If they do, try repositioning the stereo mic to resolve the phasing problems.

Assuming you're running stereo back to the studio, the VP88 can really add a lot to remote broadcasts such as ball games, auto races, state fairs, traffic reports and in-store appearances. Set the VP88 up to get a nice stereo soundfield, then mix in your normal talent mics.

Making music

The VP88 can also come in handy during music sessions. If you've got musicians who know how to play dynamically, allowing for each other, and they are in a nice sounding acoustical space, you'll get a very nice recording. It may take a bit of wandering around to find the right spot to place the mic, but that's what your golden ears are for. The VP88 also can be used as an overhead mic for drums, or to mic a stereo/chorusing guitar amp in more conventional multi-track sessions.

If you've been searching for a way to add a new dimension to your sound, the VP88 can do it. My only warning is that it's a little like going from black and white to color television; once you've seen color, black and white is a lot less interesting.

□□□

Ty Ford is a regular contributor to Studio Sessions and is principle in T/S/F Productions in Baltimore. He can be reached at 410-889-6201.

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World Radio History

Jeff Arthur Heavy into Radio Spot Production

by Dee McVicker

CLEARWATER, Fla. Business is booming for Jeff Arthur Productions, the Clearwater, Fla., studio that does many of the radio station jingles heard around the country. The company, founded by former Columbia and A&M Records recording artist Jeff Arthur, is renowned for its large radio spot productions for major clients like Jiffy Lube, Continental Airlines, Texaco, and Taco Bell.

Vince Wheeler and three other engineers are responsible for Jeff Arthur Productions' 400 to 500 jingles and commercial underscores each year—more than many studios do in a career. They also handle a staggering work load for the sports trade, producing scores and commercials for the National Football League (NFL), Budweiser, the St. Louis Cardinals and other sports affiliations.

Wheeler expects to further merge his studio with the computerized world, perhaps moving onto the info highway.

And, in between these pressing demands, the studio does its share of what is commonly referred to as "store casting." Jeff Arthur Productions is the voice behind many of the music and advertisements broadcast in the nation's malls—keeping Wheeler and the other engineers very busy.

A typical day in the production life of Vince Wheeler has him at the control of a new Otari Concept 1/DISKMIX console and mixing automation system. Next to Wheeler, "within the spin" of his chair, is an effects rack with various reverbs, harmonizers, and other effects gear.

Using digital

A large digital 24-track Studer 2-inch D827 reel recorder is within arm's length of Wheeler's workstation, and feeds most of his musical productions. "Most every one of our music beds is from our 24 track," he said. "When I do my vocals, 99 percent are done (digitally); (as in) a stereo mix blown to digital. I take 24 tracks down the stereo path to digital, then do all my vocals on digital, and then lock the two machines up and then I mix down to my hard disk editor," he said.

Digitally-controlled automated mixing is a staple at the studio. And Wheeler made the leap in technology without giving up the tactile feel of the console. After "17 plus years on a console," he said, it's not likely he'd go with a system that would drastically change the way he works.

Wheeler selects channel operating modes on his Otari Concept 1/DISK-MIX system from push buttons on a fader module located on the console, not on a PC keyboard. He can also see the mix, both from a computer screen monitor and from the console, and can update the mix during playback by simply moving a fader. The system uses Penny & Giles motorized fader technology to

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Production Engineer Vince Wheeler

NEW DIGITAL CLARITY

Clarity Of Purpose: *"Design and build an actual digital replacement for the analog cart machine utilizing individual, Magneto-Optical discs."*

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COLE'S LAW

Broadcasters Await New RFR Rules

by Harry Cole

WASHINGTON Way back in April 1993, the FCC opened a rulemaking proceeding aimed at modifying its "guidelines and methods used for evaluating the environmental effects of radio frequency (RF) exposure."

It looks like any action in that proceeding will not happen until the end of the year at the earliest, but it is not too early to size up where things might be going and how they might affect you.

Standard transition

The FCC is involved in the whole RF exposure area thanks to the National Environmental Policy Act of 1969, which requires all federal agencies to evaluate the effects of their actions on "the quality of the human environment."

The FCC considers RF radiation and its effects on humans to be an environmental factor that must be considered under the law. The commission has no special expertise in this area, and it has not undertaken any independent testing. But the law is the law, and the FCC has to do something.

In 1985, the commission adopted its own standards for human RF exposure, which were based on standards adopted by the American National Standards Institute ("ANSI") in 1982. ANSI's guidelines were developed by a panel of experts and were considered to be "widely accepted technically" and based on the "best scientific information available."

Broadcasters have been subject to the FCC/ANSI standards since then, but it has not been a great burden. About the only times anybody worries about compliance are when they file for a modification of their technical facilities or file for license renewal. In those cases, the licensee must simply file a statement of compliance.

Life may soon become a bit more complicated.

In 1992, ANSI adopted revised human RF exposure standards based on new research and study. The result is a new set of standards that are, in some ways, significantly more demanding than the old ones. In its rulemaking, the FCC has proposed adopting these new standards as its own.

Controlled environments

The FCC proposes replacing the current single set of RF standards with ANSI's new dual set of guidelines for RF in "controlled" environments and in "uncontrolled" environments. The difference between the two is easy to understand. "Controlled" environments are places where the people exposed to RF have some clue about what RF is, what exposure to it can cause, and may even be able to adjust RF levels present in their environment.

An "uncontrolled" environment is where the great unwashed public is exposed without knowing anything about it.

The difference between "controlled" and "uncontrolled" may be easy to grasp, but exactly how will the commission interpret it? The rulemaking leans toward a conservative approach "because matters of possible health and safety are involved."

The more stringent standards for "uncontrolled" environments will likely be imposed whenever the general public is exposed to RF, including cases where transmitters are located in residential areas or locations where proximity to the RF source may be unrestricted.

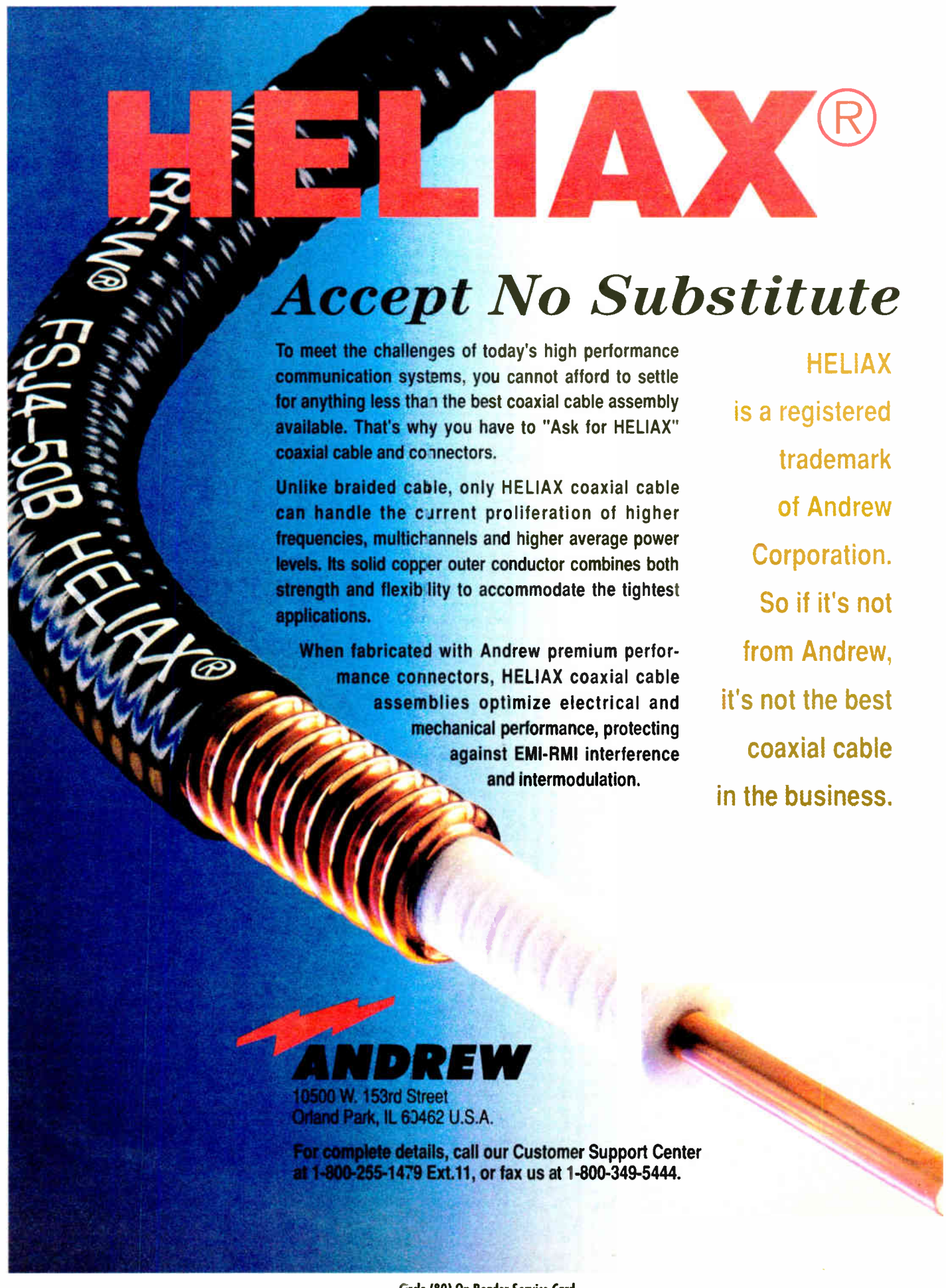
This approach could be a problem for licensees in urban areas where transmitters are in or adjacent to residential areas, regardless of whether the residences were there when the transmitter was first installed.

The ANSI standards' new recommended limits for maximum exposure from induced and contact RF currents is another possible source of problems. The old standards did not address these phenomena (which, I hasten to note, I do not fully grasp myself).

The new ANSI limits require exposure evaluation over the frequency range between 3 kHz and 100 MHz. Astute readers will immediately recognize the conundrum that creates for FM radio, since the affected range stops just about in the middle of the FM band.

Some knowledgeable people—including no less a luminary than Dane Ericksen of

continued on page 27 ▶



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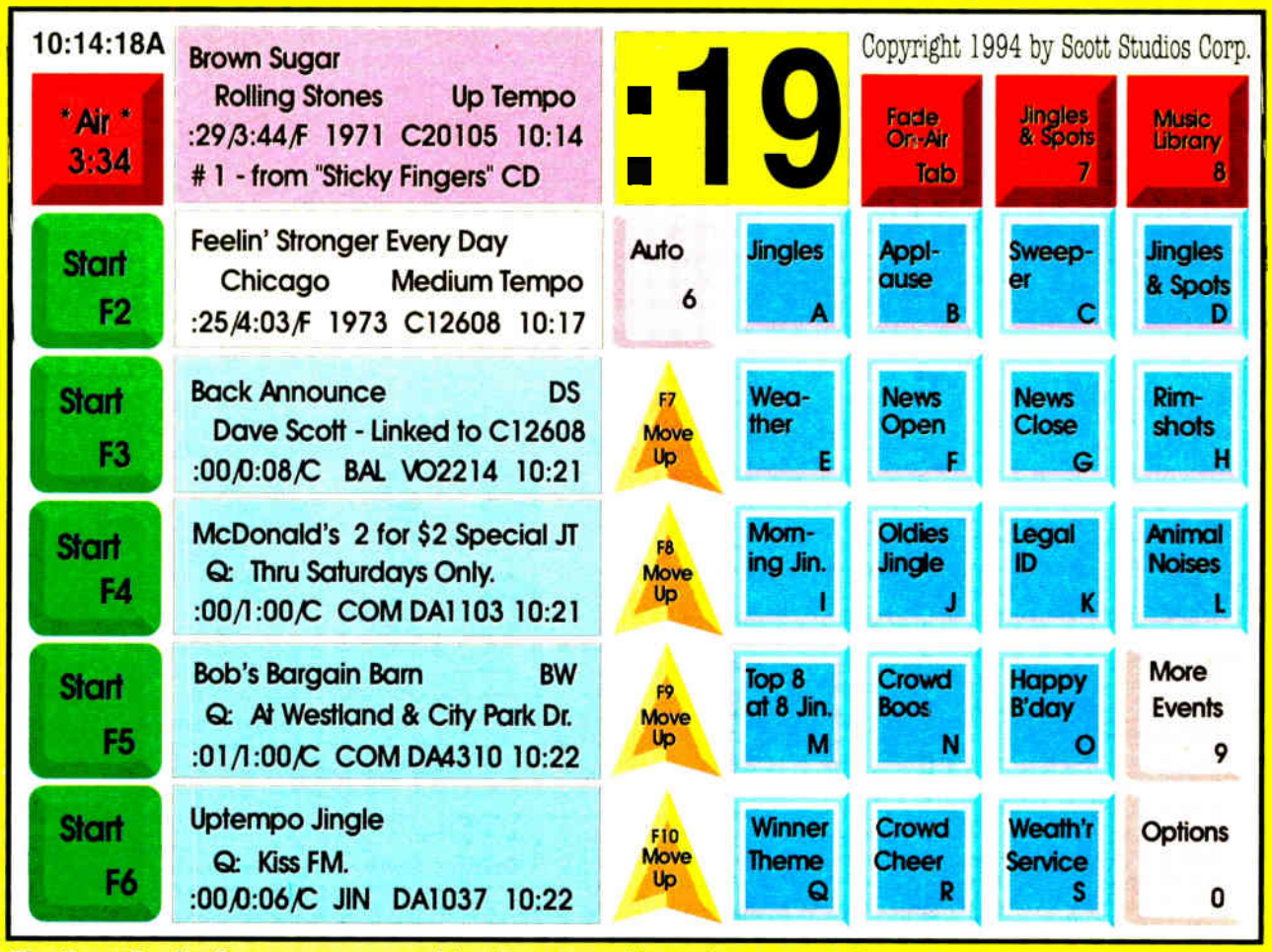

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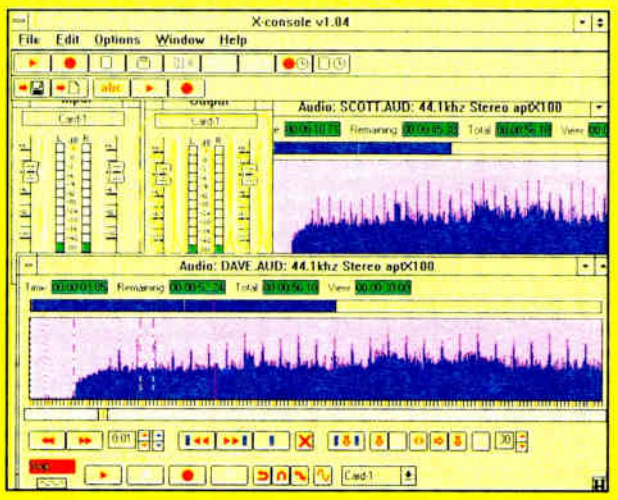

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Solid State Treats Many RF Problems

by Phill Sandahl
Marketing Manager
Crown Broadcast

ELKHART, Ind. Ron squinted at the sun glistening off his transmission tower as the charter helicopter approached the peak. He had arranged the flight to check on his FM transmitter at this nearly inaccessible site. The tower appeared to be a giant inverted icicle.

Situations like this take place in broadcasting more often than you might imagine. Fortunately, solid state transmitter technology has helped reduce the number of costly visits to locations like this one. It is a technology that has made life easier for many busy station engineers.

Solid advantages

Not all transmitters are located in such inaccessible sites, but the advantages of modern solid state components make them equally desirable in more normal circumstances as well. To fully appreciate the benefits of solid state, it is important to know some of the operating principles of tube design.

Tubes depend on heating a filament to incandescence so that they emit electrons, which pass through a grid to a plate. As the electrons strike the plate, they create additional heat that must be removed to protect the vacuum seals. The high voltage on the plate combined with control of the electron flow by the grid produces the amplification.

In contrast, solid state devices work best at room temperature; they do not require high temperatures to amplify the signal.

Almost all exciters and low-power FM amplifiers are now made with solid state power devices, either bipolar or, more commonly in modern designs, MOSFET type. They offer several advantages over traditional tube technology.

Reliability is very important in the operation of a radio station. Modern solid state devices do not change electrically over time or with use, and they do not wear out. Engineers do not have to tune and adjust circuits nearly as often to insure optimum transmitter performance. In fact, tuning adjustments are not even built into modern solid state transmitters.

Engineers can spend more time on improving the sound of the station rather than concentrating on just keeping it on the air.

Efficiency is another advantage. Solid state devices do not waste energy creating heat and light, so they require less energy to cool the entire chassis. This eliminates or reduces fans and other hardware to cool the system. Heat is one of the major factors contributing to the deterioration of components in a system, so a cooler system means less total stress on the equipment.

Solid state designs reduce problems caused by dust. The need for furnace filters is minimized, and any potential damage due to clogged filters is reduced. Time and material are saved because less servicing is required.

Wideband operation

Tube designs require transmitter circuits be tuned to a narrow range of frequencies. The circuits in solid state devices can be designed for wideband coverage. One circuit will work through the whole band without additional tuning or adjustment.

Solid state power devices are not as sensitive to load changes as many tubes are. When the load on a tube changes, the circuit must be retuned or the transmitter output reduced to prevent damage.

This feature is best appreciated by looking at what happens when ice forms on an antenna. Ice causes the antenna characteristics to change, which changes the VSWR and the "load" seen by the components in the transmitter. These changes could increase the plate current in a tube circuit and damage the transmitter. Modern designs build in foldback circuits to protect the transmitter in case of a mismatched antenna.

Experience shows that when a station uses a modern solid state exciter and then passes the signal through a tube into the final stage, the output is noisier than the input. Solid state power devices are inherently quieter electrically. Tubes generate noise that is introduced into the transmitter signal.

High-efficiency tetrode tubes must be neutralized to improve efficiency and to avoid going into oscillation. Solid state devices do not have to be neutralized.

Lower levels of heat and electrical noise in solid state circuits eliminate the need to isolate some components from others, which makes one-package design more feasible. Connectors, electrical shielding and vibration damping are reduced to produce lightweight, compact equipment.

Solid state devices are designed to last a long time without wearing out or changing their characteristics, while tubes gradually break down the thorium in their filaments. Solid state pieces do not have that kind of built-in degradation.

Reliability, efficiency, simplicity of design, and compact size add up to one conclusion: For people like Ron from the earlier example, the development of solid state power devices for low-power FM transmitters has made it possible to work in places where he could not work before.

Station engineers working in less demanding environments benefit from valuable solid state features that significantly impact the bottom line.

□□□

Phill Sandahl is marketing manager for Crown Broadcast, which manufacturers the FM100 and FM200 low-power FM transmitters. For more information on Crown Broadcast products, contact Crown at 219-294-8000; fax: 219-294-8329, or circle **Reader Service 96.**

RFR Regulations Coming

▶ continued from page 25

Hammett & Edison Inc., San Francisco, an engineer who enjoys widespread respect—have raised this problem with ANSI, but apparently to no avail so far (See "Readers Forum," June 29). The FCC, of course, does not appear motivated to develop its own innovative way of assuring equal treatment for all FM stations across the band.

Instead, the commission proposes to evaluate exposure to induced and contact RF currents at (1) all FM stations with carrier frequencies below 100 MHz and (2) all FM stations, regardless of their carrier frequencies, that are located at a single site where any one of the stations operates below 100 MHz.

If, for example, you happen to be on 107.3 MHz (and thus, theoretically exempt from the new standards), you could still get roped into having to comply with them if you happen to share tower space with, say, a noncommercial FM station. The new rules could discourage renting tower space to any station (radio or TV) below 100 MHz.

So far, the FCC does not plan to change its approach to RF standard implementation. It would still limit most RF evaluations to applications for construction permits or license renewals.

However, the FCC does suggest that it may require more extensive RF evaluations than it has in the past. It is specifically exploring whether to "require more complete documentation or evidence from applicants who claim compliance with environmental RF guidelines."

Long wait

How could all of this affect broadcasters? It's difficult to say, obviously, because we don't really know what the commission is going to do. But the FCC did offer a preliminary analysis of the impact of the new guidelines, based on a 1985 report by the Environmental Protection Agency. The report concluded that as many as 11 percent of the 4,600 AM stations and 17 percent of the 4,400 FM stations studied would require corrective action to bring them into compliance.

That is bad enough as it is, but it gets worse. The EPA report was based on data gathered several years ago, and was limited to single-facility installations. It did not consider the cumulative levels of RF that are likely to be present at multiple-user sites, and did not consider the issue of induced current limitations, which could affect many AM and FM stations.

There is probably nothing to panic about here yet, but there certainly is reason for concern. Radio broadcasters who have not focused on the new ANSI standards should probably do so soon.

Some broadcasters may want to chat with their consulting engineers about their current facilities' chances of complying with the new standards. That way they can at least have some idea of what might be in store in the not-too-distant future.

□□□

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

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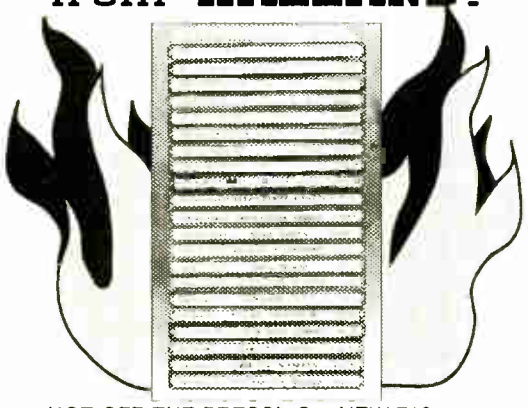

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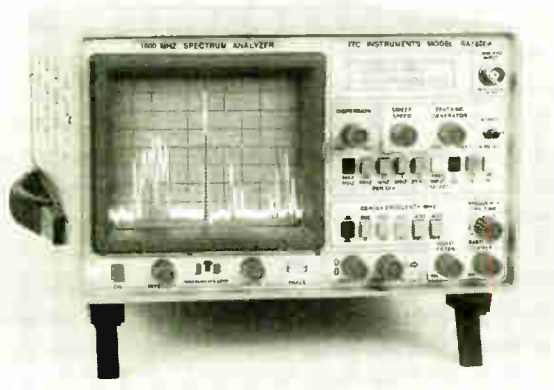

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Workers Have Radiation Protection Options

by W.C. Alexander

DALLAS For quite a few years the FCC has specified that broadcasters must protect the public and workers from the hazards of exposure to nonionizing RF radiation produced by broadcast antennas. There is a new standard in the works that sets up different levels of protection, the level to which workers may lawfully be exposed being higher than that to which the public may be exposed. Even though the threshold for workers is higher, we as broadcasters must protect our workers (even if the worker is you). Short of leaving the air every time someone must come close to an antenna, what can we do? Let's take a look at some options.

AM exposure

In AM stations, because the wavelengths are long, all the RF radiation exposure that is of concern to us is in the near field. In the near field, the electric and magnetic components are at random phase (as opposed to being in quadrature as in the far field). As a result, either component of the field may be high while the other is low. The only way to know is to measure the two components independently and check the results against the separate maximum limit.

Since high RFR in AM systems is limited to the near field, the areas in which overexposure is likely to occur are in the vicinity of the tower bases. Other likely hot spots are in any location where RF current is flowing through an unshielded conductor. This includes slant wires, feed tubing and, particularly, inductors. You can see from this where it may be impossible to safely read the base ammeters in their traditional locations on any but the lowest power station.

One approach to reading these meters and still complying with the law may entail utilizing the time-average provision of the ANSI standard. In many cases it may be entirely possible to quickly enter the high field, read the meter and then exit the area and not exceed the exposure criteria. Keep in mind, however, that if that entire process results in time-averaged exposure that is close to the ANSI limit, the subsequent few minutes will have to be spent away from any near field. Otherwise, an engineer going from base to base to base in a directional array reading meters may actually be overexposed, even though any one of the incursions into a high-field area did not result in overexposure.

Shielding is another (and probably safer) option for AM base current reading. If you can locate your base current ammeter in such a manner that all radiating conductors are shielded, there is no need to make haste in taking readings. Toroidally-coupled RF ammeters that use a length of coaxial cable to couple the pickup unit to the meter itself are particularly well-suited for this type of application. The meter can be located well clear of any dangerous fields.

What about painting, relamping and other tower maintenance that must be done on the tower itself? This may be the most difficult situation of all for AM broadcasters to deal with. In 1991, Richard Tell conducted a study in which the actual current flowing through a tower climber's body was measured while he was at various locations on towers of different electrical lengths. Following the publication of this study, it became clear that the only acceptable way to keep AM tower workers safe is to remove all excitation from the structure. This means going off the air for most stations, a situation that may be unacceptable in some instances. What happens when the tower(s) need painting? Can your station afford to be off the air completely for three or four days?

Night work is one way around the problem. Tower climbers are accustomed to working at night, and professional riggers will be well equipped for nocturnal tower work. In summer months, night work may be far preferable to hanging from a leather belt under the blazing sun.

Another possible solution, one on which only your professional consulting engineer can advise you, may be very low power non-directional operation of a multi-element array.

Low-power experience

I have used this method myself with 50 or 100 watts into one tower while work was being performed on the other towers in the array (which were "floated" during the ND operation). The thing to remember is that even though no power is being fed to the base of an unused radiator, current will still flow in that element as a result of mutual coupling. This current may be of such a low value that no harmful effects are caused to workers. It may also be significant, so before you use this method, ask your professional consulting engineer.

The ultimate solution to the AM tower work dilemma is the off-site auxiliary antenna. One station in the Dallas/Fort Worth area has constructed a relatively short tower on a corner of its transmitter site property which it fires up and uses with reduced (but still substantial) power while work takes place on its main stick. I know little about this operation, but

continued on page 30 ▶

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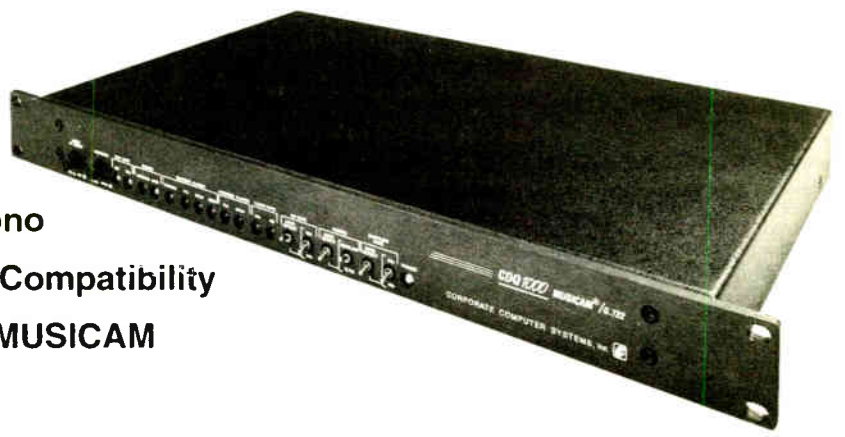

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World Radio History

Look for Tower Trouble Warning Signs

by Douglas L. Federau

BOSTON "If it ain't broken, don't try to fix it" applies to the way many owners view the more than 20,000 broadcast towers dotting the nation's landscape. Unfortunately, there is a tendency to ignore towers simply because they require less attention than the more technically intensive facilities involved with radio and television broadcasting.

Some belive that if something goes wrong, the insurance policy will be the safety net. Controlling loss is a critical point. Tower construction costs are escalating, and so are the insurance claims. The prudent business approach is to eliminate wherever possible the opportunity for damage to occur.

A tower that is out of service sets into motion a chain of events resulting in loss of income, audience share, and advertisers, notwithstanding the disruption of the station operation.

There are 12 common causes of broadcast tower loss. A review of insurance claims points out the fact that virtually all losses fall into these dozen categories. By familiarizing yourself with the causes, you can minimize the risk of having a tower either damaged or destroyed.

Inadequate planning and engineering

Planning and engineering problems are relatively easy to overcome. The first step in the planning process is recognizing weather as the main cause of tower loss.

Wind, ice and lightning account for more than 75 percent of broadcasters' losses. Tower owners and chief engineers should focus attention on gaining an in-depth understanding of climatological data in the areas where their towers are located.

Once the potential for weather extremes is recognized, steps can be taken to install the equipment necessary to minimize the possibility of loss. The type of tower, quality of construction and installation must be appropriate for the topography of the area, and must enable a tower to withstand the climatological extremes in the area where it is located.

Lightning

Lightning accounts for approximately 20 percent of all tower property claims, and the higher the tower, the greater the possibility of lightning losses. Here is a checklist to help minimize tower damage by lightning:

- Lightning rods should project well above the tower beacon. Use binoculars to verify that the rods are in place and in good condition because severe lightning hits may vaporize them.
- Guy wire anchor points should be grounded to the nearest radial by copper strap.
- For grounded towers, at least four 10-foot rods must be bonded to the tower base and in contact with the ground water table. Soil must be tested to determine conductivity.
- For insulated towers, the ball gap should be clear of debris so that the bare metal is exposed.
- Insulated towers should have a static drain choke connected between the feedline and the station ground.
- Insulated towers should have at least one 12-foot loop in the coaxial transmission feedlines between the tower and the transmitter housing.
- Cadwelding all metal-to-metal connections is recommended.
- All tower attachments should be grounded to the tower with appropriate grounding kits and these connections should be inspected annually because poor connections can cause severe damage to equipment.
- Power lines must be protected with surge arresters and line chokes.
- Phone lines should be protected with MOVs (Metal Oxide Varistors).
- In lightning zones 6 or higher, lightning dissipation systems are highly recommended.

It is prudent to have all grounding and lightning dissipation work done by a professional lightning abatement contractor. Lightning dissipation systems consist of both top hat absorbing devices or umbrellas, plus enhanced grounding systems at the tower base.

Ice

Two types of ice cause problems. Rime ice is similar to what is found in a refrigerator. It weighs about 17 pounds per cubic foot and is quite porous.

Glaze ice is different and occurs only in certain geographic areas and elevations where the temperatures drop below 32 degrees Fahrenheit. It is quite common in lower latitudes; it accumulates on tower members where there is a slight drizzle. This type of ice has a density of 54 pounds per cubic foot.

A failure to install de-icing equipment results in excess weight and will cause

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RFR Protection Ideas

▶ continued from page 29

because the engineer in charge is very reputable I assume that the current induced in the main radiator by the auxiliary antenna is safely low. This is an expensive solution, one that perhaps only the most profitable AM stations can afford. An alternative may be a "community" auxiliary antenna, located some distance from any other AM sites and co-owned by several of the AM stations in a community. Together with a frequency-agile transmitter and a simple, easily adjustable tuning network, several stations could schedule use of the site during tower work. I don't know for sure how the FCC would view such a setup, but in light of the last few years' easing of antenna restrictions the agency would probably go along with anything reasonable for a temporary antenna.

Workers that climb towers housing FM and TV antennas must pass close to radiating and re-radiating objects that are mounted on or a part of the tower structure. The FCC requires that each station devise and implement a policy which will protect workers on the tower.

At each of our FM stations, we have a procedure in which power is reduced and excitation is swapped between main and auxiliary antennas as the worker moves about on the tower. By observing the climber's position on the tower and communicating with him by radio, we are able to insure that he is never exposed to a field in excess of the ANSI limit. This works well on towers which we own and on which we are the sole broadcast occupant, but what about multi-user towers where many FM and/or TV stations are operating?

In multi-tower "antenna farm" situations, it may even be that with all the antennas on a given tower de-energized there is still enough radiation from antennas on adjacent towers to result in excessive RF radiation. I have seen this first-hand at the Cedar Hill site south of Dallas, where all the stations, regardless of which tower they are on, must cooperate in some way in the RFR safety program.

RF mapping is an important first step in determining what, if anything, can be done at a given location on a tower while there are stations operating. This is achieved by actually measuring the RF radiation levels along the tower's length to determine where the high RFR areas are. Most professional riggers offer this service, and it is a good idea even for the single-user tower. Mapping should be done separately for all modes of operation (main/aux).

The solution that is rapidly becoming the industry standard incorporates use of protective clothing made of a product called "Naptex®" which is an effective shield against RF radiation. Naptex® is constructed of stainless steel micro fiber wrapped in a pure cotton overlay which is in turn rewrapped in a cotton-polyester to produce the Naptex® thread. The thread is woven into a fabric that has the same feel and look as broadcloth. This fabric is very reflective of RF energy and absorbs little. There is little thermal effect. By using outer clothing, gloves and socks made of Naptex®, the specific absorption rate (SAR) is reduced to well below the ANSI limit, even in the most hostile RFR environments. The shielding ability of Naptex® ranges from 40 dB below 1 MHz to 20 dB above 20 GHz. For more information on Naptex® protective clothing, contact Doty-Moore Towers Inc. at 214-293-1200, or circle **Reader Service 36**.

The solution to your particular RFR situation can be very simple or very complicated. It seems to me that having tower workers wear Naptex® protective clothing may offer the easiest and least interruptive solution (although it may be the most costly). The consulting engineer is your best source of information on RFR. Unless you are very experienced in dealing with these matters, you should seek professional assistance in setting up your RFR compliance program.

□□□

Cris Alexander is director of engineering for Crawford Broadcasting. He can be reached at Box 561307, Dallas, Texas 75356.

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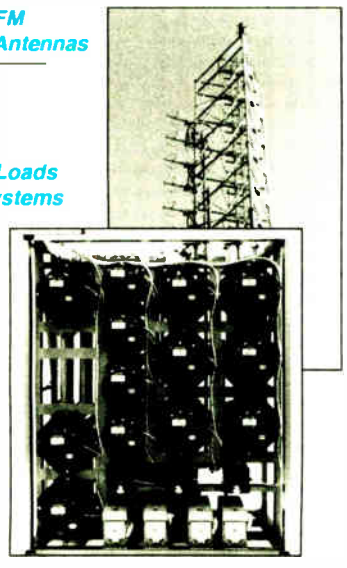

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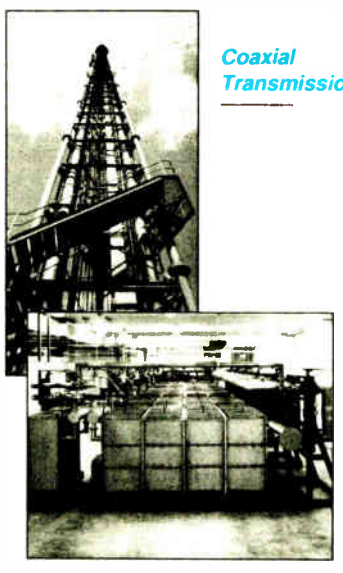

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World Radio History

Stations Get a Competitive Edge with

by Alex Zavistovich

WASHINGTON The digitization of radio is upon us. In larger markets, some studios can now boast digital consoles, CD players, disk-based cart machines and digital audio workstations.

But what about the other aspects of the chain—the STLs, RPUs, exciters, transmitters? While digital audio radio (DAR) is still a distant promise, other aspects of the radio signal pipeline have moved into the digital domain. Digital codecs are becoming more popular than ever as a means of moving pristine audio from one point to another in such applications as RPUs and STLs. Two manufacturers, Harris and Nautel, have recently introduced digital exciters, thus enabling broadcasters to move their CD signal even closer to the transmitter final without analog-to-digital conversion.

For some industry observers, the notion of a fully digital radio station is here now; once DAR becomes a reality, the last link in the digital chain will be forged.

Obstacles v. advantages

Still, there are obstacles in the path of complete acceptance of digital technology in the RF chain. Cascading of dissimilar digital compression schemes, some fear, inevitably leads to signal quality degradation. Others, however, see economic advantages to compression. They point to reduced costs of space segment utilization with compressed audio and the benefits that accrue to narrowcast networks using reduced bandwidth.

The trend toward digital in the RF chain has been slow, according to Eric Eckstein, digital product manager for QEI. The firm recently introduced the QUICK-LINK, a digital RPU that operates in the 902-928 MHz band.

"Digital RF equipment has had somewhat of a 'tortoise and the hare race' with audio equipment," Eckstein said. "Audio equipment manufacturers have been the hare in the race so far, and they've been bitten a couple of times, particularly when it comes to audio compression. The marketplace hasn't decided what it wants yet.

Eckstein believes that digital signal transmission products are just now coming into their own. "We've seen the first and second generation products; the third generation is probably no more than a couple of years away," he predicted.

As for any prediction of how far broadcasters may be from an all-digital radio station, Eckstein commented, "The digital station is really here now. What we're waiting for is prices to come down, so that medium markets can afford it."

For Ron Frillman, manager of marketing communications for Harris-Allied, digital equipment means that broadcasters can stay competitive and reduce operating costs.

Harris introduced the AM DX transmitter in 1987. Employing digital techniques, the transmitter uses no modulator, thereby boosting efficiency to 86 percent. That in turn means "dramatic reduction in power bills," Frillman said. On the FM side, Harris' digital exciter, the DIGIT, accepts an AES/EBU signal, which is then converted to an analog modulated signal that then excites the final in the transmitter.

Digital in Canada

Canada's Nautel also manufacturers digital products for AM and FM. According to Chief Engineer John Pinks, Nautel's AM transmitters digitize the analog audio input signal and use pulse width modulation to create the high power RF output signal. The company's FM transmitter products use similar techniques.

The latest entry from Nautel is the DE-50 a digital exciter that uses direct digital synthesis to generate and modulate the carrier signal. The company is now working on a retrofit front end card, capable of accepting an AES/EBU-formatted digital input. "We believe that in the next five years, this will become the industry standard," Pinks said.

For Harris's Frillman, digital equipment is a matter of simple economics. "In the next five years, because of real estate prices, consolidation of station operations and other factors, the only advantage station A will have over station B is the quality of its sound," he said.

"The more people go to CDs and digital workstations, the greater the demand for transmission equipment capable of handling a very high quality signal," Frillman added. "Analog to digital (A-to-D) conversion should really happen only once in the chain because every time you do a conversion you're going to have some degradation."

A-to-D conversion is not the only sticking point digital products have encountered. Signal degradation due to using products with differing compression algorithms has also been an obstacle.

Tom Hartnett, chief engineer for Comrex, which manufactures codecs for RPU and other applications, said there is still a big concern about putting compression in the air chain.

"Before you start crunching bits in your air chain, whether for your STL or your processing or whatever, you want to be very careful. There's a temptation, when trying to keep costs under control,

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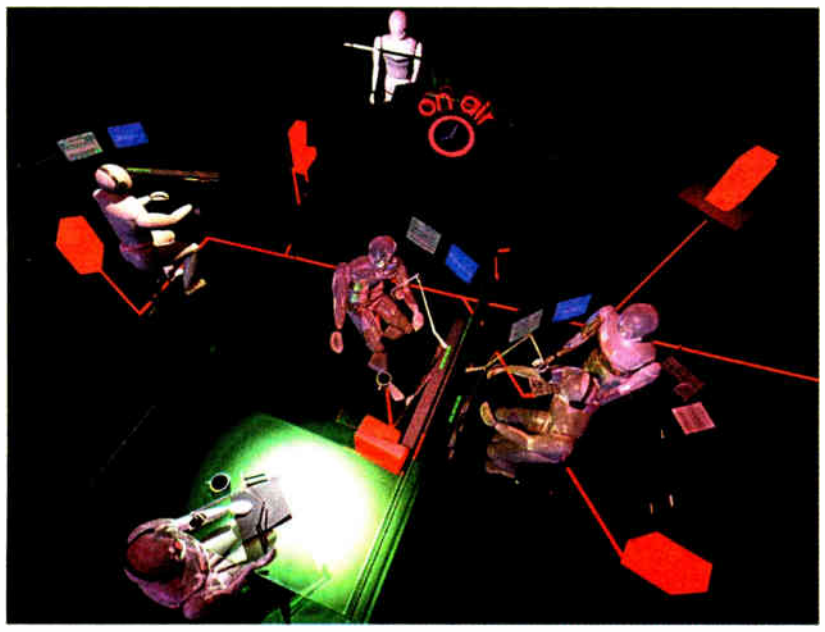

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World Radio History

Digital Processing

to go narrowband with your digital path and use some compression. Even though it may sound pretty good, if you add some processing on, either before or after, and you rely on it 24 hours a day, you'll start to get a little grunge in the signal."

Dave Chancey, national sales manager for Moseley, maintained, however, "Despite the cascading algorithm argument, people are telling me that a cascaded algorithm still sounds a lot better than a poorly designed analog system." Moseley manufactures the DSP-6000 digital STL and is preparing to ship the Star-Link, based on its 64 kilobit full-duplex digital radio product for telephony and digital data communications.

"I would imagine that as standards become more commonplace, you'll see the ability to digitally connect a lot of complementary air chain pieces right through from the studio to the transmitter," said Chancey.

End of the hysteria

"The cascading algorithm hysteria has died down somewhat," agreed Kevinn Tam, director of marketing and sales for Dolby's communications products group. Dolby manufactures the DSTL, a digital STL product incorporating the company's own AC-2 compression algorithm.

"Sound quality and robustness are unrivaled (with digital products), assuming you use a high quality coding system," according to Tam. "The only thing that remains is the time delay issue." Delay with digital products can range from four milliseconds to over nine milliseconds. "Couple that with other devices that also have time delay, and it adds up."

Broadcasters need to be concerned about audio degradation from cascaded algorithms, according to David Lin, product marketing manager for Corporate Computer Systems (CCS). Still, he said, "audio is only as good as the weakest link in the chain."

In most cases, Lin noted, this weak link is not the compression scheme but source audio with limited bandwidth.

CCS manufactures digitizers which convert analog signals to digital, employing digital reduction techniques from 4:1 to 12:1. The company's products are used primarily in RPU applications by broadcasters. Some broadcasters may want to weigh the advantages of reduced data rate requirements for audio transmission against any disadvantages they believe cascaded audio may cause, Lin said.

Controversy abating

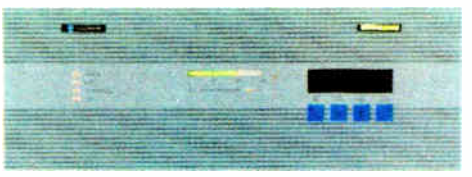
TFT Director of Marketing Darryl Parker, like Dolby's Tam, sees some of the earlier controversy about cascaded compression schemes subsiding. "In the compression world, we at TFT see everyone moving toward MPEG Layer II." TFT manufactures the DMM-92, a digital modem and multiplexer that can be retrofitted into any conventional composite STL transmitter and receiver pair.

Parker was pragmatic when it came to issues of compression and digital transmission. "There's just not going to be any more spectrum allocated to broadcasters. The DAB schemes we're looking at in this country are in-band on-channel, in-band adjacent channel. What that means to me is that broadcasters must take what they have now and make the most efficient and profitable use of it."

At least one manufacturer sees compression as being a boon to the market, rather than an obstacle to overcome. Ken Leffingwell, marketing manager for Wegener, said that compression means more niche broadcasters will be able to use satellites to transmit narrowcast network programming to affiliate stations.

Wegener manufactures the DR-95 and DR-96 digital audio receivers. On the transmit side, an encoder modulates audio into digital data stream. On the receive end, an L-band satellite receiver decodes and returns the signal to CD audio. The products employ MPEG Layer II compression.

"Our role is providing network feeds to affiliates," said Leffingwell. "In this market, digitization and compression techniques allow space segment costs and hardware costs to drop considerably, lowering barriers to entry for networks."



Harris Corp.'s DIGIT Exciter

In the end, though, many industry observers believe that digital equipment is one of the main weapons in radio's fight against alternative listening sources, such as CDs.

"Digital has had a hard role in the audio world," Frillman said, "but now we're seeing some real cost-effective products working in the digital domain." Digital transmission equipment such as STLs, exciters and RPUs are "the only real way broadcasters are going to compete with CD players in the car," he said.

What that means is having a digital exciter and a digital STL and feeding the signal as hard as they can in the digital domain, said Frillman. "What that means to the stations is they're going to hold their audience.

"And what that means is dollars."

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World Radio History

Look for Tower Trouble Warning Signs

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increased wind resistance resulting in possible tower failure.

A single icing episode can produce damage to the tower, antenna, feedline and associated structures simultaneously.

- Ice cracker cones are effective in protecting the guy wire grips.
- Ice bridges protect attachments from falling ice, including transmission lines leading from the tower to the transmitter building.
- Ice shields are both inexpensive and effective protection for side-mounted antennas, microwave dishes, beacons and other tower attachments.

Wind

It is impossible to build a tower that will withstand all winds. Wind damage is the single largest cause of broadcast tower insurance claims in both dollar amounts paid and claim frequency. The most recent release, EIA-E, establishes the minimum wind speeds to which a tower must be built in a particular locale.

Tower construction must take into account both the average winds and the peak winds. Climatologists can provide information on any special or unusual wind conditions.

In order to prevent wind damage, towers must undergo structural modifications if they do not currently meet or exceed the highest wind load expected. Manufacturers should be consulted for specific recommendations.

Tower space is often leased for local telephones, microwave dishes, side-mounted antennas and so forth without considering the impact of the additional weight or wind impedance on the tower's structural integrity.

- Adding radomes, or fiberglass covers, to antennas will increase the wind load.
- Bundling the transmission lines will also affect wind resistance. Distribute multiple lines evenly among the tower legs to reduce loading.
- Maintaining guy wires at the proper tension will keep the tower in plumb.
- Making certain the transmission line hangers are tight will reduce the effects of wind load.
- Know the specific hurricane zone.

Additional climatological factors

Hurricanes, ocean surges, floods, and earthquakes should be taken into consideration. It is essential to analyze hurricanes and tornados in terms of the wind speed for which a tower was designed. Reviewing current EIA-E data and requesting a periodic structural analysis of a tower will improve the chances of weathering a storm without substantial damage.

Ocean surge can be a cause for damage to towers located as far as 10 miles inland. Earthquakes will damage towers, particularly those that are guy-wired.

The major danger of flooding is the damage it causes to the electrical apparatus in the transmitter building. The cost of replacing the structure and equipment can exceed $100,000. Floating debris can produce tower failure.

An inaccessible tower site

Sites are often chosen because of their higher elevation to help reduce the need for additional tower height. These sites are often inaccessible during certain times of the year, making repairs impossible. As a result, the possibility of signal loss is increased. It is critical that both the tower site and the transmission building be readily accessible by some means at all times.

Inadequate tower maintenance

One of the major problems is a failure to visually inspect and maintain proper logs. Maintenance logs are prescribed by the FCC and the FAA. The back-up transmitter, generator, de-icing equipment, lightning dissipation equipment, safety lights, radome and other mechanical devices should be tested regularly using an inspection form.

A comprehensive inspection will include guy wire re-tensioning and tower bolt tightening. Identifying and cleaning or replacing rusted or corroded hardware should be part of any inspection and maintenance schedule.

Another often overlooked inspection and maintenance item is the condition of the guy wire anchors. If anchor rods are used instead of I-beams the metal can be eaten away under the ground by corrosion to a point where the rod snaps off and is pulled out by the tensioned guy wire. This is a common failure mode for towers located in areas of corrosive soil and high water tables where corrosion is especially active.

This type of preventive maintenance not only solves problems but also may help to identify potential causes of damage.

Loss control procedure

An absence of some or all key loss control procedures can result in an unnecessary signal loss. Taking the right steps in advance will help keep the station on the air and minimize down time.

- Utilize an Emergency Restoration Service (ERS).
- Provide for an auxiliary tower.
- Provide for a back-up antenna.
- Provide for an alternative source of power: 1) install an on-site generator; 2) contract for emergency generator use; or 3) use a grid to obtain power from another direction.
- Have a reciprocal arrangement to share towers with another station.

Leasing too much tower space

With increasing regularity, towers are being used to generate additional income. Tower space is being rented for microwave dishes and cellular telephone, police, utility company, signal relay, local business antennas, as well as competitors looking for an antenna location.

Each addition to a tower affects the ability of the structure to withstand the adverse weather conditions for which it was designed. A structural engineer should be engaged to inspect the tower every three years or when adding additional equipment.

Inadequate security

Security is becoming more of an issue, particularly in certain areas where towers and studios are located.

The property should be fenced in or at the least the road or walkways should have locked gates.

Depending where the facilities are located, floodlighting roads, walks and gates is essential, as well as the building, parking areas and entrances. Lighting is a major factor in deterring vandalism and other types of crime and reducing the possibility of injury.

The transmission building, the tower base and guy anchors should all be fenced, if not the entire property. Along with minimizing the possibility of vandalism, fencing provides protection for these key areas from being struck by vehicles removing trash.

Other causes of loss

Here are additional possibilities for loss:

continued on page 43 ▶

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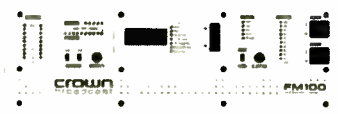

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World Radio History

Post-Deadline Details to Consider

by John Bisset

SPRINGFIELD, Va. June 30 has come and gone, and AM station owners have either complied with or ignored the FCC's new occupied bandwidth measurement requirement (73.44).

It is best to be sure you have everything in order to meet the new requirement, which will be difficult in some cases, because the FCC itself is still unsure about some procedures.

Procedures

What was once adequate procedure for making harmonic measurements (which are still required on an annual basis), may not be the best way to conduct NRSC-2 measurements.

For example, harmonic measurements are to be made at a distance of one kilometer. Section 73.44 stipulates the same distance for the close-in measurements. Getting this far from the radiating element(s) is useful when considering multiples of the carrier frequency.

However, when a close-in signal is examined, the increase in the noise floor this far from the antenna is dramatic. Depending on the power of the station, not to mention interference from adjacent stations, it may be impossible to record meaningful measurements from a kilometer away.

If a spectrum analyzer is used in the field, the carrier may have to be notched to insure measurement 80 dB down. This is further complicated by adjacent-channel interference. If another station transmits from nearby, that signal will obscure any measurements at that frequency.

Whether you make the close-in measurements yourself or leave it to a contract engineer, here are some points to consider.

If you are operating with multiple transmitters, perhaps a lower power PSA/PSSA and a main transmitter, you should measure both. Section 73.1590(b) requires that the measurements listed in 73.44 be conducted for all conditions of modulation.

Signal power level and direction are not specifically addressed in the rule, but it seems apparent that measuring output is the only way to assure compliance if you routinely use a lower power transmitter.

If a directional antenna is used, check both patterns. It is possible that nonlinearities beyond the transmitter (in the phasor, ATU or antenna) could potentially generate splatter. Chances are the results will be identical, however, since the issue of different modes of operation are not specifically addressed in the rules, the additional measurement will help demonstrate the extent of a station's effort to be in compliance.

Until the FCC clarifies where field measurements should be taken for stations operating with directional antennas, there are some basic guidelines to follow in order to eliminate measurement anomalies.

Measurements from one kilometer may be impossible for stations operating at lower nighttime power, or with PSA/PSSA power levels of, for example, 30 watts. Measurements we have taken for clients have typically been closer to the antenna.

In some cases, we measure at the edge of the antenna field to get meaningful results. This is necessary in order to get a full-scale calibrating signal on the Splatter Monitor, and it helps reduce the effect of interfering signals falling within the 100 kHz measurement range.

Compliance problems

All AM stations must make these measurements. The FCC gave stations that installed an NRSC-1 filter a grace period before making annual measurements, reasoning that installation of the filter would insure compliance on most stations.

In reality, the commission determined that conditions beyond the filter (such as transmitter "safety clippers," high transmitter incidental phase modulation or IPM, or non-linear elements) could undo the bandwidth restrictions imposed by the NRSC-1 filter.

It is very possible for a station operating with an NRSC-1 filter to be out of compliance with the RF mask. Compliance failures, I find, fall into one of three areas. If you don't "pass" your measurement test, check these areas first.

The transmitter "safety clipper" is being used or is not correctly adjusted. Either turn the safety clipper off or adjust it so that no clipping occurs. (Clipping generates the high-frequency energy that the NRSC filter just finished filtering out.)

The optional wideband mode may have been inadvertently selected on certain NRSC filters with that option. Check the NRSC bandwidth selection switches or jumpers to determine proper operation.

The transmitter may be operating with excessive phase modulation. It is easiest to either use a Splatter Monitor or AM stereo modulation monitor to measure incidental phase while adjusting the transmitter neutralization.

There are currently two methods for measuring close-in NRSC-2 performance that have demonstrated reliability and repeatability. The first is the spectrum analyzer, which the FCC uses as its basis for determining compliance. The rules provide a detailed setup procedure when this instrument is used.

The rules also allow for specialized equipment, designed specifically for measuring splatter. Delta's Splatter Monitor falls into this category.

Delta took steps to protect stations investing in their monitor by performing extensive field tests side by side with the spectrum analyzer. The results were a very close agreement between the two. Furthermore, the 0.5 kHz "window" used by Delta to scan a particular segment of spectrum is more conservative than the 300 Hz specified for the spectrum analyzer.

If there is a difference, the Splatter Monitor will show a higher level of splatter than the spectrum analyzer. An optional filter card that replicates the 300 Hz resolution bandwidth of the spectrum analyzer is also available. Given the hundreds of measurements conducted by Delta, it is unlikely that measurement disagreements will occur unless the instrument is defective.

Although 73.44 opens the door to "specialized equipment," it is doubtful that a communications receiver can provide the kind of resolution needed for these measurements. It is not wise to base a station's compliance on unproven measurement methods.

□□□

John Bisset is a principal with Multiphase Consulting. He spent several years working with Delta Electronics during the development of the Splatter Monitor. He can be reached at 703-323-7180. For more information on NRSC-2 compliance, circle **Reader Service 145.**

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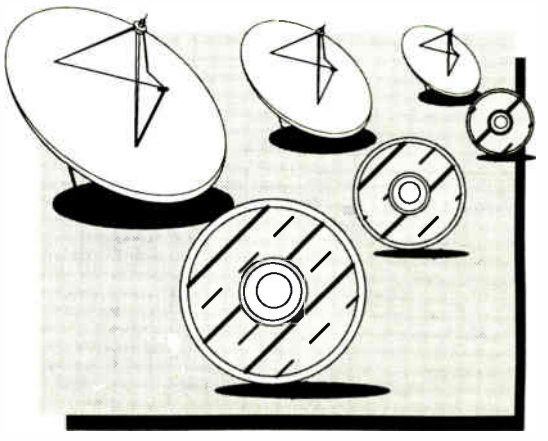

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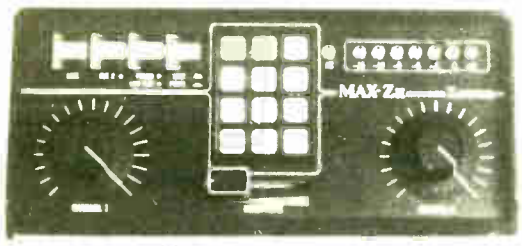

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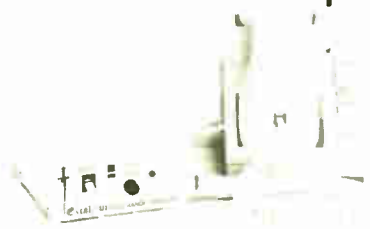

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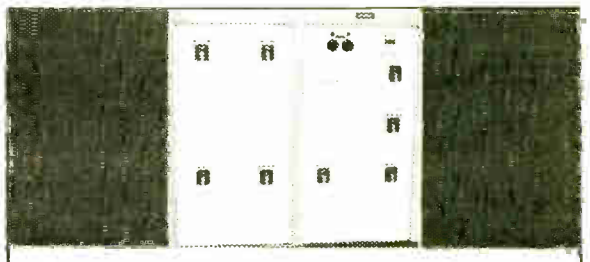

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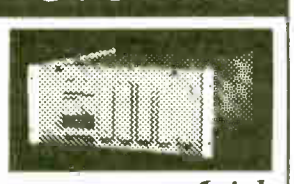

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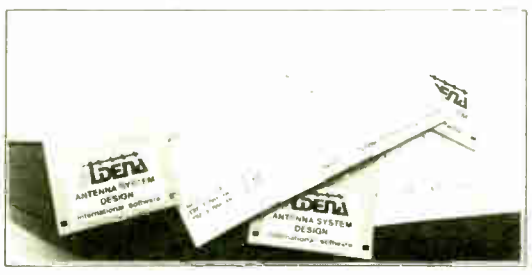

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World Radio History

Recorder Was Influential Gift

by Read G. Burgan

LAKE LINDEN, Mich. My father was a genuine techno-junkie—one of the first. He began as an amateur radio operator in the 1920s and by 1929 had joined the engineering staff of WHDF(AM) Laurium, Mich., eventually becoming chief engineer and majority stockholder.

Equipment was his first love. When he began in broadcasting, almost every piece of equipment was handmade. My dad readily embraced new equipment.

His friends never tired of describing him at National Association of Broadcasters conventions where beautiful, scantily clad young women exhibited new wares:

There was George, eyes bulging, tongue hanging out. "Did you ever see such a gorgeous body?" he would ask. "And those curves... Will you just look at those beautiful curves!"

Barely able to contain himself, he would gasp, "Did you ever in all your life see such a magnificent... microphone!"

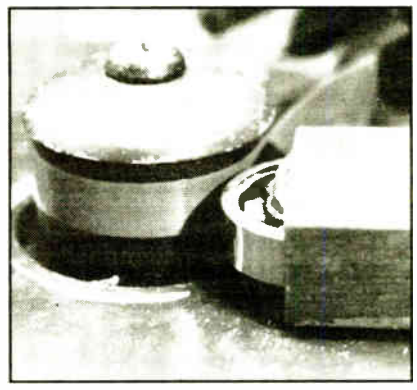
(There would be a pause between the words "magnificent" and "microphone" that seemed like an eternity.)

That devotion to technology may explain why when I was only 10 years old, my father gave me a special present—a Brush Soundmirror BK401 reel-to-reel tape recorder.

There must be something in our family genes, because there was nothing that could have pleased me more: not a bicycle; not a baseball bat, not even a genuine Tom Mix decoder ring (although the decoder ring would have been a close call).

Marvelous machine

It was not a new tape recorder. It had lost its usefulness at WHDF. But it was 1954, and hardly anyone had a tape recorder at home, even rich people. Besides, the Brush Soundmirror BK401 was not just any tape recorder.



Cork capstan on Brush recorder

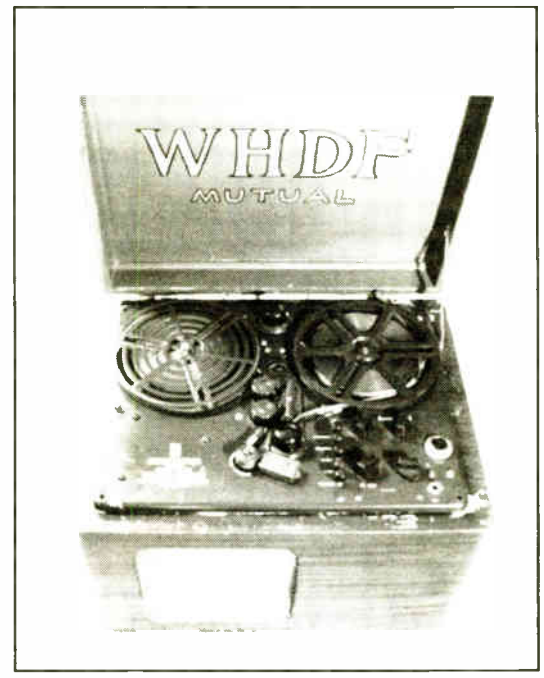
It was developed by the Brush Corp. of Cleveland in 1947 and became an early contender in the home, school and industrial markets. Professional quality reel-to-reel tape machines were still in developmental stages.

Ampex came out with its 200A series in 1948, the same early professional model Bing Crosby's people used to produce his show beginning May 12, 1948. It ran 30 inches per second, required a 14-inch reel with 5,000 feet of tape to record a half hour of programming and cost $3,825.

Several radio stations in the late 1940s, like my father's, turned to the Brush recorder for professional use. The June 1947 issue of "Audio Engineering" magazine showed how a Brush recorder could be adapted for broadcast use. It was a real steal at only $239.

The machine used seven-inch reels and operated at a single speed of seven and a half inches per second. There was no fast forward, but the tape could be rewound by threading it around a post at the back of the top chassis.

It boasted a frequency response of 100 to 5,000 cycles with a frequency deviation of -12 to +5 dB, a complement of nine tubes, a built-in monitor speaker with a 1W output. It weighed in at 40 pounds.



The Brush Soundmirror BK401

Oddities

The Brush had several peculiarities, not the least of which was a cork covered capstan and a stainless steel idler wheel. This was backwards from what became the common practice of having a solid metal shaft for the capstan and a soft idler wheel. The cork was probably used to dampen the vibrations from the capstan motor that used an idler wheel to drive the capstan flywheel.

The cork created two problems. As Richard O'Brien, author of the "Audio Engineering" article, pointed out, the cork surface could become so smooth that it no longer pulled the tape properly. This required sanding with a fine grit paper and cleaning with solvents the Environmental Protection Agency probably would not allow today.

A more serious problem formed when the worn-down cork changed the diameter of the capstan, thus altering the machine's speed. I doubt if there was any way to refinish the capstan once the problem became objectionable.

The rewind and take-up motors were mounted directly below their respective reels and their shafts were an extension of the shafts on which the reels were mounted. These motors generated enough heat to melt a plastic reel. Only metal reels could be used. I know. I tried to get away with plastic reels and ended up with a soft, gooey mess.

Perhaps the most damning peculiarity was the manner in which the tape moved from the supply to take-up reel. The tape left the supply reel wound with the oxide facing in, but ended up on the take-up reel with the oxide facing out.

This meant the machine could never be adapted to half-track use, because if you turned the take-up reel over and placed it on the supply spindle, the oxide would face away from the tape heads. A tape recorder that could not be adapted to half-track was doomed for nonprofessional use in the early 1950s.

Recording memories

Regardless of its flaws, the machine was wonderful to me. It brought instant popularity. I spent several happy hours with my friends producing radio programs, complete with sound effects and music.

I recorded many of my favorite radio programs—"The Lone Ranger," "Fibber McGee and Molly" and others. My dad would shake his head and grumble: "Just when do you expect to find time to listen to them?"

Little did he know that all of the network programs he had taken for granted for the past 20 years would disappear in little more than a year.

I learned the rudiments of tape editing and splicing on the Brush recorder, such as how to rock the tape back and forth over the head to find just the right spot, mark it with a grease pencil and cut it at just the right angle. I learned the hard way that regular Scotch tape leaves a sticky mess when it oozes adhesive some time after the edit.

I produced my first slide/tape presentation—a travelogue of Cyprus Gardens—with an inexpensive View Master projector and Brush recordings of myself playing the accordion. It was pure magic for a 10 year old.

The Brush recorder had an unexpected downside for my father, who regularly added announcing shifts to his engineering responsibilities at WHDF. One of the first things he did with the Brush machine was record his own voice. He was stunned when, as many of us find, he did not sound anything like what he thought he should. He quit announcing.

Forty years later, I still have that machine. It worked the last time I turned it on, but I fear trying it again. The insulation on the wires is brittle and the power cord needs replacing.

I could never part with it.

□□□

Read G. Burgan is a writer, producer and photographer and a former public radio station manager. He can be reached at 906-296-0652.

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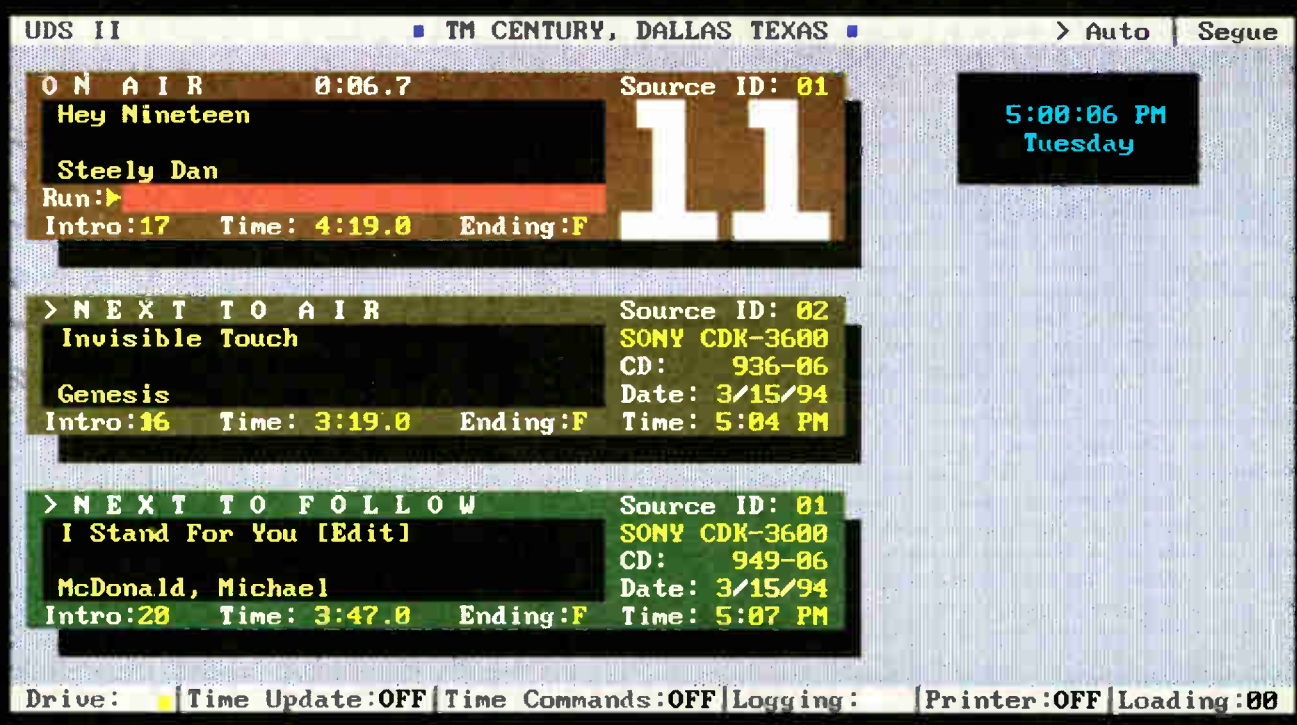

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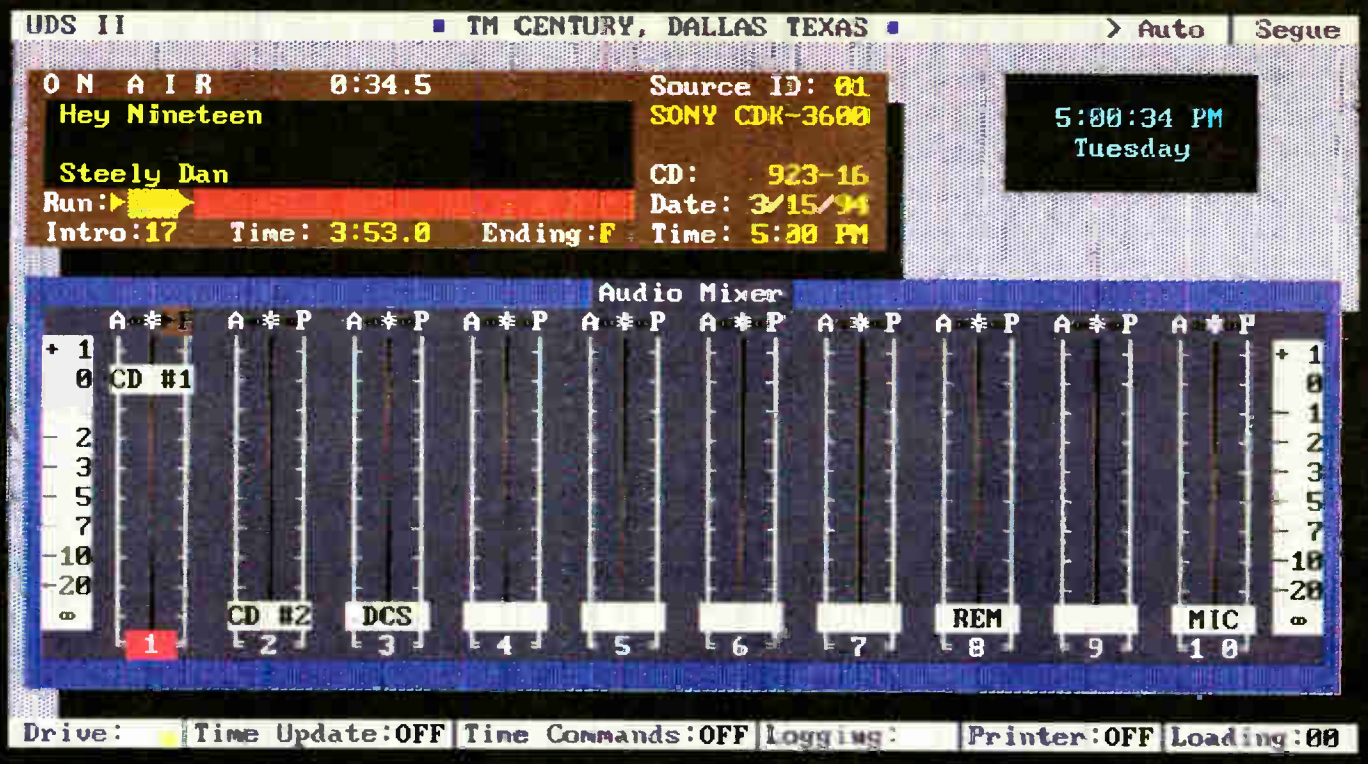

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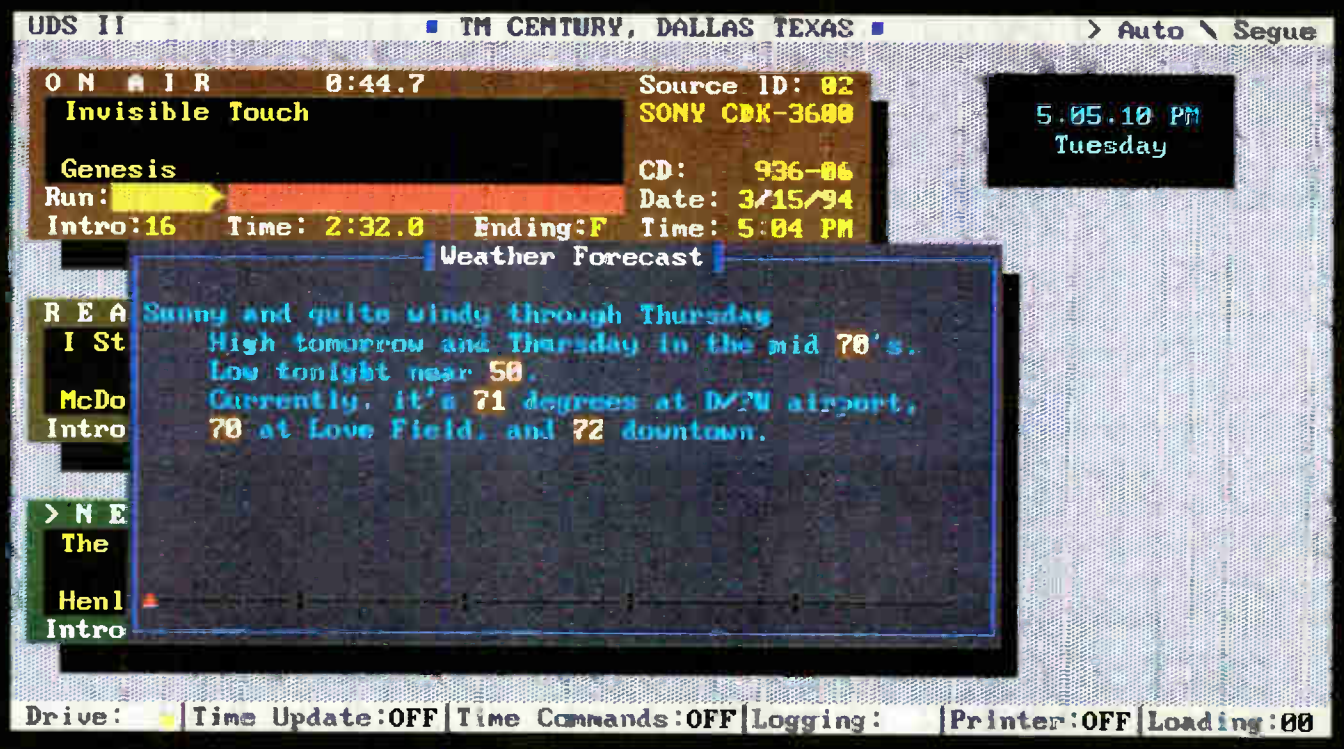

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World Radio History

Voltage Control Safeguards RF Gear

▶ continued from page 12

The life of a tube may also be considerably extended by reducing the number of on/off cycles. The high in-rush voltage on a cold filament can actually reduce its life by 75 hours for each on/off cycle, an important consideration for AM daytime operations. The added expense for electricity is insignificant when compared to tube replacement costs.

Most modern transmitter manufacturers take filament voltage control seriously. Their products include an elapsed time meter, adjustment rheostat, RMS volt meter, regulated filament transformer and provisions for remote metering of filament voltage.

Older transmitters may have few or none of these features. Some possible additions are shown in Figure 1.

The easiest modification is installation of an elapsed time meter, which is usually rack-mounted with the meter connected to the primary of the filament transformer. Good buys on these meters may be found in many of the industrial surplus catalogues.

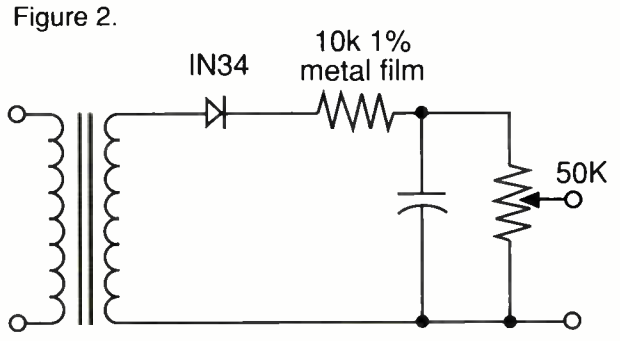
A true RMS volt meter is necessary for metering filament voltage. Many older transmitters have rectifier-type volt meters that do not have the necessary one-percent accuracy. Others meter the primary of the filament transformer, requiring you to use some conversion process.

Often the PA filament is metered, but not the filament for the driver tube. There are two alternatives for accurate filament metering. One is to use the older iron-vane AC volt meter; the other is to use newer technology and construct your own RMS DVM.

(For some inspiration on circuit design, see Analog Devices "RMS to DC Conversion Application Guide." A nifty true-RMS DVM can be built with an AD536AJD and a handful of components.)

A rheostat for adjusting voltage should be placed in the primary of the filament transformer. If you try to put it in the secondary, current requirements will be much higher.

Figure 2.



Circuit to permit metering of filament voltage

The rheostat should be able to reduce voltage by 10 percent, which is easily calculated with Ohm's law. Be sure to place the control where it can be adjusted while observing the filament volt meter. Average values are 10 to 25 ohms.

You may want to add some sort of remote filament metering device. Figure 2 shows a typical circuit. You may have to experiment with some of the component values for your installation.

Note the importance of transformer isolation from the outside world. Haphazard remote circuits may act as antennas, bringing unwanted RF from other stations right into your PA cabinet.

Also be sure lines running into the rack for elapsed time and volt metering are properly shielded. If you have doubts, check with a consultant.

If your AC line voltage varies by more than 3 percent, you must install a ferroresonant transformer ahead of the filament transformer. Without such a device, the only safe course is to operate at nominal filament voltage.

Written records of tube parameters are important to establish norms and anticipate emission drop off. Your records should include the serial number, elapsed time reading when a new tube is placed in service, optimized filament voltage, where the tube is used in the transmitter (L mod, R PA, etc.), when the tube is taken out of service and total number of hours used. This information is also useful if your tube fails while it is still under warranty.

Cleaning tubes should be a part of regular maintenance, especially for external anode devices with cooling fins. A bath in hydrogen peroxide helps these tubes because the bubbling does a good job of getting dirt out of the cracks.

Be sure the tube is well rinsed with distilled water so that no contaminants are left. Wear gloves when handling tubes. Oily fingerprints on glass or ceramic envelopes can discolor the surface when heated, leaving marks that are hard to tell from the marks caused by arcing.

Check your transmitter building to see that it has an ample supply of fresh air. A well-designed exhaust system helps protect your transmission equipment.

Special thanks to Walt Johnson, Voice of America, for his input on this subject. Walt's recent article from the NAB proceedings: "Techniques to Extend the Service Life of High Power Vacuum Tubes" contains a wealth of practical and interesting information on this topic.

□□□

Tom Vernon divides his time between consulting and completion of a Ph.D. He is occasionally sighted at WXPN(FM) Philadelphia. Call him at 717-367-5595. Tom is still testing multitone audio test systems, and will complete his current running three-part series on those systems when the tests are complete.

Audio Compression Use

▶ continued from page 22

mS, and a decode delay of just under 20 mS. Time-based compression schemes require less encode/decode time; APT's apt-X 100 system, for example, takes 3.8 mS to perform a complete cycle.

• **Stereo imaging.** With stereo imaging, some perceptual coders utilize via Adaptive Bit Allocation to offer enhanced levels of data compression, by individually processing channels, rather than treating them as a stereo pair. Such schemes can cause audible image shift on two-channel signals, caused by the far from subtle phase shifts between left and right channels.

• **Multiple generations.** Listening tests performed a couple of years ago by a leading European broadcast organization determined that a well-known sub-band ADPCM system could be used up to seven times—encode-decode cycles—with no appreciable affects on a wide range of signal sources. With more "aggressive" coders, particularly ATRAC and TASC, which offer enhanced reduction ratios, we might need to limit the number of generations to only one or two.

• **Tandem Coding.** Of more importance is the effect of sequential or tandem coding. Artifacts produced by one species of coder can easily be amplified by the use of a different kind. In reality, the overall effect of Coder A, for example, followed by Coder B and so on, is virtually unknown. I would welcome feedback from an **RW** reader with practical, documented experience; I will provide space in a subsequent column for an analysis of your reactions.

• **Post-Coding Signal Processing.** Because of the fragility of certain data-reduced signals, compression and equalization of such material can produce odd results, ranging from mid-range "chestyness" plus brittle and odd-sounding high-frequency response. Again, any **RW** user feedback would be appreciated.

• **Decoder Pre-echo.** Dependent upon the width of each frequency band, it is sometimes possible for a transform decoder to produce variable amounts of pre-echo. A sudden transient, for example, will cause the system to code the information within the appropriate frequency band, and steal data bits from the masking envelope. On the decode side, however, the output will beturned on for the entire duration of the coded frequency band, resulting in the signal being heard before the arrival of the actual transient—just like tape print through.

I would encourage all **RW** readers to gain access to and then carefully audition the various algorithms being offered. Only through careful listening tests of single, multiple and tandem coding sequences will we able to ensure that our listening audience is being treated to the best audio quality available with current technologies.

□□□

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

Circle (13) On Reader Service Card

Circle (21) On Reader Service Card

World Radio History

Recording Radio Jingles

▶ continued from page 23

automate fader/mute functions.

"Before you had to have large studios, and tons of wiring. Now, you have a small computer setup, maybe a two to seven gig system with all the internal matrix of a console, with digital signal processing, all in one little patch," he said.

Wheeler also uses the Concept 1/DISKMIX to automate primary functions of the recording process based on preset characteristics. "The console has a master section that lets me recall presets immediately using the soft keys, so if I have a bunch of singers walk in the door I can select a certain setup on the console and it's done. That saves a huge amount of time, speeding up sessions and time between sessions.

"We don't have weeks to get a piece of music right, we get hours," he added.

Creativity emphasis

Wheeler, however, will be the first to say that time-efficient gear isn't a replacement for creativity. "It's all an art. You have to be able to use that artform, which is a time consumer. If you start getting too fast, too productive, you start losing some of the creativity. We run a fine line there. And we know where that line is and if we ever seem to start passing over that, we immediately drop back."

Wheeler's accolades for digital's speed and size in no way eclipse his appreciation for analog. Analog, he said, has a "warmth" that simply cannot be found in the digital form. "We still do a lot of stuff analog for the warmth and feel of it, but we do a ton of digital too. We like to move back and forth," he said.

Where Wheeler and the other engineers are moving forward into digital these days is compact disc mastering. Wheeler purchased a new Studer D740 CD recorder for this purpose, and he's supplying CDs instead of tape for most of his jingle and commercial clients. "It's kind of a novelty item," he commented.

In time, Wheeler expects to further merge his studio with the computerized world, perhaps moving out onto the "information superhighway." To get him one step closer to that vision, he plans to replace the studio's "store casting" distribution of tapes with digital telco or similar links.

And, after that, Wheeler said he's really not sure, except that he'll continue to merge the old with the new.

Jeff Arthur Productions can be reached at 813-673-5277.

Testing the Sony DATStation Editor

▶ continued from page 15

in-point of the edit and a tabular display appears. This shows the beginning edit point as the start of a horizontal bar graph. Cueing to the "outpoint" and pressing the MARK key logs the out-point, and a horizontal bar will display the relative time of the source. The in- and out-points are always adjustable by manually entering a timecode value into the edit dialog box, or by pressing the MARK button "on-the-fly."

By pressing the PREVIEW button, the DATStation will prompt the user to insert the numbered source tape and load the audio at the first out point into RAM. It then searches for the in-point of the second edit item. When located, it plays the audio in the RAM and synchronizes the playback of the source tape to make the edit. This setup to this process can take several seconds—and must be repeated every time an edit is to be auditioned. Sony admitted the inconvenience of this procedure, but engineers are working on future versions to reduce the time.

The edit is by no means a mere hard cut: the user can choose millisecond increments from one to 3000, essentially a three-second crossfade edit, and the in-point and out-point can have different values, making a hard-end to a sweep-up edit possible. The level of the subsequent edit can be adjusted, as can the balance between channels.

When it's time to commit an edit list to a finished master, pressing the red AUTO EDIT button causes a dialog box to pop up, showing the user the parameters that the DATStation will follow in making the master tape. The edit list may be made at two times normal speed, a feature unique to the industry, and the user may select three sets of reference tones to be recorded at the head of the master. The master tape will be made using the same sampling frequency as the source tapes, but if the master is not blank and has a different sampling frequency than the source tapes, the DATStation will refuse to budge. Therefore, use virgin or completely bulk erased DATs on which to master.

The DATStation will refuse to record IDs closer than 30 seconds apart, apparently for ease of later searching. When the user OK's the dialog box, the recorder and player transports work automatically to create the master tape, selectable to real-time or double speed processing. A small countdown display ticks off seconds until the edited tape is completed.

In use

National Public Radio's Weekend Edition utilized the DATStation to do effective post-production on a studio performance by singer David Wilcox. The entire piece that aired in March 1994 remained in the digital realm, and was created by joining the musical selections to the interview portions recorded during the same session. We found the DATStation made seamless music edits, and the variable edit/crossfade parameters made a seamless transition between music and interview.

Ned Wharton, the segment producer, chose to build the project using three edit lists: one list described all of the spoken interviews, another list described the music selections, and the third described how the music and interview DATs would be edited together to make the final "air master." This process allowed the music to be digitally processed while the interview was being edited, and it ensured the project from overflowing the 100-item-per-edit-list limitation. The finished product had a very clean, pleasing sound—no digital harshness.

Conclusion

In summary, the Sony DATStation has much potential for success in the production world. Its small size, its performance and features will carve out a niche for it in the professional market. If Sony continues to enhance the DATStation by improving preview time, incorporating the serial port on the rear panel for edit list storage (or even PC control), and providing on-line HELP, use of the DATStation may become standard in the industry.

□□□

Rich Rarey is technical director of National Public Radio's "All Things Considered," and a contributing writer to Studio Sessions. He can be reached on Internet at r.rarey1@genie-.geis.com

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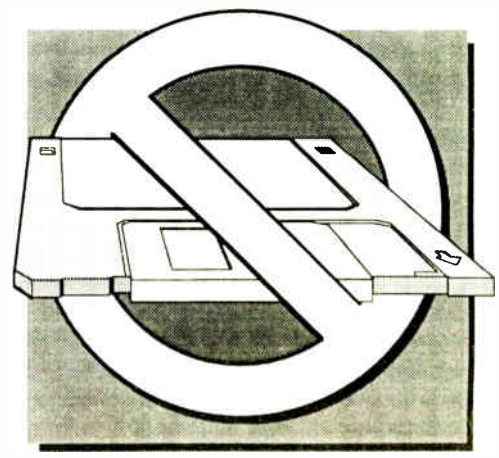

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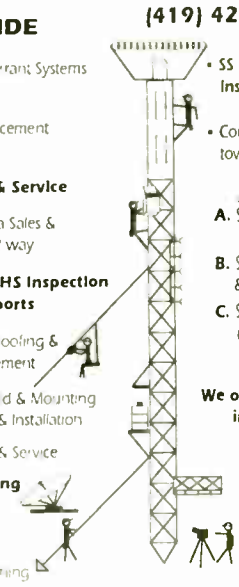

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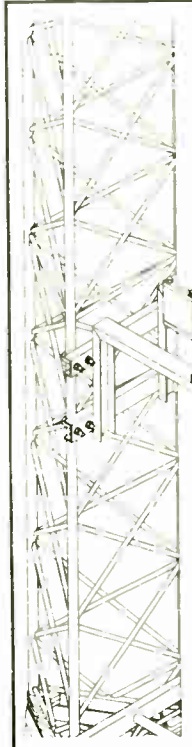

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READER SERVICE NO. 116

DAW Forces Changes In Station's Routine

FROM THE TRENCHES

by Alan Peterson

Dear Luci,

It's been a busy time out here. The latest Arbs came back with WINK 104 number one in Harrisburg again, and as the highest-rated CHR in America's Top 100 markets.

What's kept us even busier here has been the long-awaited arrival of a digital workstation for the production room. The corporation decided the time was right and purchased a Roland DM-80 eight-track.

I could have maintained the facade of instant familiarity I seem to project whenever a new piece of gear arrives, but truth be told, I was as lost as anyone on this thing. Roland's manuals were no help. I waded through three volumes before discovering a handful of pages entitled, "How to Do a Simple Voiceover." Roland ought to consider a separate volume dedicated solely to radio operations.

First in the market

No matter...we had it and no one else did. Having it and using it, however, quickly became two different matters.

Sure, it looked pretty, but it made for a very expensive rack decoration. Clearly it was time for help from above, or at least from New Jersey, where Roland's Laura Tyson is based.

We had met many times at IBS conventions in New York, so it was class reunion time when Laura came out to Harrisburg, or, more accurately, it was the first day of school for my chief engineer, our AM program director and myself.

I know you have had a chance to read the **RW** review of the Roland DM-80, so I will not repeat anything here. But here are a few things anyone going digital should consider. There are a number of very interesting quirks:

Fuzzy audio

Digital distortion is not your friend. Analog distortion always gave a nice sort of fuzzy sound to recording tape when the levels were pinning the meters.

Digital simply does not care, and slashes off the top of everything like a berserk gardener going to work on your hedges. That is why an analog "O vu" is somewhere around -18 digital. You need the room.

Get ready to hear everything. We all know digital makes no mistakes. It is sobering to actually hear it that way. Tongue clicks, heavy breathing, popped Ps and whistling nostrils leap out where the noise floor used to be.

In my own case, the sound of the HVAC and leakage from the adjoining study made a mic noise gate a must.

Digital is faster, only not now. Remember how awkward it was to thread a tape for the first time, or roll paper or load ribbon into the UPI or AP machine? That's nothing compared to scrolling through a menu or stepping through editing choices.

Like anything, it takes time to get good and fast. There is a point in the learning curve where some throw up their hands and say, "*@#%^&*#m, I'm faster on the four-track"—and so they will be... until they are retired.

No more memory. That is the computer world's way of saying, "The tape ran out." It happens frequently, especially if someone records a lot of "white space" during effect drop-ins. Even with no sound coming in, many machines constantly write to disk, so watch your memory consumption.

We're better than you

The good thing about having a digital rig is the opportunity for a little rub-their-noses-in-it fun. A week before the machine arrived, we had 500 labels made up that say, "Produced digitally by WINK 104," and stuck them to dubs going out of house—even on pieces done on our analog multi during the transition. All we did was mix more highs into our analog product to make them sound different, just to annoy the other stations.

WINK 104 is also set up for MIDI music production, and the new rig has become indispensable for tracking vocals and live instruments. Our spring promotion, the "WINK 104 Free Money Funny Farm," required production of in-house music beds with six vocal overdubs, an abysmal project on a 12-year-old Otari four-track, but a snooze in the sunshine for the Roland.

The digital upgrade also included a MIDI-programmable Para EQ and the SCC-1 soundcard for a Leading Edge 386 PC to be used as the heart of my new MIDI system. At long last, I have the radio production room I had always wanted to walk into and call my own.

I'll write back once I get all these things figured out. In the meantime, where is Laura Tyson's phone number?

—Al

□□□

Alan Peterson is production director for WTCY(AM)-WNNK-FM Harrisburg, Pa. This column marks the beginning of his sixth year writing From the Trenches *in* **RW**, *and he is grateful for your support. Call him at 717-238-1041.*

RF Tower Maintenance

▶ continued from page 34

• Because transmitter buildings are often located near a tower base, they can be damaged by falling ice unless they have been constructed properly.
• A failure to maintain strobe lights or beacons.
• A failure to execute a waiver for damage to property of others mounted on the tower, i.e., microwave dishes or antennas.
• A failure to install central source security systems, such as smoke detectors, motion detectors and fire extinguishing systems.
• A failure to implement policies for regular equipment monitoring.

Management's refusal to believe that a loss of signal can occur

With all the pressing daily issues of running a station, it is easy to neglect fixing the roof when it isn't raining. In the final analysis, neglect is perhaps the major cause of unnecessary loss.

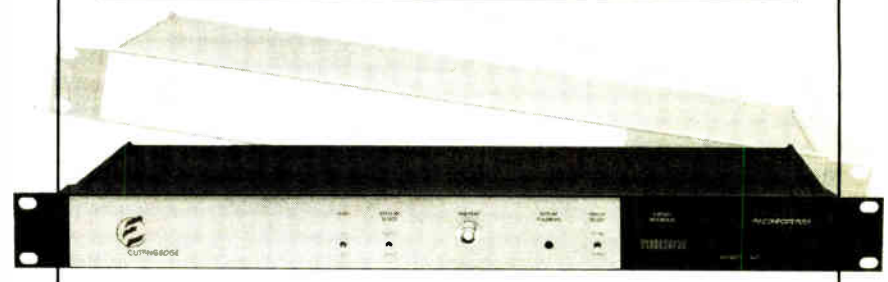
The broadcast signal is the station owner's greatest asset. If the signal fails, the value of the station can decline in a matter of hours. Other stations will instantly seize the opportunity to lure both the advertisers and audience away from the beleaguered station.

All 12 types of tower loss are based on actual broadcast tower claims. Many of the station operators could not believe what happened to their towers. In hundreds of cases, it did not happen to someone else.

□□□

Doulglas L. Federau is president of Premier Tower Insurance, a Massachusetts-based firm specializing in coverage of broadcast towers and broadcasting facilities. For information, circle **Reader Service 107.**

Who needs the Dividend Composite Filter?



every FM station that

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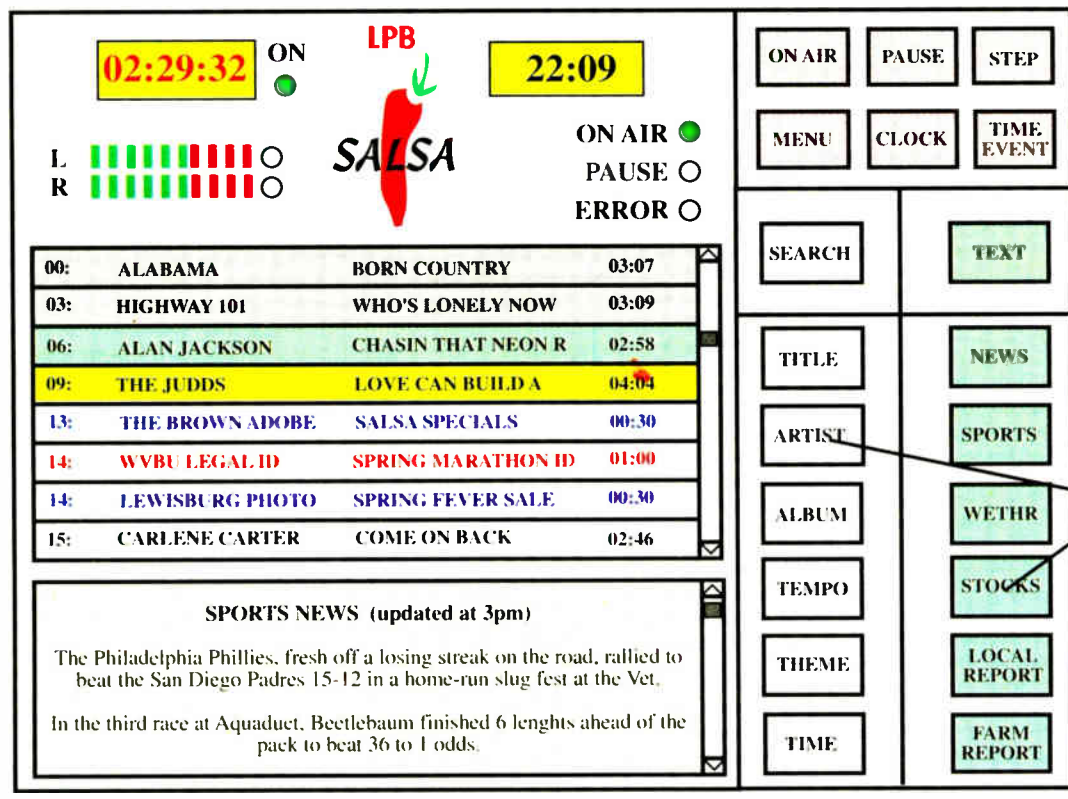

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KEYBOARD CONNECTION

BASIC Programs Can Be Handy

by Barry Mishkind

TUCSON, Ariz. Last month's installment (RW, June 15) covered how to use the BASIC computer language to write little utility programs and simplify certain tasks.

Last month's example program allows you to calculate the output power of an FM transmitter, based on the power amplifier voltage and current, and the efficiency factor:

```
100 INPUT "Efficiency factor = ";EF
110 INPUT "Plate Voltage = ";EP
120 INPUT "Plate Current = ";IP
125 IP = INT((IP + .0005)*1000)/1000
130 TPO = EP * IP * EF
135 TPO = INT((TPO + .05)*10)/10
140 PRINT TPO; "watts"
```

I have often used programs like this to generate charts for air personnel at many different stations, and there are many other applications. Sometimes, while checking the logs, I find I do not have a particular chart at hand and have to go back in the control room to find it. Why not write a quick program to check suspect readings?

Expanded applications

Last month's program can be transformed into a quick calculator with only a few changes. First, add a couple of lines to prepare the program for screen output:

```
10 CLS          (Clears the screen)
20 LOCATE 10    (Sets the cursor a few
lines down from the top)
```

Next, let the program automatically enter the efficiency factor by changing line 100 to read:

```
100 EF = .88    (Sets EF to 88 percent)
```

This is a convenient way to check suspect entries, but the program ends every time a calculation is completed. The program has to be run again to get another set of numbers.

For additional convenience, add:

```
150 PRINT : INPUT "Do you want to do
another calculation";Q$
160 IF Q$ = "N" or Q$ = "n" END ELSE
GOTO 10
```

The last line tests for either a capital or lower case "N" to terminate the program. Whether you run this from BASIC or a compiled .EXE file (naming it POWEROUT.EXE, for example), this utility can save a lot of hassle.

One little problem with POWEROUT you have probably noticed is that to use it, you have to stop everything else. It is much easier to just press a "hot key" combination and have the program pop up. You can use it, and then go back to what you were doing.

Power poppin'

Among the various compilers for BASIC programs, I have come to prefer PowerBasic. It has a number of features that allow me to create programs quickly and easily. But one of the greatest new features in Version 3 is the ability to turn virtually any program into a "pop up."

A few POWEROUT commands will set up any special combination of keys you desire to save the work on the screen you are using, pop up the power calculator, and then return to where you were. With many DOS applications, you can even "stuff" the answers you get back into your primary application.

For example, if you are doing a maintenance log, pop up POWEROUT, and when you return, the power output is inserted in your word processor.

This can be helpful when compiling information you often need, but cannot find. A pop-up program can store a variety of license numbers, frequencies, a listing of key dates (license renewal or tower inspections). You can display them when you need them and update them anytime you want.

Over in the news or sales department, a little pop-up program can hold the key phone numbers for contacts. Pop them up, make your call, and carry on with what you were doing. With a little program-writing talent, you could probably even get the program to dial the number for you.

The list of uses is endless. Here are two ways you can try them out for yourself:

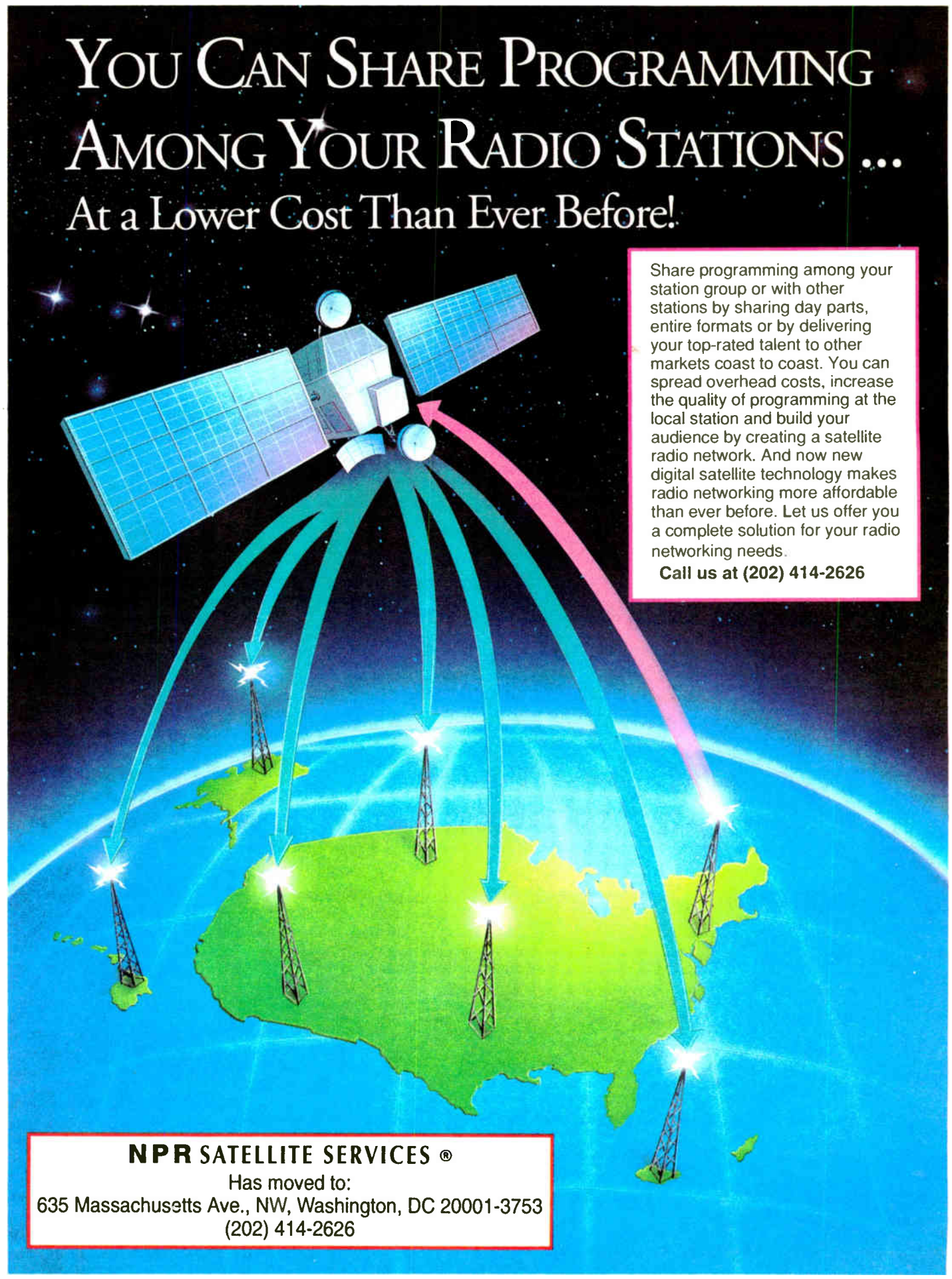
First, if you have not already keyed in POWEROUT from last month, I will send it to you on a diskette. In addition to the BASIC code, enhanced and ready to print out a transmitter power output chart, you will receive a version of POWEROUT in pop-up form. You will also receive an additional pop-up program to help your staff calculate wind-chill factors.

Just write me and send $7.50 (to cover diskette, postage and handling): Barry Mishkind, 2033 S. Augusta Place, Tucson, AZ 85710.

Otherwise, if you would like more information on the many features of PowerBasic 3.0 and/or a free demo diskette, call 1-800-780-7707.

□ □ □

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



Circle (171) On Reader Service Card

World Radio History

Open & Shut

The case for RS-Series consoles...

Look inside before you buy your next broadcast console.

Most consoles seem pretty on the surface, but only the RS-Series is engineered to be the world's easiest board to install, wire, program, and repair.

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One simple lift of the front panel provides total access to all parts, connectors, and controls.

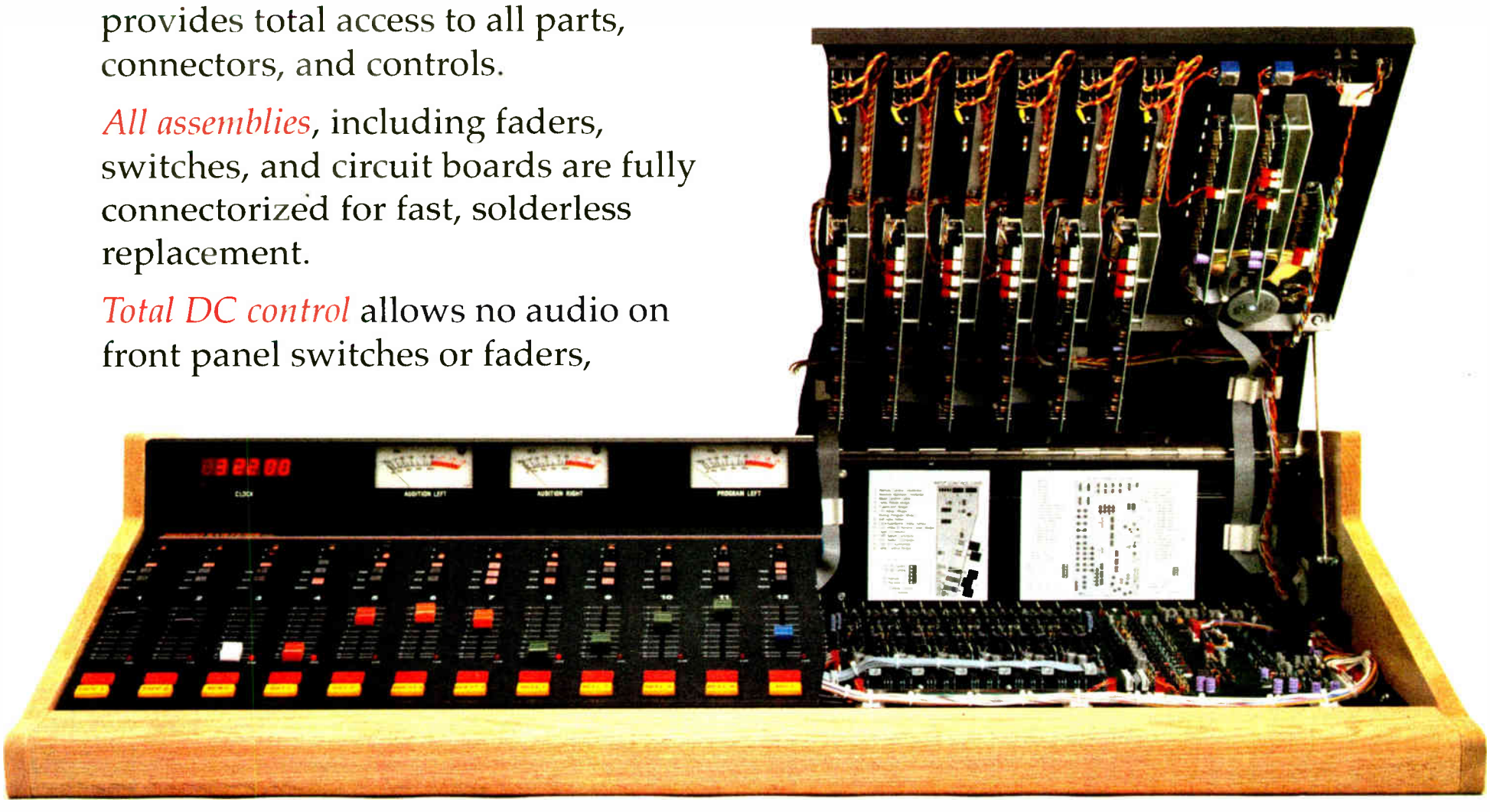
All assemblies, including faders, switches, and circuit boards are fully connectorized for fast, solderless replacement.

Total DC control allows no audio on front panel switches or faders, assuring long term audio integrity and reduced maintenance costs.

Quick-connect barrier strips are used for all audio and remote control wiring.

Complete input agility allows any channel to mix mic, through consumer, through line level signals on either input with completely programmable logic.

Documentation of connector pin-outs, and internal control locations are screened inside the console for quick reference.



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World Radio History

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USER REPORT

Format Sentry Helps Keys Station Economize

by K.C. Stuart
Program Director
Operations Manger
WFKZ(FM)

KEY LARGO, Fla. In the cost-conscious, highly competitive world of radio today, more and more stations are relying on automation systems as a programming source. In small markets, this has been a reality for a long time.

WFKZ(FM), a Key Chain Inc. station serving the upper Florida Keys, is a perfect example of a small-market, low-overhead, small-staff radio station using automation to help keep costs low, productivity high and programming fresh and competitive with a big market sound.

Time to go digital

In February 1994, we made the decision to lease/purchase a new automation system to replace our 10-year-old Sono-Mag MSP analog system. The Sono-Mag was a reliable workhorse for many years, but we felt it was time to "go digital." We also were experiencing more frequent downtime with the old system.

Even our most computer-illiterate staffers were able to run the system with ease.

After shopping around, comparing system capabilities and prices, we chose the **Sentry Systems** Format Sentry Model FS12C with the DS-1 hard drive storage/playback unit. The price was right, the capabilities adequate for our needs and, as we were already formatting our music with Broadcast Programming, we could make the switch without altering the sound of the station.

The machine tends to become the center of the broadcast universe at an automated station. When it is working well, everything and everyone else at the station is too. When it isn't, it can throw everything out of kilter. Changing a station's automation system is a major consideration.

At WFKZ, we had our share of trepidation as we prepared to change systems. None of us had a great deal of computer background or experience, and the FS12C is totally PC-based. We especially were concerned about how the traffic computer would talk to the on-air computer, billing, scheduling, formatting, live-assist capabilities and so on. As it turned out, the vast majority of our fears were totally unfounded.

Sentry Systems recommended a phase-in period of about three weeks between the two systems. This period is intended to allow the bugs to get worked out, program the basic format, interface the traffic and billing, etc.

Easy installation

Unfortunately, physical space prohibited WFKZ from maintaining two working systems. The old one had to go before we could set up the new one. We pulled the plug on the Sono-Mag at 8 p.m. on Friday, stayed on-air with a live DJ in the studio and installed the Sentry Systems FS12C in about six-and-a-half hours—all without missing a single spot. Some of the work had been completed in advance—cable runs, etc. We were pleasantly surprised by the overall ease of installation

Once installed, the really dramatic benefits of the FS12C became apparent immediately. First and foremost was the overall improvement in the audio quality with the digital system. In terms of operation, even our most computer-illiterate staffers were able to run the system with ease. The FS12C live assists seamlessly. We did, however, have to purchase a rather expensive piece of interface software to network our traffic and billing computer.

The real star of the system is the DS-1 digital storage/playback unit. We purchased ours with an extra card to allow for simultaneous stereo on-air and production use.

Simple to use

As it is configured, the DS-1 has approximately eight-and-a-half hours of storage capacity. On-screen instructions virtually eliminate training sessions for on-air/production personnel.

Nothing is perfect, however. There have been some drawbacks to the FS12C. The biggest is its reliance on Pioneer PD-M502 six-pack CD players. These are consumer-grade units, and in the first three months of operation, we have lost four out of 24 of them. They are relatively inexpensive to replace, but still, I believe, it is a weakness.

Also, we believed that virtually any piece of equipment would plug right into the system and the switcher would run it. We kept two Otari reel-to-reel decks and two Sono-Mag carousels, hoping to keep them in the system as back-ups and for some specialty programs. The reels work nicely, but the carousels will not function without the addition of an expensive interface.

The FS12C is a real winner in the opinion of this small-market, automation-reliant PD/OM

Its flexibility, ease of operation, crystal-clear digital audio and overall performance have been impressive to date. I predict a long and healthy digital future for WFKZ.

□□□

For information, contact Dave Buck at Broadcast Electronics in Indiana at 217-224-9600; fax: 217-224-9607; or circle **Reader Service 111.**

Technology Updates
on the RDS Phantom and other automation and software products begin on page 63.

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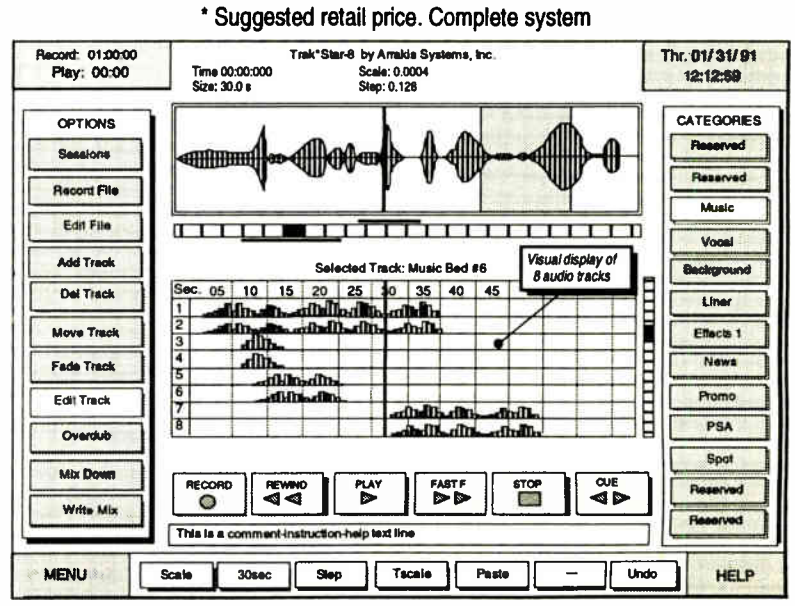

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World Radio History

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–David Esch, Director of Commercial Production WPNT, Chicago

"We looked at DAWs for a year–no other product could even come close to the DM-80's price/performance ratio."

–Bill Robinson, Production Director WQCD N.Y., NY

"I love this machine! It's reliable, and user friendly. I can edit in 1/3 the time, and I wasn't familiar with disk recorders--the DM-80 is easy to learn and use."

–Michael Cook, Program Director KSJJ/KPRB, Redmond, OR

Broadcast professionals speak out about the DM-80 Digital Audio Workstation!

"I've been editing on tape half my life, and was hesitant to give up "rocking the reels"–but I found this machine is incredibly easy to edit with. And its expandable storage put it way ahead of the competitors we compared."

–George Zahn, Operations Director WVXU, Cincinnati

"The DM-80 does more than DAWs costing twice as much. It's very rugged–you can set it up and forget about it. And it's easy to use."

–Tony Diggs, Chief Engineer WKHK Richmond, VA

"We originally chose the DM-80 because of its user friendliness. Then we discovered the real magic of this device: a promo announcement that normally would take 4 hours can be done in 30 minutes."

–Tom Collins, International College of Broadcasting & Recording, Dayton

"We universally love our DM-80's! They have revolutionized the way we work here and we have made it a point to spread this word to other public radio stations."

–Richard Paul Special Projects Engineer WAMU-FM, Washington, DC

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–Howard Silberberg, Sound Engineer United Nations Radio N.Y., NY

"The DM-80 is easy to learn, and once learned...it's fast, very fast! We also like its clean digital sound."

–Barry Witherspoon Program Director WSTO-FM, Evansville, IN

"The DM-80 is a great production tool–it really changed our sound! I like its fast and easy editing capabilities."

–Mike Britton, Production Director KODY/KXNP, North Platte, NE

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USER REPORT

OpLOG Integrates Sundance Operations

by Phil Klingler
Technical Director
Sundance Broadcasting

MILWAUKEE Some radio stations have found automation systems to be a good way to help keep operating costs low. IBM's mass-market introduction of personal computers provided **Media Touch Systems** with the foundation for its OpLOG control program.

OpLOG is a DOS-based program that facilitates control of satellite programs, cart machines, CD players and other studio devices. OpLOG communicates with other computers on the system with standard Ethernet cabling using Novell Netware.

Communication

Commercial traffic and music selection files are generated by our Columbine and Music-SCAN software. These files are input into the template log for use by OpLOG on the air. Log changes can be made from any computer on the network.

To talk to other equipment in the studio, connections are made to a Digiboard RS-232 serial interface. The Digiboard comes in four- or eight-port models and multiple boards can be installed in a system if additional device control is needed. For standard input and output, a digital device interface (DDI) connects to a port on the Digiboard. The DDI converts the RS-232 signal to one of 16 independent collector-to-ground outputs or to one of 16 opto-isolated inputs. An audio fader unit is also available.

In a common installation, another serial port would control a RAMCO or similar audio switcher, which selects the correct audio feed on the air.

One feature that caught my attention was the touchscreen. It can be programmed to replace all audio control board functions. Most importantly, the touchscreen made the program easy to use. When OpLOG was introduced in the early 1980s, computer literacy was less common, and the touchscreen shielded users from their fear of computers. More recently, a mouse control was added.

IBM's early start with PCs has also been an Achilles heel for Media Touch. The program was written in an older version of C and uses DBMAN as its database program. There is work going on to port the program to Borland C++ and a more widely used database.

The trend toward digital audio has spawned a more recent Media Touch product, Media Disk: Again a PC-based system using Antex audio cards for playback. Media Disk connects to OpLOG as a standard external device, but can be used with other control systems as well.

All digital audio and program files are stored on our 15GB Micropolis RAID Netware file server. Audio files can be automatically copied to the local Media Disk PC to reduce network traffic and to provide a level of safety in case of network failure. But I do not use this to replace a good backup procedure.

A digital audio editor is in beta-test phase and will be more polished in a few months. Auto-recording of network feeds and a quick Pick-and-Play program makes for easy newsroom integration.

Standard PCs

I have always felt that the use of standard PCs with off-the-shelf components is an attractive aspect of the system. Expansion is never a problem. In Milwaukee, we have three production rooms and a newsroom using Media Disk. Our two on-air studios have both OpLOG and Media Disk. If we need more, we just drop in another computer. I added a new Media Disk to our newsroom in less than an hour.

Our Phoenix stations have four production rooms and two on-air studios currently on-line with a third on-air studio planned for next month. The biggest problem we have had is getting all the parts to work together.

It always takes longer then we planned to fine tune OpLOG. But once it's up and running, it keeps working.

□□□

For information from Media Touch, contact Jim Waterman in New Hampshire at 603-893-5104; fax: 603-893-6390; or circle **Reader Service 172.**

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Circle (165) On Reader Service Card

World Radio History

USER REPORT

Network Sounds, Acts Local with DCS

Colorado-Based Christian Network Uses DCS to Keep Its Nationwide Network from Sounding So Far Flung

by Jon Hull
Program Director
The Word In Music

COLORADO SPRINGS, Colo. The ideal satellite automation should be just like the best audio processing: It has to constantly do its job, but without constantly reminding you that it's there. The same belief drives The Word In Music's attention to local station needs, giving us the goal of sounding as live and as local as possible.

Our 24-hour adult hit/contemporary Christian music satellite network originates at KBIQ(FM) in Colorado Springs, with the uplink and downlink at the same location. KBIQ takes 100 percent of the network programming, which includes stopsets for local breaks but not network commercials.

Of our four owned and operated (O&O) stations, one LMA and 20 affiliates, there are 22 FMs and three AMs. Of these 25 stations, 21 are commercial. Our satellite network spans from coast to coast, with stations from Virginia to California.

Dominates network

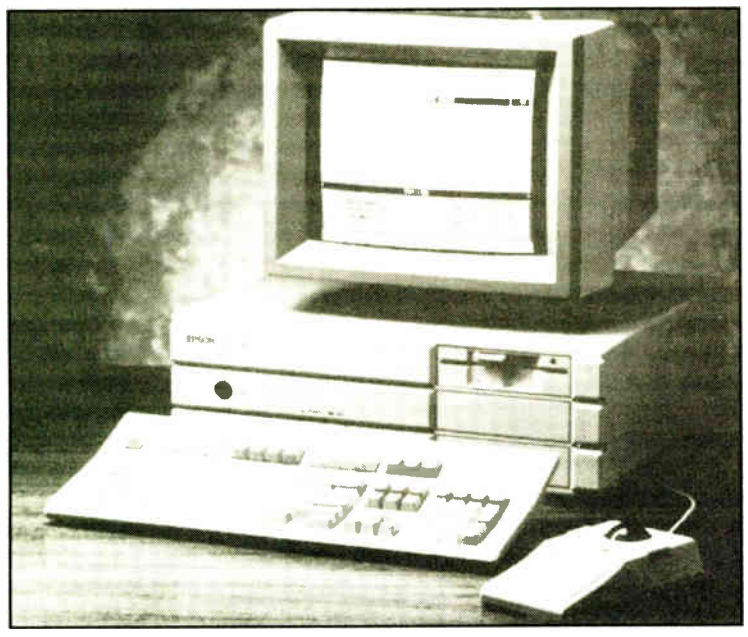
Some of the stations are completly automated, while others do drive time live. Over past few years, the **Computer Concepts** DCS hard disk system has become dominant in our network, mostly because of the reliability and flexibility it offers.

The key is to be able to air as many local liners and as much community information as we can. So far, we have succeeded, and many listeners are convinced they listen to a live local program, not a satellite network.

Our four O&Os have a total of five DCS units and there are a dozen more among our affiliates. Four DCS units at the O&Os handle the automation needs of each of those stations and the fifth DCS sends filler material to affiliates—such as the non-commercial ones, or those with unsold ad space—that do not break away during stopsets.

The remaining stations automate with everything from carts and reels to other hard disk systems. We hope to convince most of our affiliates to switch to DCS in the near future because of some key features Computer Concepts builds into its product.

First of all, DCS lets us use eight relay closures, which is more than many other systems. Our plans call for us to increase to 32 closures to be able to send more localized information. The more affiliates that use DCS, the more that can make full use of the localization we offer them.



The DCS from Computer Concepts integrates The Word In Music's national network.

In addition, DCS has remained virtually trouble-free, which unfortunately is not true with every other automation system in use by our affiliates. We have had major problems getting some of the other systems to accept all the relay closures we want to send. And some systems don't change to a new set of announcer voices when a new shift starts. With DCS, we simply do not have that problem.

Long haul

When we purchased DCS for our O&Os, we chose it for some very specific reasons. For one thing, we knew we were in this for the long haul and we looked for a company that was on the cutting edge and had plans to stay there.

Also, the DCS has dual stereo outputs, so instead of having to play an entire audio file before starting another one, we can overlap or crossfade, which makes the sound a lot more "live." We also liked its ability to record and playback at the same time, and the fact that once something is recorded it can be played back immediately.

Two features of the DCS we are just now experimenting with will help make our affiliates sound even more live. The first is Time Announce, a very savvy feature Computer Concepts developed to handle time checks.

Time Announce lets individual announcers record the actual time of day, not merely "22 minutes after the hour." There is one for every minute in the hour, and DCS figures out when to play which time and which announcer to use.

Urgent information

We are also testing the Automated Control System (ACS) feature of our DCS machines. ACS sends urgent information updates down the line to individual affiliates—in effect a dedicated or addressed spot—that can be on air very quickly during weather emergencies or whenever updated information is required.

If a tornado or hurricane watch suddenly pops up in one station's coverage area, the PD need not trek down to the station in her or his pajamas in the middle of stormy night to alert listeners. Also, there is no need to interrupt the local feel by interjecting a voice other than the announcer's.

We record the weather alert in the current on-air announcer's voice and send it down the line via ACS immediately to that particular station. It can be on air in the very next stopset.

Eventually, if there is enough demand for ACS (and once we start using it, I'm sure there will be), we plan to get a dedicated stereo pair for our affiliates to get urgent information on the air even quicker.

Computer Concepts has been pro-active in letting us know about new features, like ACS, that help us better serve our listeners. We are also impressed by the company's service after the sale.

We have developed a great working relationship with Computer Concepts, and if we ever do have a problem or technical glitch, it is nice to know they have a toll-free, 24-hour hot line answered by a real human being who will get back to us with an answer in very quickly.

These are all features that we as a network feel are extremely important to offer to our affiliates. But the final test is, of course, the listener. Letters we receive show that because of our seamless approach to satellite automation, not only does our audience think we are live, but they feel especially well-served by our attention to local community concerns.

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For information from Computer Concepts, contact Della Northcutt in Kansas at 800-255-6350; fax: 913-541-0169; or circle **Reader Service 50.**

The key is to air as many local liners and as much community information as we can. Many listeners are convinced they listen to a live local program.

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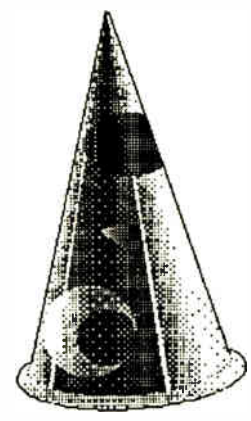

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Circle (75) On Reader Service Card

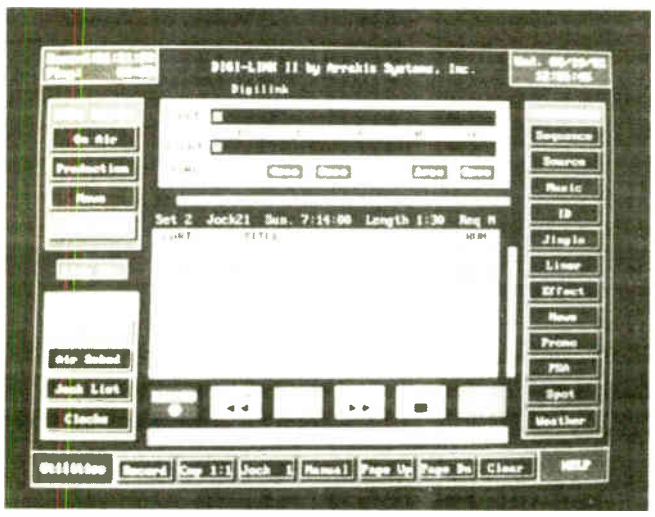
World Radio History

USER REPORT

Arrakis Automates and Live-Assists

by Dave Strycker
General Manager
WHON(AM)

RICHMOND, Ind. Our AM station has been automated for several years, but two years ago we changed to a news/talk format—local and satellite. This put even greater pressure on an already overtaxed system. The biggest problems were mechanical—both the breakdowns and an obviously mechanical and automated sound.



The Digi-Link's operation proved to be very intuitive.

After weighing our options for about a year, WHON(AM) entered an era of digital automation. Failures, missed cues and general frustration forced us to consider the technology. We searched for a system that matched all of our needs and one that helped us make the change for the right reasons, not just for the sake of having digital.

Tightens format

Our research found that digital automation tightens a format, facilitating scheduling of both people and program material. It also saves enough money to pay for itself in a short amount of time.

Our air staff consists of Dr. Joy Browne, Rush Limbaugh, G. Gordon Liddy and Pete Rose via satellite, and three hours of local talk per weekday. When trying to juggle all these various sources—not to mention commercials, liners, pros, news, features and sports—it seemed our operators were working for the old automation system.

Now, after six weeks on air, our operators make our new **Arrakis** Digi-Link system work for them. Their stress levels are down considerably and as one of our people told me recently, "I have a higher level of confidence with Digi-Link after five-and-a-half weeks of living with it than I ever had with the old tape-based automation." By the way, the "old" system WHON used dated back to 1988.

People occasionally ask me how satisfied we are with the Digi-Link. I always start by telling them how happy I am with the assistance we have received from Arrakis and from our dealer, Harris Allied. Arrakis' support has helped everyone from management to our on-air board operators.

We made the right choices in selecting Arrakis and in what we knew we wanted it to do. However, we learned the hard way that the advantages of a digital system are not easily realized when one tries the hunt-and-peck method of coming up to speed with it.

Our operators were able to achieve about a 70 percent confidence level after the first week—a testament to the intuitiveness of Digi-Link. But the other 30 percent was difficult to achieve until we finally admitted that we needed someone thoroughly familiar with all of the system's attributes.

Builds confidence

Now we truly make the system work for us. Our operators are confident that a program source will play when they call on it. All of the information is easily accessed. We no longer have to turn around to find a cart or to see if it's ready to play.

Our talkshow hosts are free to concentrate more on show content. Before Digi-Link, our board operators were forced to waste time making sure the old analog system would to work. Logistics and operations in live or satellite mode have become no hassle items.

WHON entered the digital age with the help of the Arrakis Digi-Link.

With Digi-Link, show preparation is quick and easy. With all the elements available to us daily from all of the satellite sources, we now have the luxury of making informed decisions that make us sound our best, instead of struggling to make our program ends meet.

Verification with our DARTS traffic system is close to absolute. The accuracy we enjoy now is more trustworthy than the very competent, live DJs on our FM operation.

Setting up stopsets and their lengths is easier and much less labor intensive. Digi-Link now does the majority of the work, helping us to fill our network breaks. Previously, under the analog system, stopset building wasted a lot of time and energy.

What else? I could go on and on, because we learn more great features and short cuts all the time. We sound much better both technically and in the overall production sound of the station.

This new experience convinces us that digital automation and hard disk audio storage are standards upon which we will build the future of our group's stations. Orders for more Digi-Link and Track*Star systems are in the works right now.

□ □ □

For information from Arrakis, contact Jon Young in Colorado at 303-224-2248; fax: 303-493-1076; or circle **Reader Service 22.**

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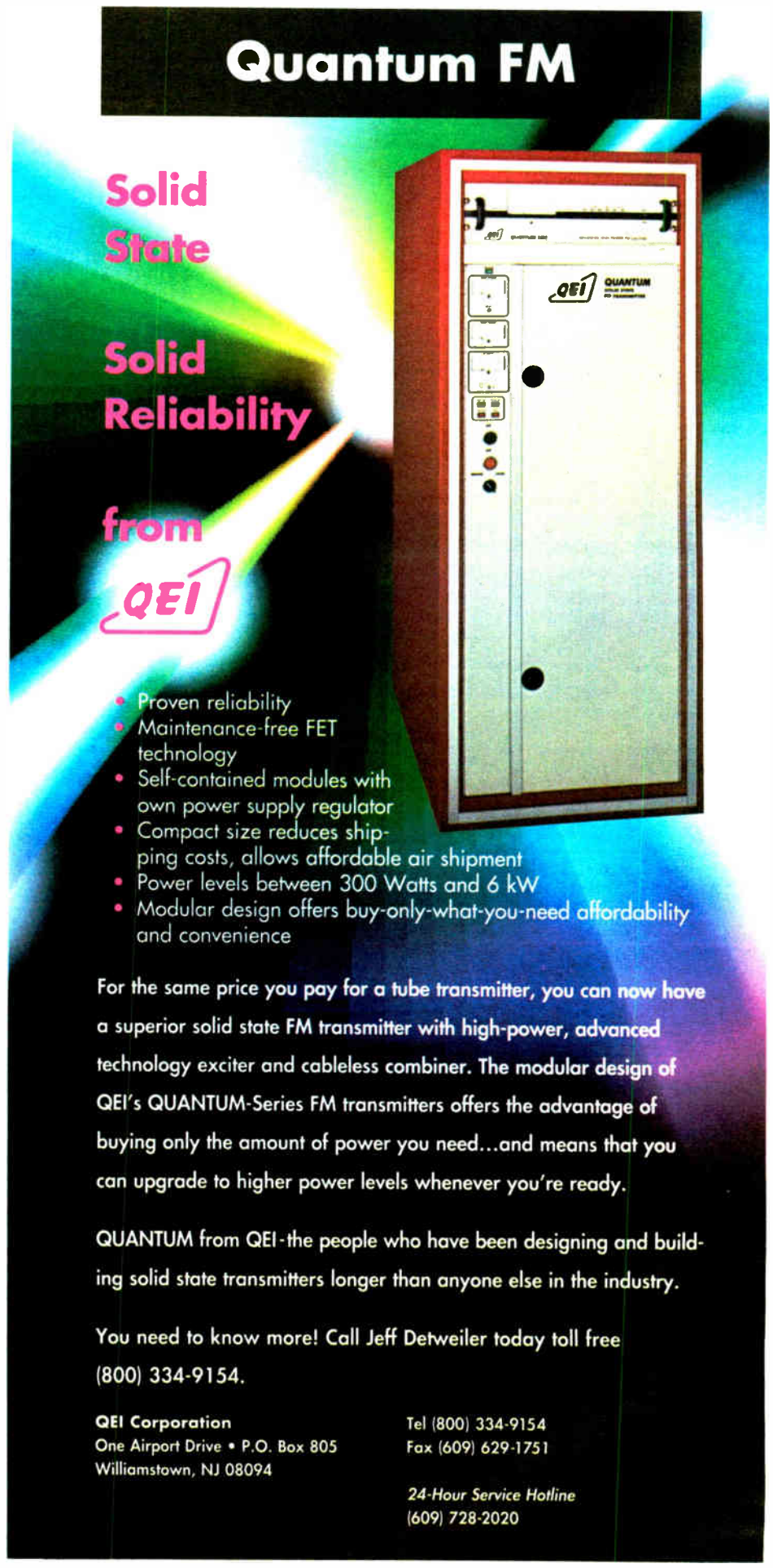

Circle (49) On Reader Service Card

World Radio History

USER REPORT

WDKM Goes On-Air with Digital DJ

by Karl J. Roekle
Chief Engineer
WDKM(FM)

ADAMS, Wis. This past October, we completed construction of our new FM radio station, WDKM(FM). In building the station, we outfitted it with the latest in computer technology, including **The Management**'s Digital DJ, Music Log and Super Log software programs and related equipment.

From day one, we have operated in the black. I attribute this primarily to choosing the right computer software and hardware, that allow us to run with a minimum of in-house staff.

One big advantage I had in computerizing our new FM station is an existing computer business that sells and services computer software and hardware. My experiences working with various software and hardware vendors and training a number of users at different businesses and public agencies in new hardware and software gave me a clear view of what I wanted for the station.

Proper choice

The proper choice of software and hardware could mean the difference between success and failure in a small community, so I established a very specific set of criteria in choosing hardware and software:

Because DOS machines make up the vast majority of computers on the market, the computers and software had to be DOS-based. The computers and parts also had to be readily available from the average computer store.

Because tape requires a large amount of maintenance, I did not plan to use tape decks or cart machines in the station. All audio would be stored on ordinary computer hard drives.

I wanted the traffic, billing, music mix software, production and on-air software packages to be from a single company.

The software needed to support consumer-grade CD decks, to help keep our initial purchase costs, replacement costs and repair costs to a minimum.

Flexible software

The software had to be flexible in order to mix our music so that it matches our surveys.

The on-air software needed to handle the entire spectrum of studio setups—from total automation to total on-air live operations and most combinations in between. It also had to handle these operations seamlessly.

Software maintenance fees needed to be reasonable, and software support had to be available at reasonable times with some way of assuring that "after hours" help would also be available.

After reviewing a number of the systems available, we selected the Digital DJ system. It really met my needs.

The Management produces all of the software packages—on-air, traffic, music scheduling, etc.—necessary to computerize a station. We could purchase the software alone and then furnish our own hardware. Not only does The Management's software support consumer decks, but the features on the Digital DJ computer are extensive: Production, EOMs, editing, recording on the fly, etc. are only a few of the features available.

We are extremely pleased with The Management's software package and with the level of support the company provides. In the seven months since we went on-air with the Digital DJ, the system has not failed us once. We have also gone through several upgrades which have expanded our capabilities.

Software upgrades

One of these upgrades is *AXS*. This piece of software is designed to replace the original Digital DJ program. Not only is *AXS* very user friendly, it is also extremely easy to use. It runs with a keyboard and mouse, but more advanced interfaces, *e.g.* a button box or touch screen, may be added.

In addition, *AXS* is packed with many new features. One such feature allows the DJ to change any upcoming song to reflect a call-in request in about 10 seconds. Another feature allows the log to be edited on the fly.

In our case, it only takes two computers running three software packages to have complete computer control of our station. The Music Log program controls all of the scheduling of the CD music. This program not only controls all of the music, but it also completes all of the necessary reports, including the report to BMI. Currently, we have this program running on an ordinary 386 25/DX computer.

Also running on this computer is the Super Log traffic and billing software package. This program completely controls all customer accounts, billings, traffic, daily logs and so forth.

Multitasking

The third program is Digital DJ, which runs the on-air computer, an ordinary 486 33/SX with 4MB of RAM. It also contains a 1.2GB hard drive. The hard drive stores all commercials, jingles, station IDs, sweepers, etc. in stereo, plus the Digital DJ program itself.

It takes about 1MB of hard drive space per

continued on page 55 ▶

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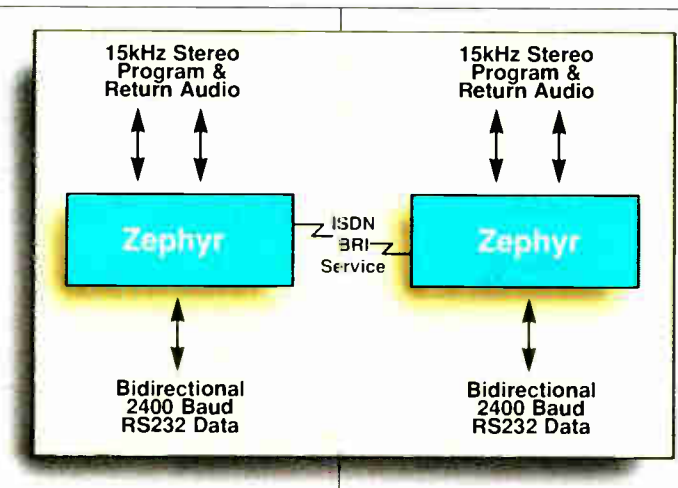

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Specifications and requirements:

- Audio coding and decoding in conformity with ISO/MPEG Layer II.
- Versions for DTMF or Continuous Data Channel telecommand.
- Automatic News Recording System activated by DTMF.
- Runs on PC 386 DX 33 or higher, with 2 Mb RAM minimum, requiring DOS 5.0 or higher.
- Also operates under many popular LAN's O.S. like NOVELL 3.11, Personal Netware, Lantastic, etc.
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- All work station associated to the System are multitask, enabling the management of the transmission, recording, play list and template edition and automatic transmission from any of these.
- The System can be expanded from a single basic configuration, incorporating more work stations.
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Specifications:

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World Radio History

Circle (176) On Reader Service Card

USER REPORT

Pristine Facilitates Jump to Digital Systems

by Matt Sedota
President and General Manager
WNMB(FM)

NORTH MYRTLE BEACH, S.C. In May 1993, after having spent months reviewing our options and considering our needs, WNMB(FM) jumped into hard disk audio and the **Pristine** Music Management. At the time, fewer systems were on the market than today, but once we determined our goals and needs, the choice was narrowed even further. Now, more than a year later, we are confident we made the correct decision, and believe WNMB and our Pristine System is capable of competing with the best on the market today.

It was important, and continues to be critical, for hard disk audio both to provide an improved product and to help reduce cash expenses at our operation. Pristine Systems does both.

WNMB Program Director Phil Thompson puts the Pristine system through its paces.

Higher quality

Our overnight show is pre-produced at a considerably higher level of quality. Much of our weekend programming is also pre-produced, again improving the product.

While we give a hearty endorsement to Pristine and Professional Management Services, it is important to recognize the shift to hard disk involves a dramatic change in thinking and operation.

Operators must learn the difference and understand the roles of audio files, data, traffic-driven information and system-driven material, to name just a few. Sales department personnel must understand the concept of not dealing with physical carts.

Once we all began thinking differently and looking at our product from a different perspective the system fell into place.

Pristine provides superior quality audio presence for all hard disk elements; it includes a complete music management system, eliminating the need for an outside music scheduling programming; and actually improves many aspects of our station.

High efficiency

Commercials are cleaner and tighter; our traffic system is used at the highest level of efficiency; and on-air presentation is controlled with a considerably higher degree of quality.

Professional Management Services provided tremendous support through installation and day-to-day assistance, and Pristine Systems continuously enhanced and improved its system, making our radio station better day by day.

Pristine improved the flexibility its system offers by adding, deleting, moving, previewing and adjusting hard disk items to keep system operations as powerful as possible.

Pristine Systems has the ability to control the overlap of hard disk items and their interface with CD players and other external elements. No other system on the market offers as much ability to automatically overlap audio for voicetracking.

Our pre-produced shows are tighter than most live announcers and are designed to be fresh, timely and accurate.

Everything we need

Pristine and Professional Management Services offer exceptional value, support and a system that does everything we need it to do—and some things we didn't know we needed.

I have talked with operators who have had a difficult time with hard disk audio. We have experienced our share of difficult moments too, but they are almost always linked to our refusal to think in terms of 1990s technology as opposed to 1960s technology.

We have become better broadcasters thanks to the Pristine Music Management system and Professional Management Services. Regardless of the size market or station, every broadcaster considering the addition of hard disk audio and/or automated operation should look closely at the options provided by Pristine.

We have done our research; we put the system through difficult paces every day; we demand the absolute highest level of flexible control; and we expect integration with our highly systemized operation. Pristine Music Management Systems and Professional Management work hard, work well and work right for us.

□□□

For information from Pristine Systems, contact William B. Sanders at Professional Management Services in South Carolina at 803-370-2400; fax: 803-370-2314; or circle **Reader Service 103.**

On-Air with Digital DJ

▶ continued from page 52

minute to store stereo information.

The 486 33/SX is multitasking, meaning it can do two completely different tasks at the same time. For example, we can edit on the computer and at the same time control the music or feed voice from the same hard drive to the transmission system without so much as a hiccup.

The Management system helps manage our payroll and labor costs too. The DJs now have time to help with other office duties, including copy writing, production, answering the phone, evaluating new music, record keeping, etc.

Because The Management Music Log generates the entire day's music log in approximately four minutes, and the traffic program generates the entire traffic log in three to four minutes complete with music, a very substantial amount of time is saved each day.

Both the Music Log and the Super Log are very user-friendly and can easily be operated by someone with minimal computer training, again saving extensive training costs.

□□□

For information on the Digital DJ, contact The Management's sales department in Texas at 817-625-9761; fax: 817-624-9741; or circle **Reader Service 56.**

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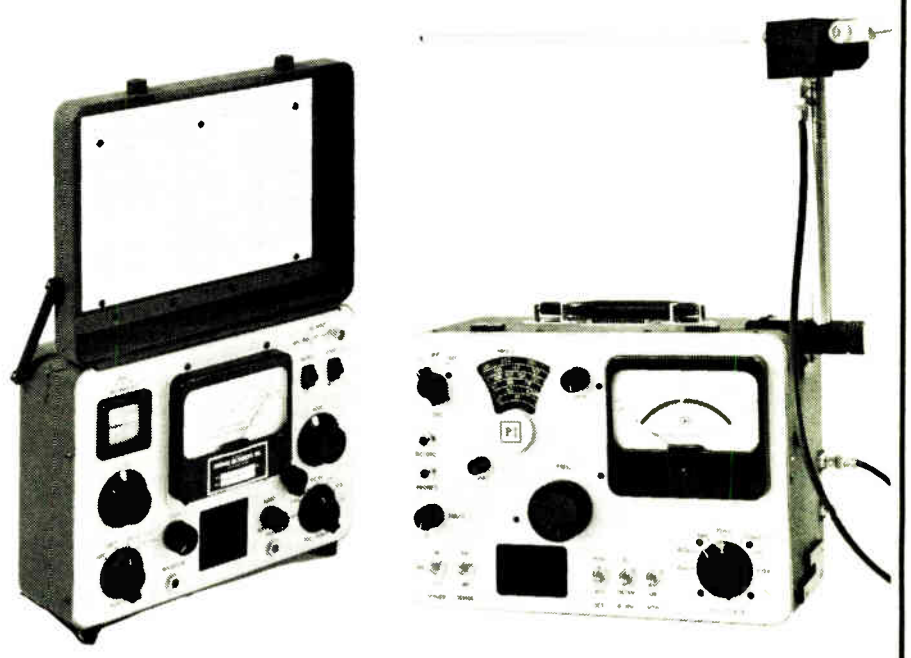

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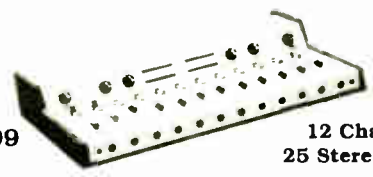

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READER SERVICE NO. 105

USER REPORT

Satellite Feeds Feel Local with ENCO

by Jim Hoge
Director of Engineering
Moffit Media

ORLANDO, Fla. 1993 was a year of change for Moffit Media. One major project involved an intensive search for the ideal multitasking hard disk-based digital audio system.

With AM/FM combos in Orlando, Philadelphia and Knoxville, Tenn., we wanted to fully automate one side and run the other live assist, with the option of automating overnights and weekends. We realized that installing and standardizing such a system could significantly improve operating efficiency.

After reviewing information on virtually every system on the market, having on-site demonstrations of those that appeared to be the most viable, and almost reaching a decision, we heard about the ENCO Systems DAD486x.

Caught interest

The DAD demonstration caught everyone's interest, and we soon installed a system for evaluation. Dean Chapman, our corporate program director, immediately gravitated toward the flexibility of the system. Recording and cut-and-paste assembly editing are rapid and accurate.

With the various reproduction modes and multiple players, it easily adapts to both our live-assist and automated hours, and individual user setups allow us to optimize operation for each personality and/or daypart. It sounds natural, even when A/B tests were performed of linear versus compressed data files at different sampling rates. (DAD supports both Dolby AC-2 and MUSICAM compression.)

Scheduling is easy. In fact, all aspects of operation are so simple that the learning curve is virtually non-existent, a fact borne out by the jocks. Where they had previously moaned and groaned about the "computerese" required with other demo systems we brought in, they immediately took to the DAD.

They could touch the screen and make it operate like a whole rack of cart machines—albeit faster and with more sophisticated features. The general attitude was "Wow, it's so easy."

My interest was piqued by two factors. First, the benefits of a system that operates on non-proprietary computer hardware and via standard Ethernet network architecture that could be purchased, maintained and expanded through local sources, all without specialized training. Second, the powerful logic within DAD does more than we had initially planned, but with less equipment and at a lower cost than anticipated.

First system

We purchased our first DAD486x system for WTLN-AM-FM in Orlando at the end of the year. It included two workstations—one for FM on-air, another with multiple audio boards doing double duty as automated AM on-air and production for both AM and FM. A file server linked the two together for immediate access of all audio files by either studio. With the excellent sonic quality of DAD's compression algorithms, and the long life expectancy of modern hard drives, we opted to store our complete music library in the DAD rather than relying upon potentially troublesome external CD decks.

The DAD486x system at WTLN-AM-FM is remarkable in operation. We take up to 10 different satellite feeds—airing some live, automatically recording and time shifting others—plus adding local voiceovers and drop-ins.

We created 168 independent logs to run the AM side, one for each hour of the week, and automatically chained them together for unattended execution. Because the logs use the familiar dBase III protocol, they can be imported and exported from DAD for traffic, billing and music scheduling.

As with any new equipment, there were the occasional initial problems. We elected to purchase the DAD software and audio boards from ENCO, and to obtain and configure our own computer hardware locally. In retrospect, that may have not been the ideal choice for our first installation. We soon discovered that a hard disk controller had bug-ridden driver software that eventually corrupted all of our data.

Gene Novacek at ENCO went out of his way, spending countless, and sometimes trying, hours talking us through the reconfiguration processes over the phone. He even assisted in recovering lost data. Considering that it was not their equipment, the service was phenomenal, and available at 24 hours a day. Our system was soon back up and running. Installation of the DAD portion was easy and problem free.

Command cuts

We extensively use the Command Cuts feature. These are sets of logic instructions, similar to macros, that can easily be written and verified off-line, and then stored for insertion in any log to execute various internal and external functions.

Combined with the eight-in/eight-out GPI logic board, the logic instructions

continued on page 58 ▶

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Circle (18) On Reader Service Card

USER REPORT

DigiCenter Gives Competitive Edge

by Greg Sapp
Station Manager
WXEF(FM)

EFFINGHAM, Ill. When WXEF(FM) was preparing to hit the air in January 1994, it faced some imposing obstacles. First of all, competition for ad revenue was fierce. In our small town of 12,000, an AM/FM combo station and a dozen different print and broadcast media outlets were already operating, selling and competing for media dollars.

Add that competition to the fact that WXEF was assuming the frequency and 3 kW power limitations of a formerly Christian music-formatted station, and it's easy to see why we needed to make some difficult decisions before going on-air.

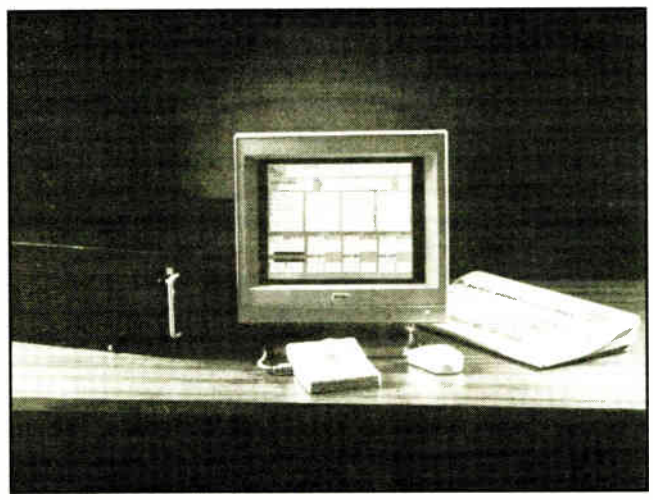
WXEF began, like most new stations do, by considering the potential revenue available in this small, competitive community. We weighed these numbers with the high start-up costs involved for equipment upgrades, and then added in our goal of 24-hour-a-day operation.

At WXEF, we first determined that while 24-hour programming was essential, an around-the-clock staff was not. Satellite programming was briefly considered, but because of the importance of local control of programming, we made the decision to purchase a CD automation system.

Complete system

After reviewing several digital management systems, we selected the DigiCenter from **International Tapetronics Corp.** (ITC). ITC provided a complete system for a neophyte station like WXEF by offering simultaneous live assist and automation, along with cutting-edge technology.

In addition to its technology, DigiCenter was desirable for several other reasons. We liked the user-friendly screen selections, and its cost was within our budget. While ITC offers 24-hour emergency service and support to all DigiCenter customers worldwide, the fact that ITC was within two hours' driving time made us feel even more comfortable with the shift to digital technology.


The ITC DigiCenter eases automation for WXEF.

Because WXEF signed-on with a DigiCenter we have made good use of ITC's services; for example, ITC helped train our on-air staff. For various reasons, mostly on our end, the period between installing the DigiCenter and going on-air was very brief. The entire remodeling of the station and the installation of the equipment all happened within two weeks: We trained our staff while holes were still being cut in the walls. Therefore, we experienced problems that come naturally from trying to learn a new system while you're on-the-air, but the whole group at ITC was unfailingly patient and helpful.

CD automation

Another feature of the DigiCenter that especially appealed to us was its compatibility with live, satellite and CD automation set-ups.

For CD automation, ITC offers stations a choice between off-the-shelf CD players or large Denon players. Because ITC's CD automation products have jukeboxes with the power to store entire libraries, we were cautious of being off-the-air due to the CD equipment not operating correctly and chose to utilize several store-bought players. We figured if one of the store-bought players went down, we'd only lose a small portion of our library for a brief period of time. If the Denon unit went out, on the other hand, we would lose a large chunk of our music until the unit was repaired or replaced.

While ITC offers traffic, automation and music input/output interfaces (TAMIO) and Reconciliation—a program that forwards the day's activities (songs, spots, etc.) to traffic and billing—I hope to see ITC design its own scheduling system for DigiCenter that integrates traffic and billing and other station aspects. Currently, the process of merging files generated from two different scheduling sources (both of which over-schedule the hour) is accomplished with ITC's TAMIO, but causes compromises in both produced schedules.

Today, all of us at WXEF are up and running, 24 hours a day, with virtually no problems. My advice to prospective purchasers of any digital system is to allow plenty of time to acquaint yourself with a system before putting it on-air. And provide computer-illiterate on-air staff members more time to become acquainted with the equipment.

We found that long-time broadcasters with little computer experience had a lot more trouble learning the system than our younger announcers. With their computer knowledge, the kids had it down in a couple of days.

□□□

For information from ITC, contact Charlie Bates in Illinois at 309-828-1381; fax: 309-828-1386; or circle **Reader Service 59.**

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Local Feel With ENCO

▶ continued from page 57

allow the DAD to interface with any type of controlling logic, from fader starts to decoded satellite receiver tones, or to make DAD the master controller of virtually anything in a broadcast facility.

One of the best features of the DAD486x is its built-in automatic recorder, which is similar in operation to that of a consumer VCR. It is ideal for taping network feeds. The software interfaces with a serially controlled Conex routing switcher to set the "channel." At the pre-programmed time, the proper satellite or other audio feed is selected, and stored into DAD without human intervention. DAD also can play the file while recording, for programs that need time shifting or to provide a profanity delay.

In May, we installed a DAD system at WVCH(AM)-WEEE(FM) in Philadelphia, a single workstation that runs both stations. An illustration of our enthusiasm was when Tom Harvey Moffit Sr., our founder and president as well as a 50 year broadcast veteran, exclaimed: "This is the only time I have ever enjoyed writing a check for a piece of equipment."

As I write this, I am finalizing an order for a system for WRJZ(AM)-WYLV(FM) in Knoxville, plus additional workstations in Orlando to include our production rooms and our new station, WEAZ(FM).

□□□

For information from ENCO Systems, contact Larry Lamoray in Michigan at 800-ENCO-SYS or 810-476-5711; fax: 810-476-5712; or circle **Reader Service 182.**

World Radio History

USER REPORT

Audisk Suits Complex Setup

by Mark Young
Chief Engineer
WJON(AM)-WWJO(FM)
KMXK(FM)

ST. CLOUD, Minn. For the past few years, we watched digital storage systems develop, waiting for them to evolve into what we needed for our somewhat complex facility. But purchasing a digital system could wait no longer once we purchased a third station in our market.

After researching the design and features of several systems, we felt that the Audisk system by **DHK Group** and distributed by **Harris Allied** best met our needs. The way the system could custom fit our facility and its user friendliness and reliability record made the Audisk system a fairly easy choice.

Three systems

We purchased and installed three Audisk systems in January, one for each station. Everything is tied together with a Lantastic network.

The systems themselves are stored in a central engineering area. In each studio, news booth, office, etc., wherever we need to work with the Audisks, we have a standard IBM compatible PC—a total of 13 workstations. In the studios, all the operator sees is a monitor, keyboard and an optional Dreamer keyboard.

Each of the three systems has two 1.2GB drives for commercials that store nine hours of audio each at 15 kHz stereo. All spots are automatically LAN mirrored to the other two systems. This keeps operators from having to worry about which system they cut a spot on, and whether or not they need to copy spots to the other stations. It also serves as a back-up. In the event a system ever went down, Audisk has the ability to run two stations with a single Audisk.

Both of our FM music stations have three 3.4GB drives (25.5 hours each) where all of the music, along with the jingles, promos, etc., is stored. Audisk allows more flexibility for music on hard drive than most systems do, because the music can be scheduled on a separate schedule from commercials. Storing music on hard drives also gives us much higher reliability than CDs.

We use a music scheduling system for one of the stations, which interfaces easily with Audisk. The other station makes use of Audisk's rotations feature for music rotation and a variety of other things. This feature rotates audio files to air in a variety of ways: sequential, random, by day of the week, hour of the day, etc.

One of the most unique and useful Audisk features is segments. Segments allow you to play selected portions of audio files to air. The application of segments we have used the most is to prerecord long form programs for playback at later time. Segments allow us to separate the program into its shorter portions for insertion of spots, IDs, etc.

More efficient

Two good examples of how segments makes us more efficient are "Food for Thought" and "American Country Countdown."

"Food for Thought" is an hour-long program that Audisk auto-records at 9 a.m. It takes the program director less than two minutes to segment it into its six different sections. He then can walk away and do other things at 11 a.m. when it is played back.

"American Country Countdown" is a four-hour program that arrives on CD. The overnight DJ—who is not live on the air as all three stations are automated overnight—records the program by simply starting it recording once an hour. She then segments it into its natural breaks. The total time spent working to avoid having a live DJ tech the show's four hours is about 10 minutes.

The Audisk helps link three Minnesota stations

There are a variety of other features that make Audisk easy to use.

The Dreamer keyboard has a numeric keypad and 30 other keys. Each DJ can program two sets of 30 audio files or commands for each of the 30 keys. It then provides instant access to air for each of those files—like having 60 loaded cart machines at your fingertips.

The Touch-Tone decoder feature allows you to call the Audisk and take control. A variety of things can be accomplished with tones, including playing any audio file to air or recording. This is a great feature for sports, allowing you to use the same phone line for broadcast and control.

A modem on the system works great. It

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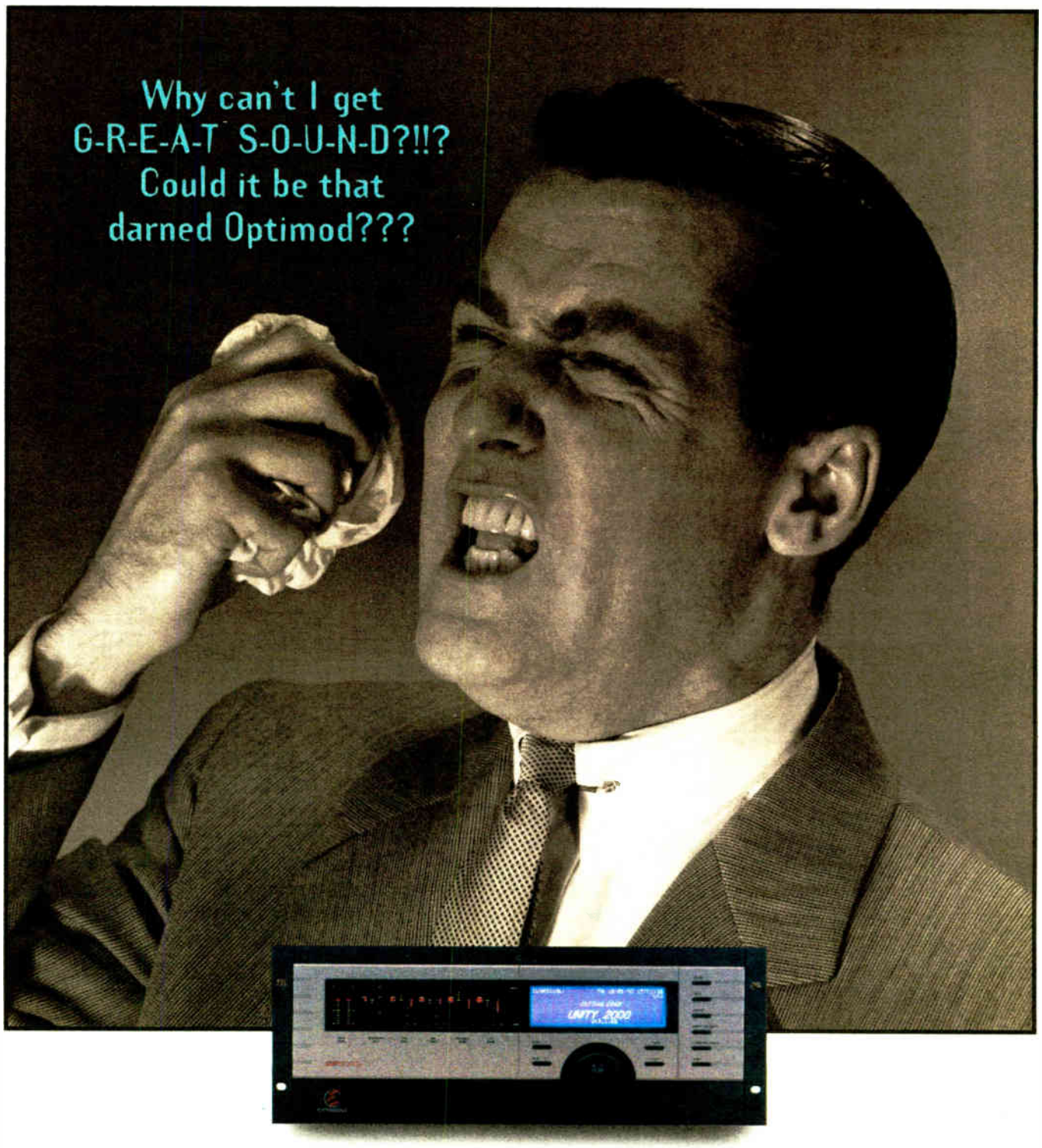

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World Radio History

USER REPORT

Prophet Systems Automates Magically

by Norm Laramee
Director of Engineering
Signal Media of Arkansas

LITTLE ROCK, Ark. It seems like only yesterday "broadcast automation" meant equipment racks full of reel-to-reel and/or cart machines controlled by some sort of electro-mechanical clock mechanism. Now, nearly every broadcast automation system is controlled by a computer and includes varying degrees of digital audio. Searching for the right system can be a dizzying experience, even for the most technically astute individuals.

Signal Media of Arkansas owns three stations with formats that run the gamut: KSYG(AM) is all-talk with local programming plus six different satellite networks; KHLT(FM) is a light rock format; and KKYK(FM) is a classic/heavy rock format. We needed a centralized system that was easy to use, flexible enough to accommodate our diverse formats, and that could store and play all audio, including music and other programs of varying lengths from hard disk.

Our goal was to replace completely all tape and CD on-air audio sources. The only system that suited our needs completely was Wizard for Windows from **Prophet Systems Inc.**

Windows platform

Wizard for Windows, as the name implies, operates on a Windows platform within a centralized file server system using Novell Network technology. Audio is recorded and stored on hard disk using the Dolby AC-2 compression scheme, the audio quality of which is excellent.

If you are looking for a CD automation system, Wizard for Windows does that too. In fact, Wizard for Windows supports all modes of automated operation including satellite automation, manual live-assist and fully automated local programming.

The system also includes a built-in multitrack digital editor. Audio files created by the Wizard Real Time Editor are compressed and use the Windows standard ".WAV" format, which is compatible with many other digital audio editing programs. Sampling rates are adjustable at 32, 44.1 and 48 kHz.

The basic Wizard system links as many as 21 workstations. More are possible, the only limit is Novell licensing. The main file server and associated hard disk drives store and manage all of the record and playback audio for all of the workstations on the network.

Text only workstations are usually located in the office of the general manager, program director, traffic director, etc., for access to the copy, music and program log functions of each station. In fact, it is possible to control any station's on-air operation from any workstation. Password protection is provided systemwide for obvious reasons.

Multiple workstations

Each control room has two workstations associated with it. The Control workstation is used to access the station program/music log, live copy, access other text related functions of the system, control on-air operations, and double as a standalone record/playback unit in the control room, independent of its on-air audio operations.

The program log is displayed on the screen in an easy-to-follow, line-by-line fashion. Each spot, song, function and event for an entire 24-hour period is available on-screen for viewing and editing. Cut and paste functions allow for last minute, on-screen changes in the program log. It is one of the most uncluttered and common sense on-screen program log formats I have seen.

Each control room also has an Audio Server workstation. It contains three playback-only audio cards and manages the program log and on-air audio operations. Up to three audio elements can play at the same time, allowing for smooth crossfades between spots or between songs with recorded voice tracks.

An optional VCA audio control box provides remote control of up to 16 stereo audio sources and/or relays for satellite network switching or other audio.

In the production room, the Wizard Real Time Editor workstation is used to record audio into the system, play-back, edit and otherwise manage it. This workstation has three play-only audio cards and a single play/record audio card.

The hardware, along with the Wizard Editor program, is the foundation of the system's multitrack recording capability. Three stereo tracks can be recorded separately, then edited with cut-and-paste techniques. Audio from any track can be moved and/or copied to any other track. When the editing is finished, all three tracks are mixed down to the final mix track. This audio track can be the final product, or can be moved back into one of the three work tracks and remixed over and over with additional audio tracks an infinite number of times with no degradation of the audio. Individual work parts can be

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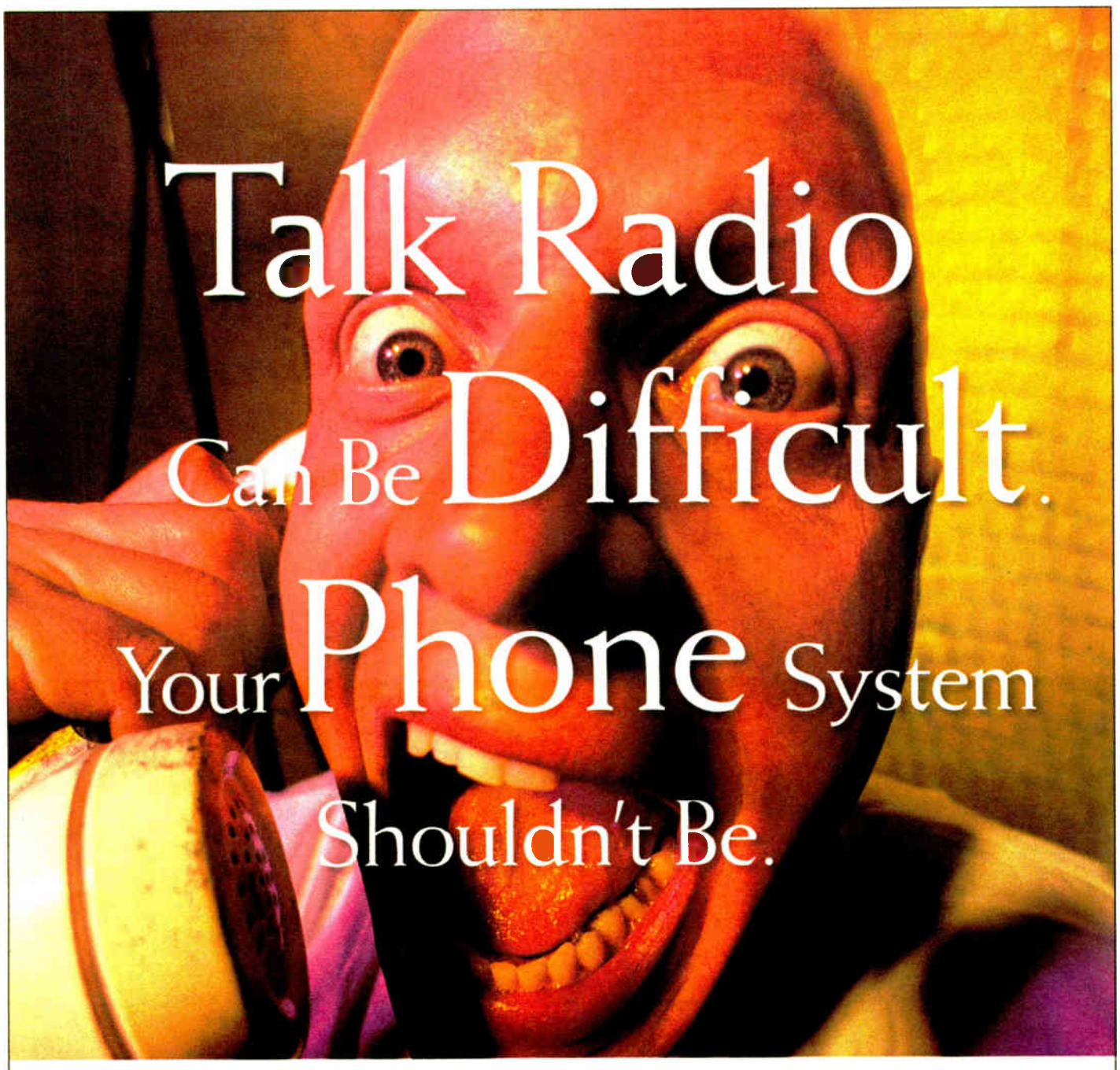

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The TS612 is a six-line (expandable to 12) Telephone System. It features Gentner's Direct Connect Technology™, which allows you to hook it into a regular phone line. Plus, its built-in handset and keypad eliminate the need for another screening phone. With the TS612, you can talk to callers (even the Pizza Guy) off-air, while other callers are on-air.

Technologically, the TS612 features built-in mix minus, to compliment Gentner's digital audio enhancement. It has two DCT Superhybrids, automatic level control, dual air control surfaces, optional screener control surface, and dual audio bus operation. You also have DCT connection to your hard disk or studio PC, for screening and controlling calls. But what would you expect — the TS612 was designed specifically for talk shows.

See your Gentner rep today, or call 1-800-945-7730 and make your life easier with the TS612. After all, that psycho's still on line two.

Radio World Cool Stuff Award

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World Radio History

Value

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DESIGNS THAT MAKE THE DIFFERENCE

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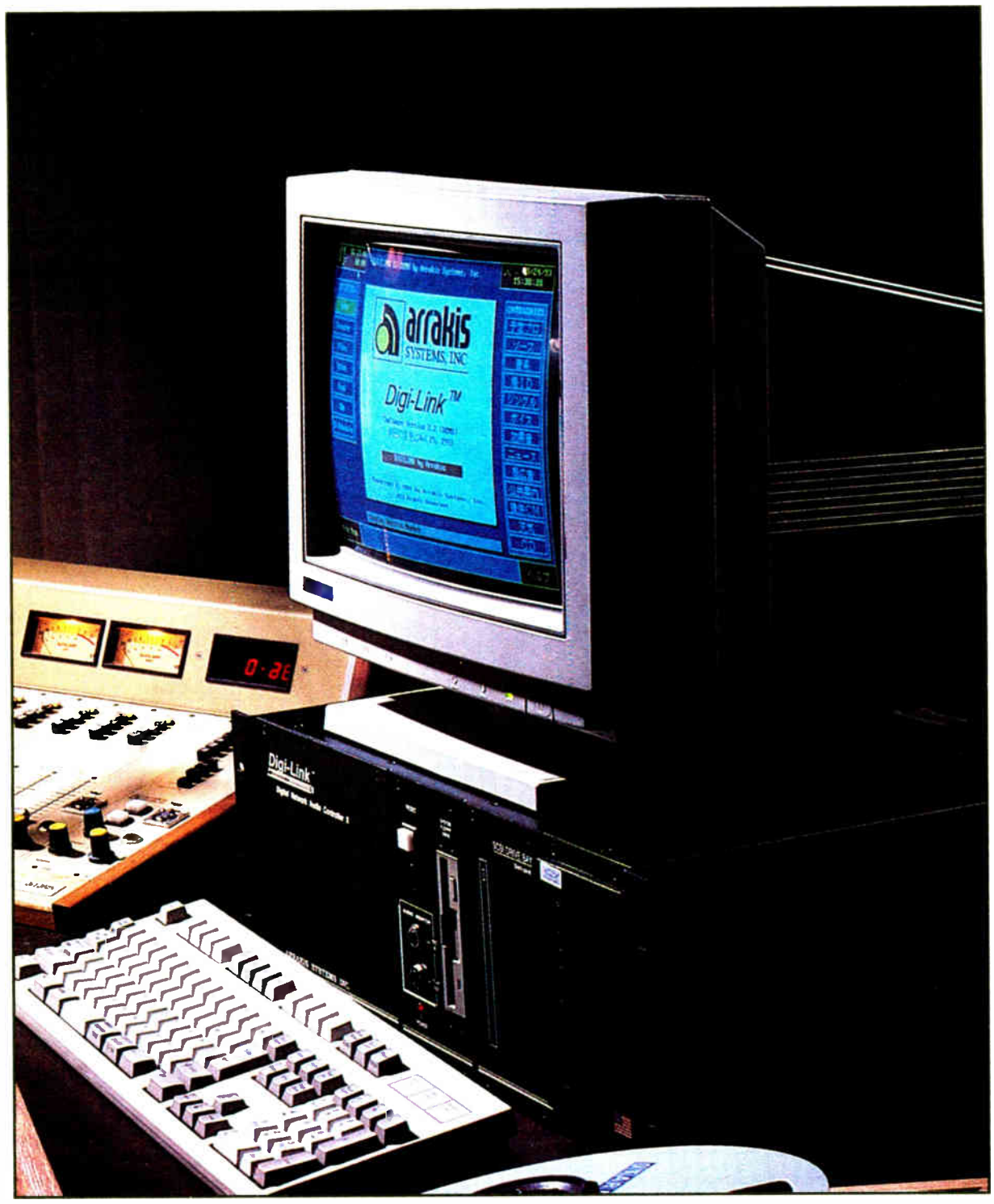
World Radio History



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Digilink by Arrakis is a digital audio workstation that does it all while increasing your profits.

You can replace your live on air cart machines while adding CD or satellite automation for nights or weekends. You can use just one workstation or network as many as 15 and send your spots & schedules in perfect digital between your studios. Add a Trak*Star eight track digital audio editor for under $5,500 and you can quickly and easily produce spots that would have taken forever or been impossible with tape.

Digilink is also easy to schedule. You can use the standard Digilink traffic & CD scheduling system or import music and traffic schedules from all of the most popular 3rd party programs.

Features like simultaneous Play, Record, & Network transfer; hard disk to hard disk & CD crossfade; cart rotation; Autofill: Smart-squeeze; Macros; and incredible ease of use make Digilink perfect for live & automation studios.

Call or write today for more information on why Digilink is #1–with more than 600 workstations sold worldwide from Moscow, to Japan, to Barbados, to your own back yard.

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World Radio History

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TECHNOLOGY UPDATES

CBSI

Solution-Oriented Software From CBSI Integrates Traffic Billing and Accounting

REEDSPORT, Ore. The Classic and Elite traffic and billing systems and InterAcct accounting system from **CBSI/Custom Business Systems** are "solution-oriented software" packages designed for broadcasters.

CBSI's Classic system provides versatility and flexibility for any size operation and features contract maintenance, availability and revenue projections, program logs, accounts receivable, integrated co-op copywriting and a sales analyzer for in-depth sales management and projections.

Elite is a streamlined business office system, created for budget-minded station operators. It includes many of the Classic's features including contract maintenance, availability, revenue projections, program logs and accounts receivable.

InterAcct is an accounting system well suited for single-station, multistation or multilocation corporate use, duopolies and LMAs. Its features include Design Financial Reports, which allows users to customize reports. It imports and exports data to and from popular spreadsheet programs and can store up to six-and-a-half years of detailed financial history.

All CBSI systems are supported by toll-free customer service and regular enhancements.

For information, contact Bob Lundstrom in Oregon at 800-547-3930; fax: 503-271-5721; or circle **Reader Service 79.**

JDS

Jefferson-Pilot Data Presents Ambitious Plans For LMAs and Duopolies

MEMPHIS, Tenn. For more than 20 years, **Jefferson-Pilot Data Services** (JDS) has offered the JDS/1000 radio traffic services program. The JDS/1000 system provides complete applications for sales, traffic and accounting (including AP/GL).

JDS has ambitious plans for the radio market and key components of a recently announced new system include Salesline and Mini-Network.

Salesline is a series of front-end applications that provide sales departments a local area network. Orders are electronically moved from the proposal phase to the ordered, ready to be submitted for approval. Sales and accounting management receive these orders, approve or change them, and then electronically forward the orders to traffic. Once traffic okays the orders, they are electronically entered into the traffic system.

Mini-Network is JDS's name for all the unique applications that serve the needs of duopolies, LMAs, etc. These specialized applications address the growing need of managing multiple inventories, as well as provide management reports to track multiple sets of revenue.

For information, contact Susan Harris in Tennessee at 901-762-8000; fax: 901-762-8038; or circle **Reader Service 73.**

TM CENTURY

Ultimate Digital Studio II Combines Live-Assist, Automation and Editing Into Virtual Console

DALLAS The Ultimate Digital Studio II (UDS) from **TM Century** includes a user-friendly screen, which includes a large end-of-song countdown clock, a graphic time bar for each cut, note pads and linear, news weather and script windows.

A programmable "Hot Key" window allows instant playback of 10 pre-programmed cuts from a Computer Concepts DCS. An unlimited number of Hot Key windows can be assigned by name, and filed for use during different shows and applications.

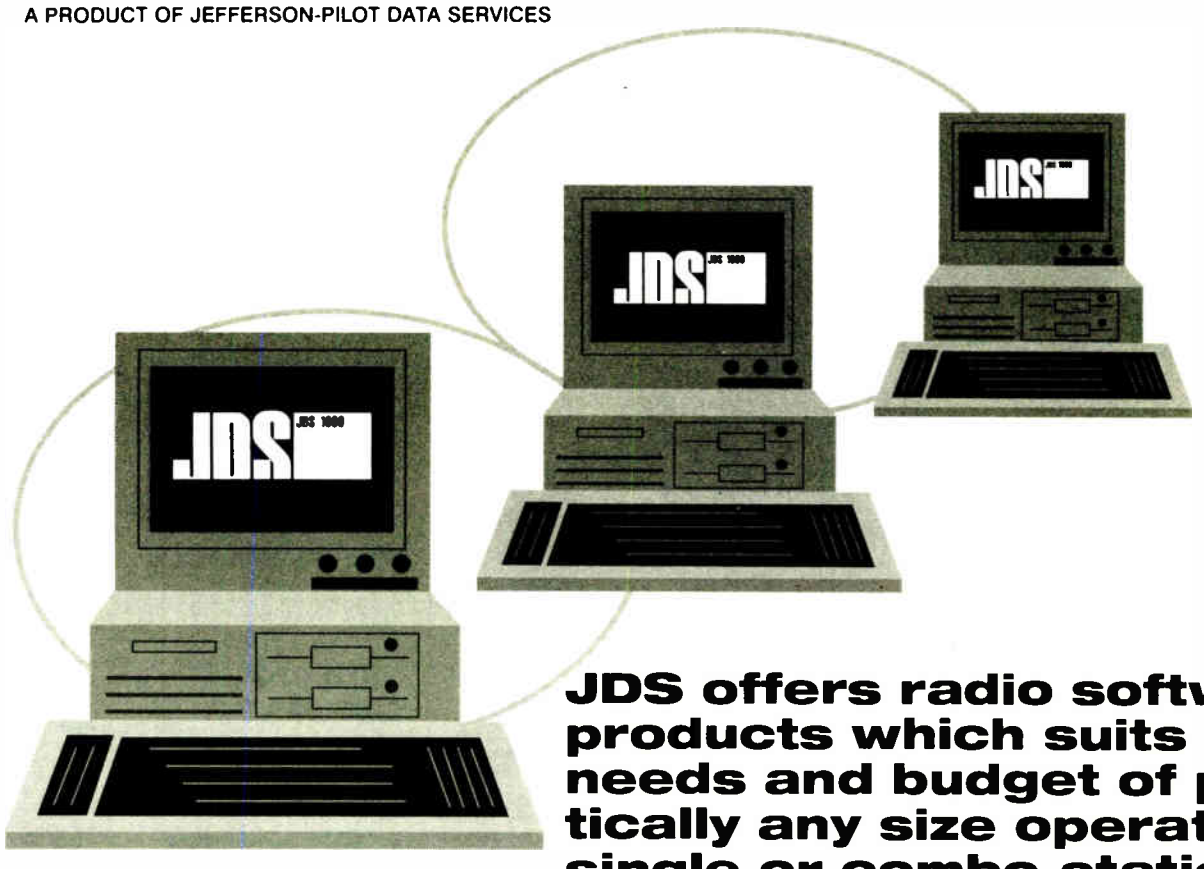
A mixer window gives the operator complete control of the A-4000 mixer, making the UDS II a virtual console. The A-4000 is rack frame that holds as many as 10 input cards, program output and optional audition output cards, serial control card and heavy duty power supply.

The UDS II is a hard disk audio system with CD control capability—an audio management system capable of interfacing with a wide range of CD jukeboxes and hard drive audio systems. The A-4000 controls incoming remote and satellite feeds.

The new hardware and software of the UDS II make it one of the most flexible systems on the market today. The TM Century philosophy is to provide a system that adapts to each customer's needs, without forcing the customer to adopt special or new scheduling software that may not be in the customer's best interests.

For information, contact TM Century in Texas at 800-TM Century; fax: 214-406-6890; or circle **Reader Service 195.**

JDS 1000
A PRODUCT OF JEFFERSON-PILOT DATA SERVICES



JDS offers radio software products which suits the needs and budget of practically any size operation, single or combo-stations, as well as radio networks. Radio clients can choose from a variety of software applications and IBM computer hardware, depending on your specific needs. Modular structure of both hardware and software make future expansion easy.

Call us to see for yourself how JDS 1000 can meet your business needs.

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Memphis, TN

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World Radio History

MILESTONE

SATX Software Helps Ensure Reliable Transfer of Data Files Including RDBS

RALEIGH, N.C. SATX software, designed by **Milestone Technologies Inc.**, transfers data files reliably over a wireless data broadcast network. It is designed for use with IBM and compatible PCs.

Potential applications for SATX include networks that use radio subcarriers or RDS/RBDS, digital broadcast satellites (DBS), TV subcarriers or VBI, and even some paging systems. With SATX, companies have all of the components at their fingertips to assemble their own data broadcasting networks, both hardware and software.

Files such as multimedia, digital audio and database files can now be broadcast reliably. With SATX, it is even possible to transfer entire software applications over a data broadcasting network.

According to the company, SATX's Thunderfile protocol is more robust than FEC (forward error correction) and can withstand long error bursts and multiple errors per file transferred. SATX also provides comprehensive history logs and error logs that provide details on performance and assist with troubleshooting.

For information, contact Miles Beam in North Carolina at 919-856-0700; fax: 919-856-8600; or circle **Reader Service 143.**

TAPSCAN

MusicSCAN Makes Music Scheduling Consistent and Rotation Smooth and Non-Repetitive

BIRMINGHAM, Ala. At the heart of the **Tapscan Inc.** MusicSCAN music scheduling software system is a unique scheduling process that produces consistent song rotations.

With MusicSCAN, songs always return to their original position in the card file after scheduling. By using this exclusive "Rolodex-type" scheduling method, artists and songs are always kept evenly spread out, so there is never a need to reshuffle the category.

This system naturally compensates for difficult-to-schedule songs, which are shoved to the back of the file in other systems.

MusicSCAN is network-friendly, runs under Windows on a 386-based processor with a 5MB hard drive and 4MB of RAM, and interfaces with virtually every digital storage and automation system available.

Behind the MusicSCAN software is Tapscan's service and support. Each and every MusicSCAN representative is a former radio programmer—familiar with the challenges of music scheduling. Telephone support is available toll-free 24 hours a day, seven days a week.

For information, contact Mark Schreiber in Alabama at 205-987-7456; fax: 205-733-6268; or circle **Reader Service 15.**

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READER SERVICE NO. 83

EZ RAZE Portable Antenna Mast

Transport the EZ Raze Antenna Mast in any size vehicle. Its five foot mast section easily fits into the trunk of most cars and this portable 25 foot free standing, self-supporting (no vehicle support or guy wires needed) antenna mast can be easily assembled by one man in five minutes.

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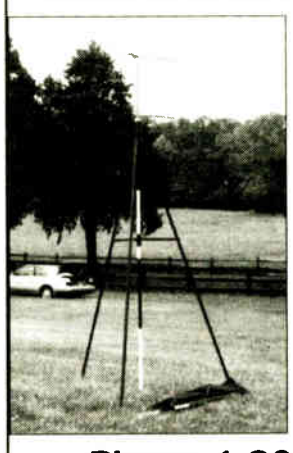

The EZ Raze Antenna Mast is omnidirectional. In just minutes, one person can erect a stable 25 foot antenna and you're ready to start broadcasting.

OLD STONE CORPORATION
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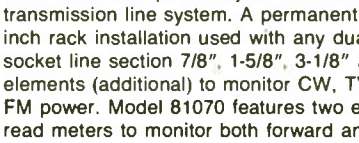
Phone: 1-800-538-4977

READER SERVICE NO. 219

Measure Up With Coaxial Dynamics Model 81070 WATTCHMAN Transmitter Protection System.

NEW! 4-1/16 and 6-1/8 series line sections and elements to add to our exciting line-up



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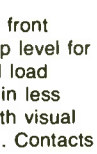

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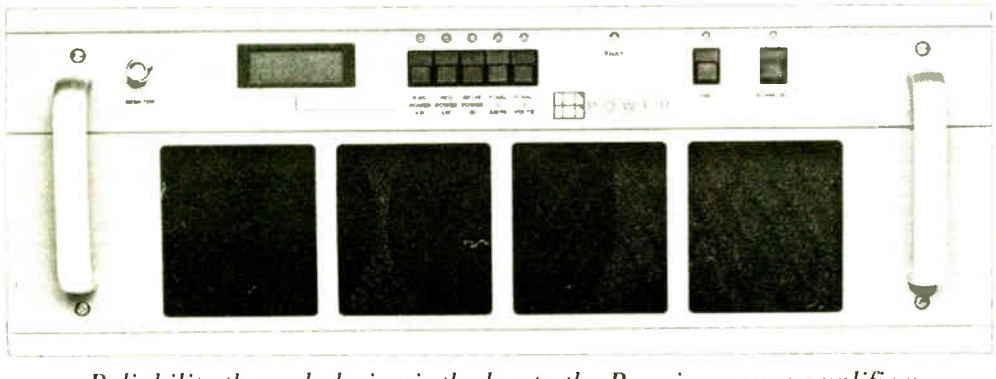

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World Radio History

LPB

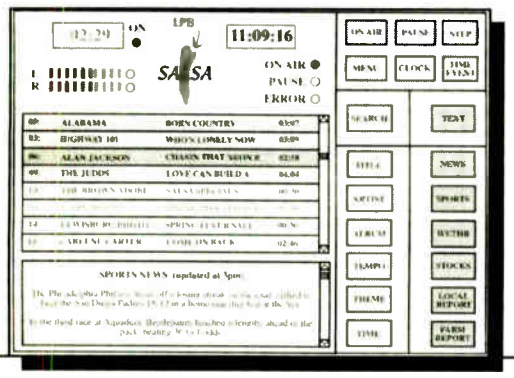
LPB SALSA System Spices Up Live Studio Assist and Satellite Automation Operations

FRAZER, Pa. LPB Inc. offers the SALSA—Satellite Automation and Live Studio Assist—automation system.

The standard SALSA live assist mode includes complete mouse control, full color and easy to understand graphics, six categories of user-configured data search and store, instant access or scheduled play for hard drive audio, and automatic identification of bad audio files—before they air. Satellite automation handles up to 15 separate stereo satellite networks, unlimited events/hours, delayed broadcast recording, 21 format clocks and eight control outputs for other sources or equipment.

The SALSA also features simultaneous record and play, stereo and mono, and audio overlap for live-sounding segues. SALSA overlap is user variable from 0.1 to 9.9 seconds in 0.1 second steps, for each song individually. A built-in historical log records everything that airs and when. And you get 24-hour support, 365 days per year.

A unique SALSA option is random access DDS-2 digital data storage tape, which holds 4GB on a tape the size of a DAT. SALSA can download from the DDS tape to the hard drive, without interrupting the on-air signal.



Other options include smart terminals, production terminals, DTMF remote control, CD automation and more.

For information, contact John Devecka in Pennsylvania at 610-644-1123; fax: 610-644-8651; or circle **Reader Service 125.**

DIGITAL LINK

User-Friendly Digital Audio Processor System Features Intuitive Controls

MIAMI The DAP digital audio processor system from **Digital Link Inc.** is designed for both live-assist and walk-away automation, and is very user-friendly.

The DAP system features an intuitive keyboard, touchscreen, mouse and JLCooper control. It uses a full range of compression algorithms, including ADPCM, ADPCME, Dolby AC-2 and MUSICAM ISO/MPEG Layer II. Additional features include graphic waveform editing; intelligent automatic crossfades; digitally controlled 12-channel dual output on-air mixer; multi-user support; and analog and digital I/O.

For storage media, DAP can use any mix of hard drives, removable/rewritable optical disk, DAT tape or any IDE- or SCSI-based digital storage.

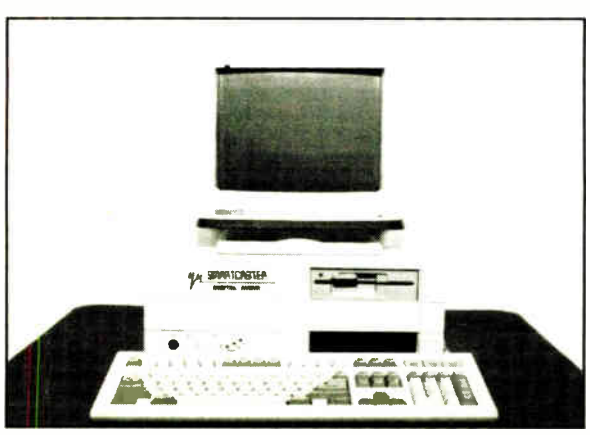
For live-assist operation, professional CD autochanger software control. The same software can perform satellite operation the same way. Intelligent crossfades and automatic time and weather reports help walk-away automation sound live.

For information, contact Carols Sarraff in Florida at 305-888-4883; fax: 305-888-0812; or circle **Reader Service 106.**

SMARTS

SMARTCASTER Makes Use of Multiple Compression Standards

EMMETSBURG, Iowa The SMARTCASTER digital audio system from **SMARTS Broadcast Systems** features Dolby AC-2 and apt-X compression algorithms for high digital audio quality.



The SMARTCASTER is capable of unattended record and playback of both short- and long-term programs, with the ability to insert spots. Simultaneous record, playback and audition of audio is also possible.

True local area computer networking of the studio to office, production and other studio computers is facilitated by the system, and it can connect to a variety of outside equipment via LAN networks, relay TTL voltages and RS-232.

Around the clock service and technical support from engineers, technicians and broadcast professions is available every day.

For information, contact SMARTS Broadcast Systems in Iowa at 800-747-6278; fax: 712-852-3061; or circle **Reader Service 114.**

DATACOUNT

DARTS System Designed for Any-Sized Market

OPELIKA, Ala. The DARTS—**Datacount** Accounts Receivable and Traffic Scheduling—computer software package encompass all aspects of logging, traffic, co-op, billing, accounts receivable and sales/management reporting.

Designed for all market sizes, DARTS is a PC-based system available in single and multi-user versions. The single user PC version offers a cost effective, full-featured system. In larger markets, the multi-user version offers expanded functions at a much lower cost than other mini-computer systems. It includes a five-year sales history report writer, rotating carts/media system, bulk bay and sales-rep commission reporting features. It is also one of the only traffic systems to offer inventory front-loading capabilities in a dynamic scheduling environment.

DARTS offers multiple data directories as well as true multistation billing to facilitate the operation of LMAs. Automation interfaces to major automation/digital suppliers are available as are exports to popular word processing and spreadsheet programs.

For information, contact Debbie Hamby in Alabama at 205-749-5641; fax: 205-749-5666; or circle **Reader Service 157.**

dbx

Compact, Powerful Mic Preamp from dbx

SAN LEANDRO, Calif. The **dbx** Model 760X microphone preamp delivers up to 60 dB of soncially transparent gain when matched with virtually any type of microphone. The half-sized single-rack-space unit is equipped with professional features, including polarity reverse and 48-V phantom power capabilities.

A clip LED function monitors clipping s brief as 10 milliseconds in duration. Independent two-channel operation facilitates stereo microphone applications.

It is designed for a variety of applications, including direct-to-DAT recording either in the field or in the studio, location recording, sample recording and for use as a performance upgrade for existing mic preamp stages in live sound mixers.

For information, contact J.X. Loeb in California at 510-351-3500; fax: 510-351-0500; or circle **Reader Service 74.**

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RADIO THE NAB SHOW
October 12-15,1994
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SCHAFER

Schafer Offers Italian Automation System

MARION, Va. **Schafer World Communications Corp.** searches the globe for the best technology—both hardware and software—and integrates it into a functional, broadcaster-friendly automation system.

The latest system available from Schafer is the Tiesseci TS35 digital studio, a full automation or super-flexible live-assist hard disk system that controls any type of equipment. The system includes up to 15 control terminals, touchscreen, complete remote control interface, multiple audio outputs for LMAs.

The TS35 includes music scheduling and program/traffic management software, or you can import your present traffic system log information.

In the live mode, the TS35 is like a 1,000 channel mixing console with the possibility of selecting all music, jingles, spots, etc. with a touchscreen. The TS35 is also ready when you want to send data via RBDS.

For information, contact Bob Dix in Virginia at 703-783-2000; fax: 703-783-2064; or circle **Reader Service 122.**

dbm

CartWorks Easy to Use

JACKSON, Miss. CartWorks was designed by **dbm Systems Inc.** for use by broadcasters. Its uncluttered screens look and operate like traditional broadcast equipment, greatly reducing training time.

Audio is stored either uncompressed or with apt-X 4:1 digital compression, with sampling rates from 8 to 48 kHz. The CartWorks' switcher is a 12-channel stereo audio or machine control switching. Multiple audio busses are possible. It interfaces with tape machines, satellites or anything controllable by relay contacts. Twelve optically isolated logic inputs for sensing satellite tone closures, EOM, etc. are also included.

CartWorks automates both music and talk satellite formats and allows for multiple networks. Simultaneous play and record are standard, as are time-delay background recording and playback.

For information, contact George Thomas in Mississippi at 601-982-1062; fax: 601-362-1905; or circle **Reader Service 39.**

RDS

The Phantom Provides Easy Live and Automated Operation

PERRY, Ga. The Phantom from **Register Data Systems** (RDS) is a complete, self-contained digital audio automation system for use with both live-assist operation and the automation of satellite program sources.

Standard features include true simultaneous record during playback; multiple compression options, including Dolby AC-2; a user-friendly menu-driven interface; and multiple storage capacity options.

Advanced features include dynamic spot-retiming for exact fit of spots into breaks, automatic timer recording for recording news or syndicated program feeds from satellite or other sources as well as a host of other scheduling functions.

The system imports logs from RDS and other traffic and billing systems. It also can be optionally configured to integrate with existing CD automation systems, eliminating cart- and reel-based systems.

New optional accessories for 1994 include removable backup hard drives. When this option is selected, both hard drives are mounted in front-loaded removable trays. Also new is a remote control interface allowing off-site computer control of the Phantom via a modem link.

For information, contact Brad Harrison in Georgia at 800-521-5222; fax: 912-987-7595; or circle **Reader Service 1.**

Digital Magic from Wizard

▶ continued from page 60

saved and reused with later projects.

The Wizard Digital Reel-to-Reel workstation is a basic audio record/play terminal, similar to the Control workstation. It is used for basic recording, dubbing and editing as in a production room or newsroom. It is different in that it can be set to record audio unattended either by an external cue or at a specific time.

Up to 16 audio sources can be programmed for timed access and automatic recording. One of the more common uses is for recording network feeds or even full network programs.

In the case of network programming, the Wizard system also records the network cues for commercial breaks and inserts them later on playback to cue itself to play local spots.

Flexibility

The flexibility of the Wizard system impresses me greatly. Unlike some other broadcast automation systems, Wizard for Windows is not locked into a narrowly based hardware/software platform. There is virtually no station format that it cannot accommodate right out of the box.

Furthermore, there have been many occasions when I wished a particular feature, function or report could be implemented in the system. Usually within a day of expressing my wish to Prophet Systems' technical support, the Wizard operating system would be modified via modem to include the changes I requested. Try getting that kind of service and support from any other broadcast automation supplier.

Other features of Wizard for Windows include a fully integrated copy system. Live copy is entered at any terminal and displayed in the production and control rooms. When live spots appear on the log in the control room, they are automatically displayed on-screen for the announcer to read.

Touch pad

The Button Bar accessory is a touch pad with 24 programmable keys assignable to 24 different audio files. It is like having 24 cart machines on stand-by for instant play. Up to 99 different 24 key programmed sets can be programmed into the system for a total of 2,376 preprogrammed audio files playable on demand.

The Voice Track Module is a unique tool for programming an automated music format ahead in time and having it sound perfectly live.

Assuming a music sweep scenario with a back/pre-announce of the music, or just a station liner, it would work like this: You first cursor ahead on the program log to the song you want to talk out of and specify how far back from the end of the song to being the drop-in. Then select how far into the beginning of the next song the vocal or liner should run.

Once this slice of time is defined, you can play it back while simultaneously recording the voice track into the system. After recording, you can listen back to the two songs segue with your voice and readjust your voice in time, relative to the music, for precise placement.

The system automatically inserts the voice track on the log with the scheduled songs and then plays them as recorded. With this feature, it is possible to prerecord a four-hour air shift in 15 to 20 minutes and to have it sound perfectly live.

These days it is rare to find a product or service that actually performs as advertised. Usually surprises hidden by the advertising hype and fine print jump right out and bite you once the purchase is made. Wizard for Windows performs flawlessly as advertised, and then some.

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For information from Prophet Systems, contact Kevin Lockhard in Nebraska at 800-658-4396; fax: 308-284-3517; or circle **Reader Service 187.**

Audisk Suits Complex Setup

▶ continued from page 59

allows us to do anything with any PC on the Lantastic network from anywhere. Using terminal emulation, anyone can be just like they are sitting at the terminal in the studio.

Auto-jock

The addition of Audisk to our station basically allowed us to add a third radio station without adding a lot of new employees. Our newest station uses an auto-jock format. Existing employees—for example copywriters with on-air experience—take 30 minutes to cut the "live" breaks for their five hour shows. Because it is locally produced every day, it sounds completely live.

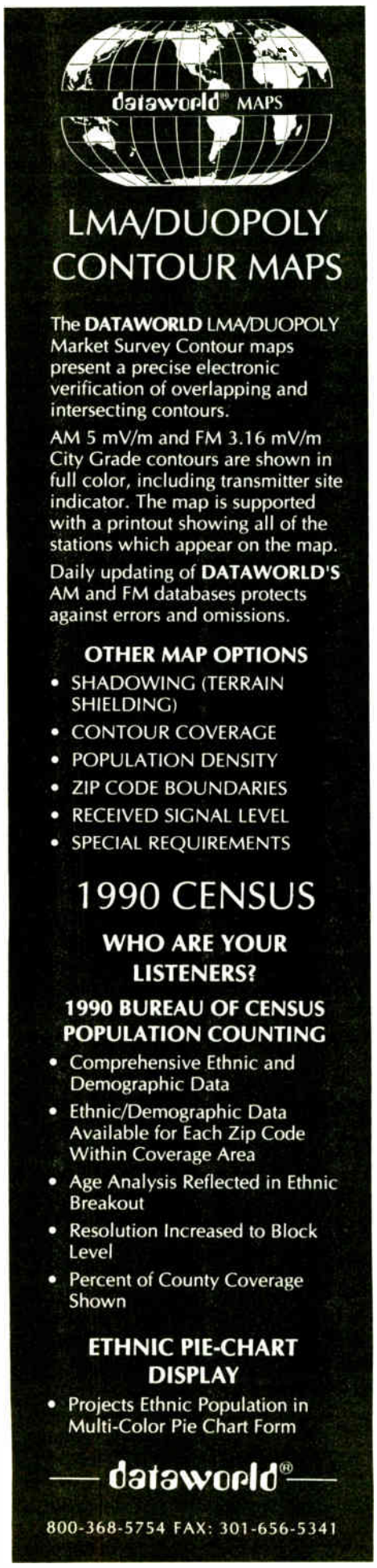
Audisk also handles automation of satellite programming very well, a feature we use with our AM station at night and on weekends.

Because we were one of the first stations to use LAN mirroring, we did have some problems with system lock-ups early on. But Tim Balley was very good to work with in straightening out the system.

There are a lot of digital systems on the market, and the decision of which one to buy is not an easy one. Overall, we have been very pleased with our choice of the Audisk. I was amazed at how quickly and easily our DJs learned to use the system. Its many features and overall user friendliness are hard to beat.

□□□

For information on the Audisk, contact John Haronian at Harris Allied in Indiana at 317-962-8961; fax: 317-962-8961; or circle **Reader Service 138.**



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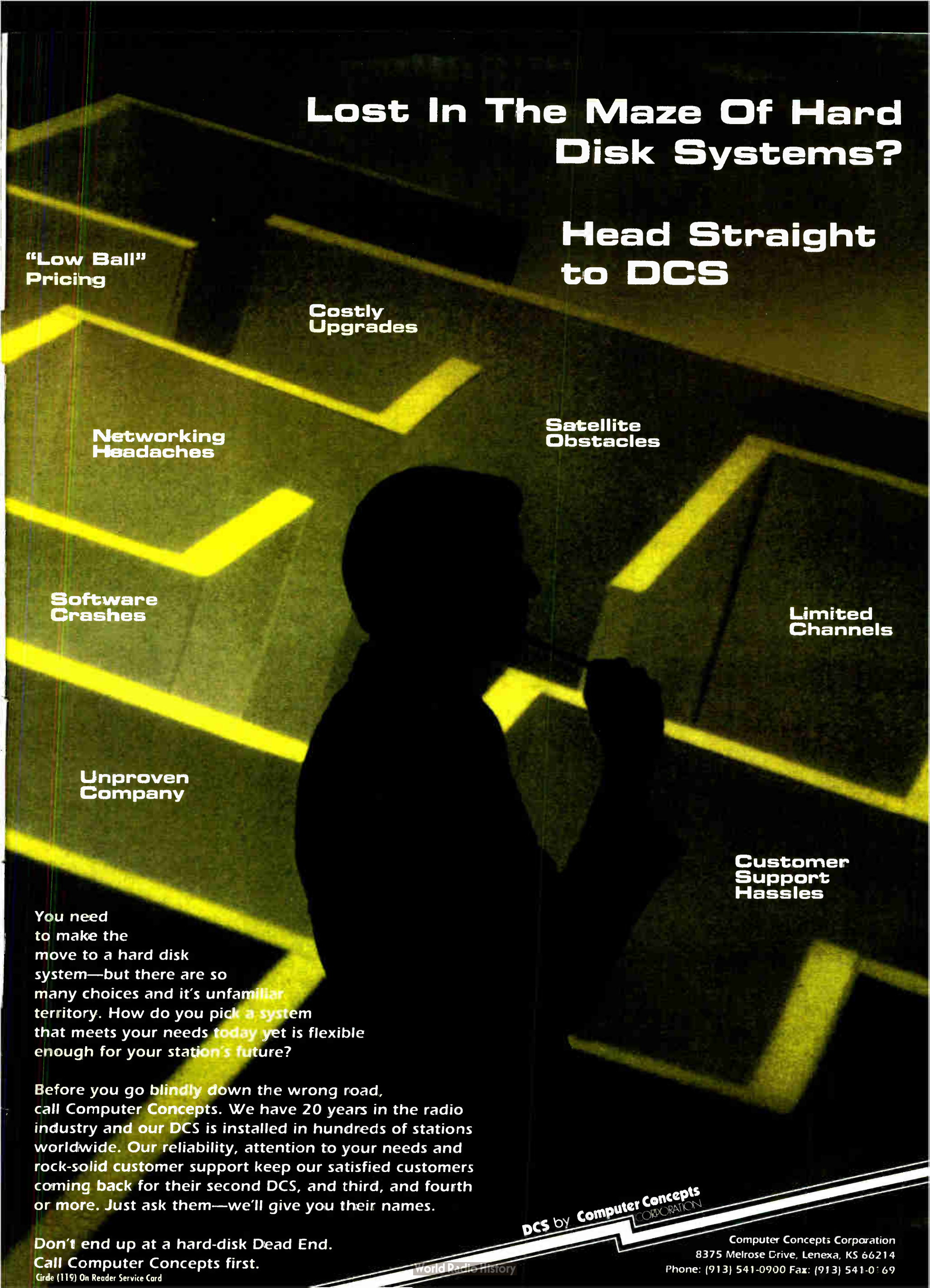

You need to make the move to a hard disk system—but there are so many choices and it's unfamiliar territory. How do you pick a system that meets your needs today yet is flexible enough for your station's future?

Before you go blindly down the wrong road, call Computer Concepts. We have 20 years in the radio industry and our DCS is installed in hundreds of stations worldwide. Our reliability, attention to your needs and rock-solid customer support keep our satisfied customers coming back for their second DCS, and third, and fourth or more. Just ask them—we'll give you their names.

Don't end up at a hard-disk Dead End. Call Computer Concepts first.

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World Radio History

TECHNOLOGY UPDATE

900 MHz breakthrough!

New technology launches wireless speaker revolution...

Recoton develops breakthrough technology which transmits stereo sound through walls, ceilings and floors up to 150 feet.

Breakthrough wireless speaker design blankets your home with music.

By Charles Anton

If you had to name just one new product "the most innovative of the year," what would you choose? Well, at the recent *International Consumer Electronics Show*, critics gave Recoton's new wireless stereo speaker system the *Design and Engineering Award* for being the "most innovative and outstanding new product."

Recoton was able to introduce this whole new generation of powerful wireless speakers due to the advent of 900 MHz technology. This newly approved breakthrough enables Recoton's wireless speakers to rival the sound of expensive wired speakers.

Recently approved technology. In June of 1989, the *Federal Communications Commission* allocated a band of radio frequencies stretching from 902 to 928 MHz for wireless, in-home product applications. Recoton, one of the world's leading wireless speaker manufacturers, took advantage of the FCC ruling by creating and introducing a new speaker system that utilizes the recently approved frequency band to transmit clearer, stronger stereo signals throughout your home.

Crisp sound throughout your home. Just imagine being able to listen to your stereo, TV, VCR or CD player in any room of your home without having to run miles of speaker wire. Plus, you'll never have to worry about range because the new 900 MHz technology allows stereo signals to travel over distances of 150 feet or more through walls, ceilings and floors without losing sound quality.

One transmitter, unlimited receivers. The powerful transmitter simply plugs into an audio-out, tape-out or headphone jacks or our stereo or TV component, transmitting music wirelessly to your speakers or headphones. The speakers plug into an outlet. The one transmitter can broadcast to an unlimited number of stereo speakers and headphones. And since each speaker contains its own built in receiver/amplifier, there are no wires running from the stereo to the speakers.

Full dynamic range. The speaker, mounted in a bookshelf-sized acoustically constructed cabinet, provides a two-way bass reflex design for individual bass boost control. Full dynamic range is achieved by the use of a 2" tweeter and 4" woofer. Plus, automatic digital lock-in tuning guarantees optimum reception and eliminates drift. The new technology provides static-free, interference-free sound in virtually any environment. These speakers are also self-amplified; they can't be blown out no matter what your stereo's wattage.

Stereo or hi-fi, you decide. These speakers have the option of either stereo or hi-fi sound. You can use two speakers, one set on right channel and the other on left, for full stereo separation. Or, if you just want an extra speaker in another room, set it on mono and listen to both channels on one speaker. Mono combines both left and right channels for hi-fi sound. This option lets you put a pair of speakers in the den and get full stereo separation or put one speaker in the kitchen and get complete hi-fi sound.

These wireless stereo headphones have a built-in receiver.

Factory direct savings. Because of our commitment to quality and our factory direct pricing, we sell more wireless speakers than anyone! For this reason, you can get these speakers far below retail with our 90 day *"Dare to Compare"* money-back guarantee and full manufacturer's warranty. Through this limited time offer, the Recoton transmitter is only $69. It will operate an unlimited number of wireless speakers priced at only $89 and wireless headphones at $59 each. So take advantage of this special offer to fill your home with music. Your order will be processed in 72 hours.

Recoton Transmitter.....**$69** $4 S&H

Wireless products compatible with the Recoton transmitter:

Recoton Wireless Speaker.....**$89** $6 S&H

Recoton Wireless Headphones.....**$59** $4 S&H

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150 foot range through walls!

Recoton gives you the freedom to listen to music wherever you want. Your music is no longer limited to the room your stereo is in. With the wireless headphones you can listen to your TV, stereo or CD player while you move freely between rooms, exercise or do other activities. And unlike infrared headphones, you don't have to be in a line-of-sight with the transmitter, giving you a full 150 foot range.

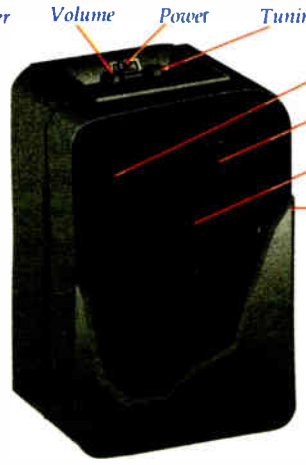
The headphones and speakers have their own built-in receiver, so no wires are needed between you and your stereo. One transmitter operates an unlimited number of speakers and headphones.

Recoton's transmitter sends music through walls to wireless speakers over a 75,000 square foot area.

AWARD WINNING WIRELESS SPEAKER

Built-in receiver and amplifier:

The wireless speaker and headphones both contain a built-in receiver and amplifier. Signals are picked up and transmitted as far as 150 feet away through walls without the use of wires.



Size: 9"H x 6"W x 5.5"L
Signal-to-noise ratio: 60 dB
Channel Separation: 30 dB
Two-way bass reflex design
10 watts/channel RMS amps
Frequency Response: 50 Hz-15 KHz

Don't take our word for it. Try it yourself. We're so sure you'll love the new award-winning Recoton wireless speaker system that we offer you the **Dare to Compare Speaker Challenge.** Compare Recoton's rich sound quality to that of any $200 wired speaker. If you're not completely convinced that these wireless speakers offer the same outstanding sound quality as wired speakers, simply return them within 90 days for a full "No Questions Asked" refund.

Recoton's Design and Engineering Award

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BGW Systems 750C pro pwr amp. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

Crown power amp, silver face, $275. B Wilson, 4400 Old Lebanon Rd, Campbellsville KY 42718. 502-789-1505.

Radix TP500 preamp; Microtrak 6405 preamp, BO. M Comfort, WQNN, 3405 Frontage Rd, Columbus MS 39705. 601-328-7124.

RTS-405 stereo preamp (2), used 6 mos, $140 ea + shipping. B Lord, Lord Bdcting Co, 13313 SE 208th, Kent WA 98042. 206-631-2374.

BGW systems professional pwr amp. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

Gates tube type, 2 mic mixer, RCA MI 9358, Best Offer. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Dynaco stereo 120 solid state, rack mt $229, Dynaco stereo 70 tube amp all new tubes! Dynaco PAT 4 preamps $59. W Gunn 619-320-0728.

New 10 kW FM amp under $24,000. Call for details. Bill Hoffman, 518-743-1601.

Want To Buy

Marantz Model 1, audio consolette preamp, single or pair, and model 6 stereo adapter. P Chance, Imperial Analog, 925 Clinton St, Philadelphia PA 19107. 215-574-8147.

Mc60 single or pair; US 6550's tubes, Coke bottle shape pref, other audio tubes needed. R Glenn, WJGR, 1718 Shenandoah Dr, Wimauma FL 93598. 813-634-1940.

ANTENNAS/ TOWERS/CABLES

Want To Sell

Andrew LDF7-50A, 1-5/8" coax, (4) lengths of 245 feet & 3 lengths of 265 feet, $5.00/ft. Andrew JH-50A, 1-5/8" coax, several at 310 feet, $7.25/ft. Andrew LDF2-50, 3/8" coax. Any length, $0.85/ft. J. Mussell, 1421 Bay Ave., Santa Maria, CA 93454. 805-922-7775.

Jampro 2 bay, on 99.3, 300' Andrew coax with 1 5/8" connectors; Rohn 55, 300' tower, still erected. D Denver, KUTT, 414 4th St, Fairbury NE 68352. 402-734-5521.

Pirod tower light control, needs work. F Nienow, WYTE, POB 1030, Stevens Point, WI 54481. 715-341-8838.

Scala CA series, low power, 4 bay TV antenna for channel 2, includes cable harness & pwr divider. P Delaney, RR2 Box 106A, Lacrescent MN 55947. 507-875-2065.

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Andrews 1 5/8 coax, 300', incl 2 EIA flanges, $1800; 7/8 coax 265', $780 cash or bank check. C Sigmon, WBZK-AM, POB 398, York SC 29745. 803-684-4241.

FMH ERI 8 bay FM, tuned to 96.9, incl mounting brackets, $10,000. S Smidt, KELO, 500 S Phillips, Sioux Falls SD 57102. 605-331-5350.

STL; FM xmtr, 3-bay 93.1; exciter; RPU. R Osborne, WMOV/WFYZ, Box 667 Ravenswood WV 26164. 304-273-2544.

Kintronic FMC 7.5 iso-coupler, FM 98.5 & AM 1350, $1200; Jampro JLCP 3 bay, tuned to 98.5, $2000. M Basso, KCAR/KGAP, Clarksville TX. 903-427-3861.

ERI G5CPS 12 bay center fed, exc cond w/300', 3 1/8" coax. G Hofer, KJLT, POB 709, N Platte IN 69103. 308-632-5515.

UTC 120 180' guyed twr, beacon, side lights, tuning unit, lighting chokes, diode unite, 0-5 amps, electric eye, etc, still standing, you dismantle & ship, BO. J LoPresti, WGSR, 111 Avalon Dr, Warner Robins GA 31093. 912-929-4904.

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Andrew H59-50, 5" coax, 500' on spool in Brooklyn IA, BO. R Henry, WPIO, Box 6501, Titusville FL 32782. 407-267-3000.

Want To Buy

Low power stand-by FM antenna, tuned to 94.3. B Campbell, KRIG, 918-333-7943.

LAPP insulator Push/Pull 9861 casting needs to be good, not porcelain. D Mance, WATN, 199 Wealtha Ave, Watertown NY 13601. 315-782-1240.

AUDIO PRODUCTION

Want To Sell

360 Systems AM 16/E audio routing switcher 16x16 expansion unit, $495; Studer Dyaxis, 2-chnl digital audio processor unit, cond unknown, $495. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

dbx 150x (4), $100 ea. G Anderson, GEE Wizz Prod, 2005 Laurel Lane, Plano TX 75074. 214-423-2005.

AccessIt signal processing rack (4), mono compressor, reverb & bal/unbal DA w/ps in 2 sp, rk mt, w/some manuals, VGC, $155. S Hoffman, Sounds Impossible, 7109 NW Birch Pl, Lawton OK 73505. 405-536-0559.

AKAI S1000 16 bit digital stereo sampler, 2 meg RAM expandable to 32 meg, $1994; AKAI S950 12 bit digital sampler, 750k RAM expandable to 8 meg, $985. Dave, 317-846-7768.

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Burwen TNE 7000A transient noise eliminator for records, 2 sp rk mt, exc cond, some corrosion on RCA jacks; works perf, manual, $195 + shipping. S Hoffman, Sounds Impossible, 7109 NW Birch Pl, Lawton OK 73505. 405-536-0559.

KLH DNF 1201A dynamic noise filter, stereo, $50. G Haltman, Haltman Media Svcs, 300 Limpy Creek Rd, Grants Pass OR 97527. 503-474-6466.

Orban 674A stereo EQ, graphic & pan, $300. G Haltman, Haltman Media Svcs, 300 Limpy Creek Rd, Grants Pass OR 97527. 503-474-6466.

Auratone RT 5V 2 way rack mt monitor speaker sys new in box, $75. D Tonelli, Aquarius Audio, 679 Calmar Ave, Oakland CA 94610. 510-444-3094.

Eventide 1745m (6), digital delay lines, 3 in working order, 3 outs & pitch, 3 not working, $300 ea working, $175 ea not working. S Russell, Russell Stud, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

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Orban 245-E stereo synthesizer, $415 cash or bank check. C Sigmon, WBZK-AM, POB 398, York SC 29745. 803-684-4241.

Sennheiser wireless infrared stereo headphones & xmtr, little use, work great, $99; dbx 4BX dynamic range expander, perfect shape, $250. R McMillen, Super Duper Audio Duplicating, 1634 SW Alder St, Portland OR 97205. 503-228-2222.

ADC 96 & 144 Pr TT patchbays, excel cond, 1 rack space, 3 rows of 48, top 2 rows normalled, $149, 96 is 2 row normalled, $129 (you remove old wiring) or we totally refurbish w/new front panel, ready to install, $199-229. TT cords up to 10 per bay at $9 ea, reg $13.95, also 1/4" bays. Audio Village, 619-320-0728, or Fax 619-320-2454.

Orban 672B; Orban 622B; Orban 424A. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Demeter 4 ch rack mt tube direct box NEW $795. W Gunn 619-320-0728.

Want To Buy

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AUTOMATION EQUIPMENT

Want To Sell

SMC Otari (3), R-R, PB w/built-in tone sensor. R Statham, WHLG, 1000 NW Alice Ave, Stuart FL 34994. 407-692-1000.

BE Control 16 brains w/audio switchers (2); Otari ARS 1000 R-R in exc cond (5); working SMC Sonomag Carousels (2); SMC Sonomag Carousels good for parts (3); ITC triple stacker cart machine w/R/PB; ITC triple stacker w/PB only, cabinets included. M Jones, WZKB, POB 520, Wallace NC 28466. 910-285-4900.

Cetec 7000 Level 2, 5046 event memory, terminal, source cards, 4 350 series Carousels, 3 250 series Carousels, 1 Audiofile, 2 ITC 760 R-R play decks, all $2500 or will sell parts. E Moody, KJEM/KESE, 216 N Main, Bentonville AR 72712. 501-273-9039.

MEI Control 3; MEI-Satmaster; MEI 100MP24; MEI 100MP48. E Monskie, WLPA/WROZ, 1996 Auction Rd, Manheim PA 17545. 717-653-0800.

IGM RAM stereo automation cntrlr with 4096 events of memory, clock, silence sense, 9 audio inputs, 4 random access Carousel cards, manuals; stereo 350 (4), random access. F Nienow, WYTE, POB 1030, Stevens Point, WI 54481. 715-341-8838.

Automated Bdct Cntrls, incl audio controller, decoder mem controller, pwr sup, gd for parts, $400/BO. S Carter, WJNT, 1985 Lakeland Dr, Ste 212, Jackson MS 39216. 601-366-1150.

ESP-1 automation system with brain, DS-20 switcher, bi-directional Carousels (4), PDC digital clock, power supply, encoder with 2 mono video monitors, printer, no racks. R Statham, WHLG, 1000 NW Alice Ave, Stuart FL 34994. 407-692-1000.

IGM Instacarts 48 tray, mono (2) w/direct access MOS programmer w/manuals, $600. N Lyda, WHKP, POB 2470, Hendersonville NC 28793. 704-693-9061.

SMC, Otari R-R (3), DP-2, PDC 5 clock, DS-20 switcher, mono PB units (2); 350 RS Carousels (3), working when removed, $1800/all or will part out. V Richardson, WWST-FM, 8419 Kingston Pk, Knoxville TN 37919. 615-693-1020.

SMC MSP-12 inc DAS-12 audio switcher; 721 dual play cart decks (2); 450 Carousels (2); upright SMC racks (2); power supply; keyboard & monitor, all manuals inc, $4800/BO. R Freeman, KSEK, 1604 E Quincy, Pittsburg KS 66762. 316-232-1340.

SMC 25 Hz tone gen; SMC 25 Hz tone decoder. R Statham, WHLG, 1000 NW Alice Ave, Stuart FL 34994. 407-692-1000.

Want To Buy

NBC/Mutual tone decoder wanted. J Condon, WKDR, 388 Shelburn Rd, Burlington VT 05401. 802-862-8255.

CART MACHINES

Want To Sell

BE 2100, stereo R/P; ITC Delta 3 deck, stereo, R/P, w/ secondary & tertiary tones. F Nienow, WYTE, POB 1030, Stevens Point, WI 54481. 715-341-8838.

Gates Cartritape II, R/P deck, $300, PB deck, $200. E Moody, KJEM/KESE, 216 N Main, Bentonville AR 72712. 501-273-9039.

ITC 706 PB decks (2), $250 ea or $400/both. E Moody, KJEM/KESE, 216 N Main, Bentonville AR 72712. 501-273-9039.

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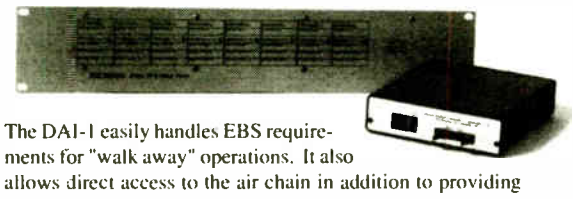

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World Radio History

CART MACHINES...WTS

ITC Delta R/P stereo, exc cond, $1500. C Scherer, WZAK, 216-621-9300.

ITC 99B stereo RP elsa (4); Audicord Moducart 100; ITC Delta stereo record amp. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

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ITC misc spare circuit boards, transformers & parts, reasonable prices. D Tonelli, Aquarius Audio, 679 Calmar Ave, Oakland CA 94610. 510-444-3094.

ITC mono R/P (2); ITC stereo R/P (2). R Statham, WHLG, 1000 NW Alice Ave, Stuart FL 34994. 407-692-1000.

Tapecaster X-700, X-700RP, (3) stereo, $200; 1 R/P in good condition, $300. K Carpenter, KPGM, 601 W Collins, Casper WY 82601. 307-266-4003.

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

Scully 8300 triple decker, mono play, $750. M Basso, KCAR/KGAP, Clarksville TX. 903-427-3861.

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Broadcast Electronics 3200 original cover. D Green, KTCU, POB 30793, Ft Worth TX 76129. 817-921-7630.

ITC, BE, Fidelipac cart machines: single, triple, mono, stereo, play & record/play. Call M O'Drobinak @ 619-758-0888.

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Want To Sell

MCI solid state w/sync designed to replace tube type electronics on Ampex, etc (8), $150 ea. T Boddie, 12202 Union Ave, Cleveland OH 44105. 216-752-3440.

Nagra 4.2L, mono rec w/crystal sync, $4200. P Koch, Koch/Marschall, 4310 N Mozart, Chicago IL 62618. 312-463-4010.

Otari DP 4050-0CF duplicator w/MCI 1/4"- 1/4 trk rec, Dolby B encoder, 6 units in one pass, 80/hr. C Hertzburg, Kinura Records, Box 860236, Miami Springs FL 33166. 305-887-5329.

Sony DAT DTC 75ES low hours, $500; Teac test tape 15 ips, 1/2", $45; MRL test tape, 15 ips, 1/4", $25. D Kocher, Digital Sound Makers, 1901 Hanover Ave, Allentown PA 18103. 610-776-1455.

Recordex 6 cassett rewinder $100; Tascam 40-4 4 track 10" in flight case with free dbx $750; MRL new short test tapes $39 for 1/4' to $199 for 2". W Gunn 619-320-0728.

Tascam 38, 8 trk, 1/2" open reel, $1100. P Cibley, Cibley Music, 138 E 38th St, New York NY 10016. 212-986-2219.

Ampex 351, $300 cash or bank check. C Sigmon, WBZK-AM, POB 398, York SC 29745. 803-684-4241.

Ampex 351 tube stereo hi-speed; Tascam 40-4; Technics 1520. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Otari MX 50/50 Mark III-8, 8 trk, mod from rack mt, w/manual, $1500. G Anderson, GEE Wizz Prods, 2005 Laurel Lane, Plano TX 75074. 214-423-2005.

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Teac X-2000R (3) R-R mac, 10.5" reels, 1/4 trk stereo, dbx I NR autoreverse, $600 ea/$1500 all 3 + shipping. WDFH-FM, 21 Brookside Ln, Dobbs Ferry NY 10522. 914-693-3963.

Telex 36 NAB cart deck w/rack mt, new factory boxes, no electronics, $100; Telex 36 in cabinet, no electronics, $35; PB amp for above, $25. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

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Otari 5050 MK III-8 track, heads excellent, $2450. Wayne Gunn 619-320-0728.

NAGRA 4 SL, sync recorder, exc cond, $5000. D Scales, 3142 Market Place, Bloomington IN 47403. 812-339-4446.

Otari Mark II-IV 1/2" 4-track, multi-track, mint, less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

16 track 2" $3450, MCI JH110C-8 $2800, 110C-8 play only $500, ATR800 mono or Tascam 7300 or 2502 $600 each, MCI Locator III $1195, Tascam 52 2 track $1200, Ampex AG350 electr $50/ch. W Gunn 619-320-0728.

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Ampex ATR-800 4-track 1/2" R-R, needs repair or use for parts, BO; Symetrix 108 telephone syst. T Rusk, KSSN-KMVK, POB 96, Little Rock AR 72203. 501-227-9696.

Otari MTR-12, 4 trk, 1/2", exc cond, tape inc, BO. B Webster, WLIT, 150 N Michigan Ave, Chicago IL 60601. 312-329-9002.

Viking 76 mono 7" open reel deck, $35; Tape-Athon 707-7 & 10 R-R with auto reverse, one 7", one 10", also spare parts, $35; 10" tapes, mono circa 1970, 6 hour/reel, $5 ea. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

Scully '100' recorders, record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 4646 Hounds-haven Way, San Jose CA 95111. 408-363-1646.

Want To Buy

Concertone 90-2, deck or capstan motor, need 2 speed, 7.5-15 ips, prefer complete deck in good condition. T Boddie, 12202 Union Ave, Cleveland OH 44105. 216-752-3440.

Alesis ADAT, in perf cond. W Whitney, POB 2411, Overland MO 63114. 314-428-8430.

Otari 5050BII remote control. M Harrington, POB 7610, Little Rock AR 72217. 501-223-9056.

TEAC A-3300 SX, 2 track; also RC-120 remote control unit. D Palmer, Dynamic Sound Productions, POB 239, Isleboro ME 04848. 207-734-6484.

Ampex tube recorders and mixers. W Gunn, 619-320-0728.

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

Tascam 58 1/2" 8 track wanted to buy or trade for Otari 5050 MK III-8 or...? Wayne Gunn 619-320-0728.

CD PLAYERS

Want To Sell

Denon 950F (2), $300 ea. N Doshi, WQCD, 220 E 42 St, New York NY 10017. 212-210-2775.

Denon DCM 950; Shure D600. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

IBM RT-PC 60 programs, adv operating interactive systems, will trade. R Suracci, Fine Art Prods, 67 Maple St, Newburgh NY 12550. 914-561-5866.

Want To Buy

Apple 660AV or 840AV; Amiga 4000. R Suracci, Fine Art Productions, 67 Maple St, Newburgh NY 12550. 914-561-5866.

COMPUTERS

Want To Sell

Creative Labs Sound Blaster 16 ASP, 16 bit sound card for IBM PC's, $125. P Cibley, Cibley Music, 138 E 38th St, New York NY 10016. 212-986-2219.

Exabyte EXP-8200 2.5 gig DAT tape drive for backup, 5 1/4" SCSI-2 drive, $495. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Hewlett Packard, Compaq, Hyundai 286 PC's (25), w/1 mb RAM and monochrome monitors; various dot matrix printers, modular active hub, other accessories avail; will sell in bulk or individually, BO. S Kornblum, WRRK, 7 Pkwy Center, Pittsburgh PA 15220. 412-922-9290.

Want To Buy

Tandy 6000HD w/at least 1 floppy drive. Mel Crosby, 408-363-1646, FAX 408-363-0957.

CONSOLES

Want To Sell

Collins IC-10A, gd cond, $2000. Barry, KWMT, Box 578, Fort Dodge IA 50501. 515-576-7333.

Ramko DC5RA 5 chnl, mono, rk mt, comp w/all parts, non wkg, exc cond, $50 + shipg; JBL 5600-2B, 6x1 mono rk mt, w/4 bal mic plug-in xfmres & bal out xfrmer, gd cond w/schem, $75 + shpg. S Hoffman, Sounds Impossible, 7109 NW Birch Pl, Lawton OK 73505. 405-536-0559.

Altec Lansing 250 SU 10 chnl tube type, can be wired for stereo w/manual, $300. N Lyda, WHKP, POB 2470, Hen-dersonville NC 28793. 704-693-9061.

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Arrakis Modulux counters, 4 studios, short U, Long-L (2), Unbalanced U, can be reconfigured, BO you pick up. E Monskie, WLPA/WROZ, 1996 Auction Rd, Manheim PA 17545. 717-653-0800.

Fostex 2016 line lvl mxr, or aux effects mxr, new, $125. D Tonelli, Aquarius Audio, 679 Calmar Ave, Oakland CA 94610. 510-444-3094.

Harris Medalist Gold 12 chnl, current mod w/manual, (2); Sparta spot mono board. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

WE 23C 5 chnl console. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Newcomb KX6A tube 6x1, 5 low imp mic ins, 600 ohm bal out, rack mt, $35. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

Ramsa WRTM20, 20x8-2, 8 buss out, 3 band EQ, 4 sends, pgm mis talkbacks, exc cond, $2000/BO. E Sperry, 53 Ann St 2nd Flr, New York NY 10038. 212-732-9316.

TOA R5A-216 16 chnl w/4 mono amps avail for main & monitor mixing, exc cond, $1200. B Wilson, 4400 Old Lebanon Rd, Campbellsville KY 42718. 502-789-1505.

Yamaha PM1000, 16 input, 12 echo send, 4 monitor, 4 buss output, gd cond, w/book & stand, $1200/BO. Bernie, TV-50, 890 San Marcus Ln, Duarte CA 91010. 818-303-7161.

Ramko DC5AR 5 channel mixers, vgc, $175 each. 916-725-2434.

Want To Buy

Collins-Rockwell audio rock 10 cue monitors, or comp console for parts. T Hodgins, 14 E Main St, Walla Walla WA 99362. 509-529-6242.

Sparta A-15-B manual. R Lee, POB 61, Clarksburg WV 26302. 304-624-6801.

Pacific Recorders BMX II, need 2 mic modules, will trade for line modules. A Bishop, WMAX, 412 State St, Roch-ester NY 14608. 716-232-8870.

Stereo console; any make. R Osborne, WMOV/WFYZ, Box 667 Ravenswood WV 26164. 304-273-2544.

DISCO-PRO SOUND EQUIPMENT

Want To Sell

dbx 118 compressor-expander, exc cond, $125: SAE 5000 click-pop filter $125; JBL 2426H compression driver, new in boxes, $300/pr. R Glenn, WJGR, 1718 Shenandoah Dr, Wimauma FL 93598. 813-634-1940.

Aphex studio clock converts analog sound to MIDI infor, $299; Lexicon PCM 60 digital reverb, $425. R McMillen, Super Duper Audio Duplicating, 1634 SW Alder St, Portland OR 97205. 503-228-2222.

JBL 8306 pr of wall mt 2 way spkrs, new, $75. D Tonelli, Aquarius Audio, 679 Calmar Ave, Oakland CA 94610. 510-444-3094.

Speakers pr self enclosed; Audimetrics mike boom, 41" reach w/12" pro-base, new. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

JBL ceiling speakers (2), inc housing, speaker, control knob, $33 ea; Lil Miss Moffat 48 V phantom power supply (2), $18 ea; 6' rack rails (2), $18 ea; other pieces avail free with purchase; all items + shpg. B Lord, Lord Bdctg Co, 13313 SE 208th, Kent WA 98042. 206-631-2374.

JBL 2204 (4), 2445 (2) drivers, 2380 (2) horns, 2404 drivers in cabinets, exc cond, $1400. D Kocher, Digital Sound Makers, 1901 Hanover Ave, Allentown PA 18103. 610-776-1455.

Speakers, self enclosed 7 x 4 1/2 x 4 1/2. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

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

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Former CE, present 2 way radio tech seeking CE position. Strong PC digital and RF background. D Rupp, 1302 S Uplands Dr, Camano WA 98292.

Graduate w/3 yrs exp incl new director & asst promo dir for small mkt stn, hard working, looking for new challenges. Natalie, 814-827-1519.

Recent graduate w/on-air promo, PR, writing, prod & concert relations exp, looking for challenge. Chad, 412-225-9436.

Seeking GM/GSM position, recently GM/GSM w/eastern NC stn built from CP, can wear many hats to reduce your overhead. B Bolton, 919-249-1893.

Southern talk show host will relocate, North, West, Midwest, great pipes and gifted intellect. J Allan, 901-324-0859.

You don't have to call him Ted, Teddy or Theodore, you do have to call if you want radio's best entertainer. 405-361-1762.

19 yrs bdct exp, 10 yrs asst, seeks AM/FM any format, DJ, prod exp, FCC, Gen/Radar, Marine, Ham & Rest. C Hamlin, 606-523-0901.

Combo manager, sales, PD, CE, anncr, prod, Tampa Bay area, coastal FL or powerful signal in gd area, 30 yrs exp. Bill, 813-844-3823.

Country DJ w/13 mos exp seeks FT on-air pos, willing to relocate, west pref. F Albaugh, POB 505, Torrington WY 82240. 307-532-2670.

Engineer/technician w/18 yrs exp seeks field pos w/bdct manufacturer, willing to travel domestic/abroad. G Howe, 217-586-3741.

Just out of school, seeking on-air, production, sales, have positive attitude, work well w/others. Brian, 405-372-2364.

Nice guy, solid friendly voice, plenty of exp in all facets of radio, speak a bit of Spanish. 408-283-9141.

Radio Vet w/morning & PD exp, gt voice, prod, personality looking for aggressive country stn in TX. Brian, 602-753-6848.

Ratings need a boost? Young, energetic, mouthy, willing to relocate, seek position w/AOR stn. Karen, 405-691-3924.

Talk show host & morning drive news anchor combined, avail now. D Diamond, 901-761-5577.

Will work for food, and a little cash too, great on-air presence & prod skills, will relocate anywhere in US and Canada. Todd, 405-321-8425.

Young, eager, wet-behind-the-ears grad, ready to commit to sports & prod for stn in TX or OK area. Steve, 405-634-5208.

Seasoned Air Talent, 8 yrs exp in prod, promo, AOR/Oldies/ Country, prefer West Coast, AZ. Robin, 602-461-8209.

Combine information & entertainment w/this controversial SportsTalk host, 10 yrs exper, top rated in medium market for 4-1/2 yrs. PBP exper. Send replies to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 94-06-29-1RW.

Combo Manager, sales, PD, CE, Announcer, production, Tampa Bay, coastal FL or powerful signal in good area, 30 years experience. Bill, 813-844-3823.

You have nothing to lose, shake up your market, 21 year major/secondary market veteran for prog or mgmt. Guy, 601-867-2023.

HELP WANTED

CHIEF ENGINEER: Georgia Class C FM & directional AM seeking exprienced chief. Applicant should be comfortable with RF and studio maintenance including digital audio. Good pay & benefits. Send Replies to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box #94-6-29-2 RW.

Engineer-Announcer. Great facilities, country living. Tape, resume. EOE. WSMI FM-AM, Box 10, Litchfield, Illinois 62056.

WNCI-FM Radio, Columbus, Ohio, has an opening for a chief engineer. Experience necessary in high power FM, studio maintenance & remote broadcasts. SBE certification a plus, management skills necessary. New FM studio & office remodeling underway. Applicant must be familiar with PC based computer network systems. Nationwide Communications Inc. & WNCI Radio are equal opportunity employers & encourage women & minorities to apply. Send resume to: Robert Reymont, Director of Radio Engineering, POB 5159, Mesa AZ 85211-0500. 602-964-4000 for more details.

ABOUT OUR EMPLOYMENT SECTION

HELP WANTED

Any company or station can run "Help Wanted" ads for $1.50/word or buy a display box for $60/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.

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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 blind 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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World Radio History

Radio World

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AMPLIFIERS

Want To Sell

BGW Systems 750C pro pwr amp. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

Crown power amp, silver face, $275. B Wilson, 4400 Old Lebanon Rd, Campbellsville KY 42718. 502-789-1505.

Radix TP500 preamp; Microtrak 6405 preamp, BO. M Comfort, WQNN, 3405 Frontage Rd, Columbus MS 39705. 601-328-7124.

RTS-405 stereo preamp (2), used 6 mos, $140 ea + shipping. B Lord, Lord Bdcting Co, 13313 SE 208th, Kent WA 98042. 206-631-2374.

BGW systems professional pwr amp. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

Gates tube type, 2 mic mixer, RCA MI 9358, Best Offer. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Dynaco stereo 120 solid state, rack mt $229, Dynaco stereo 70 tube amp all new tubes! Dynaco PAT 4 preamps $59. W Gunn 619-320-0728.

New 10 kW FM amp under $24,000. Call for details. Bill Hoffman, 518-743-1601.

Want To Buy

Marantz Model 1, audio consolette preamp, single or pair, and model 6 stereo adapter. P Chance, Imperial Analog, 925 Clinton St, Philadelphia PA 19107. 215-574-8147.

Mc60 single or pair; US 6550's tubes, Coke bottle shape pref, other audio tubes needed. R Glenn, WJGR, 1718 Shenandoah Dr, Wimauma FL 93598. 813-634-1940.

ANTENNAS/ TOWERS/CABLES

Want To Sell

Andrew LDF7-50A, 1-5/8" coax, (4) lengths of 245 feet & 3 lengths of 265 feet, $5.00/ft. Andrew JH-50A, 1-5/8" coax, several at 310 feet, $7.25/ft. Andrew LDF2-50, 3/8" coax. Any length, $0.85/ft. J. Mussell, 1421 Bay Ave., Santa Maria, CA 93454. 805-922-7775.

Jampro 2 bay, on 99.3, 300' Andrew coax with 1 5/8" connectors; Rohn 55, 300' tower, still erected. D Denver, KUTT, 414 4th St, Fairbury NE 68352. 402-734-5521.

Pirod tower light control, needs work. F Nienow, WYTE, POB 1030, Stevens Point, WI 54481. 715-341-8838.

Scala CA series, low power, 4 bay TV antenna for channel 2, includes cable harness & pwr divider. P Delaney, RR2 Box 106A, Lacrescent MN 55947. 507-875-2065.

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Andrews 1 5/8 coax, 300', incl 2 EIA flanges, $1800; 7/8 coax 265', $780 cash or bank check. C Sigmon, WBZK-AM, POB 398, York SC 29745. 803-684-4241.

FMH ERI 8 bay FM, tuned to 96.9, incl mounting brackets, $10,000. S Smidt, KELO, 500 S Phillips, Sioux Falls SD 57102. 605-331-5350.

STL; FM xmtr, 3-bay 93.1; exciter; RPU. R Osborne, WMOV/WFYZ, Box 667 Ravenswood WV 26164. 304-273-2544.

Kintronic FMC 7.5 iso-coupler, FM 98.5 & AM 1350, $1200; Jampro JLCP 3 bay, tuned to 98.5, $2000. M Basso, KCAR/KGAP, Clarksville TX. 903-427-3861.

ERI G5CPS 12 bay center fed, exc cond w/300', 3 1/8" coax. G Hofer, KJLT, POB 709, N Platte IN 69103. 308-632-5515.

UTC 120 180' guyed twr, beacon, side lights, tuning unit, lighting chokes, diods unite, 0-5 amps, electric eye, etc, still standing, you dismantle & ship, BO. J LoPresti, WGSR, 111 Avalon Dr, War-ner Robins GA 31093. 912-929-4904.

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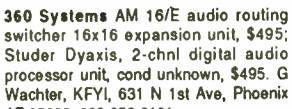
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Andrew H59-50, 5" coax, 500' on spool in Brooklyn IA, BO. R Henry, WPIO, Box 6501, Titusville FL 32782. 407-267-3000.

Want To Buy

Low power stand-by FM antenna, tuned to 94.3. B Campbell, KRIG, 918-333-7943.

LAPP insulator Push/Pull 9861 casting needs to be good, not porcelain. D Mance, WATN, 199 Wealtha Ave, Watertown NY 13601. 315-782-1240.

AUDIO PRODUCTION

Want To Sell

360 Systems AM 16/E audio routing switcher 16x16 expansion unit, $495; Studer Dyaxis, 2-chnl digital audio processor unit, cond unknown, $495. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

dbx 150x (4), $100 ea. G Anderson, GEE Wizz Prod, 2005 Laurel Lane, Plano TX 75074. 214-423-2005.

Accessit signal processing rack (4), mono compressor, reverb & bal/unbal DA w/ps in 2 sp, rk mt, w/some manuals, VGC, $155. S Hoffman, Sounds Impossible, 7109 NW Birch Pl, Lawton OK 73505. 405-536-0559.

AKAI S1000 16 bit digital stereo sampler, 2 meg RAM expandable to 32 meg, $1994; AKAI S950 12 bit digital sampler, 750k RAM expandable to 8 meg, $985. Dave, 317-846-7768.

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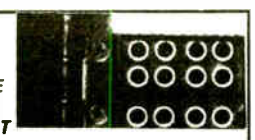
Burwen TNE 7000A transient noise eliminator for records, 2 sp rk mt, exc cond, some corrosion on RCA jacks; works perf, manual, $195 + shipping. S Hoffman, Sounds Impossible, 7109 NW Birch Pl, Lawton OK 73505. 405-536-0559.

KLH DNF 1201A dynamic noise filter, stereo, $50. G Haltman, Haltman Media Svcs, 300 Limpy Creek Rd, Grants Pass OR 97527. 503-474-6466.

Orban 674A stereo EQ, graphic & pan, $300. G Haltman, Haltman Media Svcs, 300 Limpy Creek Rd, Grants Pass OR 97527. 503-474-6466.

Auratone RT 5V 2 way rack mt monitor speaker sys new in box, $75. D Tonelli, Aquarius Audio, 679 Calmar Ave, Oakland CA 94610. 510-444-3094.

Eventide 1745m (6), digital delay lines, 3 in working order, 3 outs & pitch, 3 not working, $300 ea working, $175 ea not working. S Russell, Russell Stud, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.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Orban 245-E stereo synthesizer, $415 cash or bank check. C Sigmon, WBZK-AM, POB 398, York SC 29745. 803-684-4241.

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ADC 96 & 144 Pr TT patchbays, excel cond, 1 rack space, 3 rows of 48, top 2 rows normalled, $149, 96 is 2 row normalled, $129 (you remove old wiring) or we totally refurbish w/new front panel, ready to install, $199-229. TT cords up to 10 per bay at $9 ea, reg $13.95, also 1/4" bays. Audio Village, 619-320-0728, or Fax 619-320-2454.

Orban 672B; Orban 622B; Orban 424A. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Demeter 4 ch rack mt tube direct box NEW $795. W Gunn 619-320-0728.

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AUTOMATION EQUIPMENT

Want To Sell

SMC Otari (3), R-R, PB w/built-in tone sensor. R Statham, WHLG, 1000 NW Alice Ave, Stuart FL 34994. 407-692-1000.

BE Control 16 brains w/audio switchers (2); Otari ARS 1000 R-R in exc cond (5); working SMC Sonomag Carousels (2); SMC Sonomag Carousels good for parts (3); ITC triple stacker cart machine w/R/PB; ITC triple stacker w/PB only, cabinets included. M Jones, WZKB, POB 520, Wallace NC 28466. 910-285-4900.

Cetec 7000 Level 2, 5046 event memory, terminal, source cards, 4 350 series Carousels, 3 250 series Carousels, 1 Audiofile, 2 ITC 760 R-R play decks, all $2500 or will sell parts. E Moody, KJEM/KESE, 216 N Main, Bentonville AR 72712. 501-273-9039.

MEI Control 3; MEI-Satmaster; MEI 100MP24; MEI 100MP48. E Monskie, WLPA/WROZ, 1996 Auction Rd, Manheim PA 17545. 717-653-0800.

IGM RAM stereo automation cntrlr with 4096 events of memory, clock, silence sense, 9 audio inputs, 4 random access Carousel cards, manuals; stereo 350 (4), random access. F Nienow, WYTE, POB 1030, Stevens Point, WI 54481. 715-341-8838.

Automated Bdct Cntrls, incl audio controller, decoder mem controller, pwr sup, gd for parts, $400/BO. S Carter, WJNT, 1985 Lakeland Dr, Ste 212, Jackson MS 39216. 601-366-1150.

ESP-1 automation system with brain, DS-20 switcher, bi-directional Carousels (4), PDC digital clock, power supply, encoder with 2 mono video monitors, printer, no racks. R Statham, WHLG, 1000 NW Alice Ave, Stuart FL 34994. 407-692-1000.

IGM Instacarts 48 tray, mono (2) w/direct access MOS programmer w/manuals, $600. N Lyda, WHKP, POB 2470, Hendersonville NC 28793. 704-693-9061.

SMC, Otari R-R (3), DP-2, PDC 5 clock, DS-20 switcher, mono PB units (2); 350 RS Carousels (3), working when removed, $1800/all or will part out. V Richardson, WWST-FM, 8419 Kingston Pk, Knoxville TN 37919. 615-693-1020.

SMC MSP-12 inc DAS-12 audio switcher; 721 dual play cart decks (2); 450 Carousels (2); upright SMC racks (2); power supply; keyboard & monitor, all manuals inc, $4800/BO. R Freeman, KSEK, 1604 E Quincy, Pittsburg KS 66762. 316-232-1340.

SMC 25 Hz tone gen; SMC 25 Hz tone decoder. R Statham, WHLG, 1000 NW Alice Ave, Stuart FL 34994. 407-692-1000.

Want To Buy

NBC/Mutual tone decoder wanted. J Condon, WKDR, 388 Shelburn Rd, Burlington VT 05401. 802-862-8255.

CART MACHINES

Want To Sell

BE 2100, stereo R/P; ITC Delta 3 deck, stereo, R/P, w/ secondary & tertiary tones. F Nienow, WYTE, POB 1030, Stevens Point, WI 54481. 715-341-8838.

Gates Cartritape II, R/P deck, $300, PB deck, $200. E Moody, KJEM/KESE, 216 N Main, Bentonville AR 72712. 501-273-9039.

ITC 706 PB decks (2), $250 ea or $400/both. E Moody, KJEM/KESE, 216 N Main, Bentonville AR 72712. 501-273-9039.

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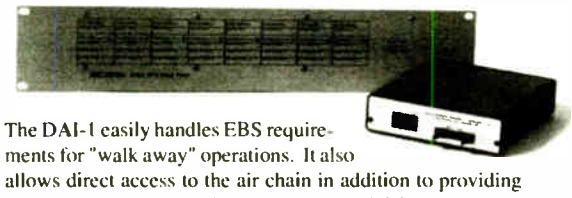

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ITC Delta R/P stereo, exc cond, $1500. C Scherer, WZAK, 216-621-9300.

ITC 99B stereo RP elsa (4); Audicord Moducart 100; ITC Delta stereo record amp. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

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ITC mono R/P (2); ITC stereo R/P (2). R Statham, WHLG, 1000 NW Alice Ave, Stuart FL 34994. 407-692-1000.

Tapecaster X-700, X-700RP, (3) stereo, $200; 1 R/P in good condition, $300. K Carpenter, KPGM, 601 W Collins, Casper WY 82601. 307-266-4003.

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

Scully 8300 triple decker, mono play, $750. M Basso, KCAR/KGAP, Clarksville TX. 903-427-3861.

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MCI solid state w/sync designed to replace tube type electronics on Ampex, etc (8), $150 ea. T Boddie, 12202 Union Ave, Cleveland OH 44105. 216-752-3440.

Nagra 4.2L, mono rec w/crystal sync, $4200. P Koch, Koch/Marschall, 4310 N Mozart, Chicago IL 62618. 312-463-4010.

Otari DP 4050-0CF duplicator w/MCI 1/4"- 1/4 trk rec, Dolby B encoder, 6 units in one pass, 80/hr. C Hertzburg, Kinura Records, Box 660236, Miami Springs FL 33166. 305-867-5329.

Sony DAT DTC 75ES low hours, $500; Teac test tape 15 ips, 1/2", $45; MRL test tape, 15 ips, 1/4", $25. D Kocher, Digital Sound Makers, 1901 Hanover Ave, Allentown PA 18103. 610-776-1455.

Recordex 6 cassett rewinder $100; Tascam 40-4 4 track 10" in flight case with free dbx $750; MRL new short test tapes $39 for 1/4' to $199 for 2". W Gunn 619-320-0728.

Tascam 38, 8 trk, 1/2" open reel, $1100. P Cibley, Cibley Music, 138 E 38th St, New York NY 10016. 212-986-2219.

Ampex 351, $300 cash or bank check. C Sigmon, WBZK-AM, POB 398, York SC 29745. 803-684-4241.

Ampex 351 tube stereo hi-speed; Tascam 40-4; Technics 1520. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Otari MX 50/50 Mark III-8, 8 trk, mod from rack mt, w/manual, $1500. G Anderson, GEE Wizz Prods, 2005 Laurel Lane, Plano TX 75074. 214-423-2005.

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Telex 36 NAB cart deck w/rack mt, new factory boxes, no electronics, $100; Telex 36 in cabinet, no electronics, $35; PB amp for above, $25. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

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Otari Mark II-IV 1/2" 4-track, multi-track, mint, less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

16 track 2" $3450, MCI JH110C-8 $2800, 110C-8 play only $500, ATR800 mono or Tascam 7300 or 2502 $600 each, MCI Locator III $1195, Tascam 52 2 track $1200, Ampex AG350 electr $50/ch. W Gunn 619-320-0728.

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Ampex ATR-800 4-track 1/2" R-R, needs repair or use for parts, BO; Symetrix 108 telephone syst. T Rusk, KSSN-KMVK, POB 96, Little Rock AR 72203. 501-227-9696.

Otari MTR-12, 4 trk, 1/2", exc cond, tape inc, BO. B Webster, WLIT, 150 N Michigan Ave, Chicago IL 60601. 312-329-9002.

Viking 76 mono 7" open reel deck, $35; Tape-Athon 707-7 & 10 R-R with auto reverse, one 7", one 10", also spare parts, $35; 10" tapes, mono circa 1970, 6 hour/reel, $5 ea. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

Scully '100' recorders, record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 4646 Hounds-haven Way, San Jose CA 95111. 408-363-1646.

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Concertone 90-2, deck or capstan motor, need 2 speed, 7.5-15 ips, prefer complete deck in good condition. T Boddie, 12202 Union Ave, Cleveland OH 44105. 216-752-3440.

Alesis ADAT, in perf cond. W Whitney, POB 2411, Overland MO 63114. 314-428-8430.

Otari 5050BII remote control. M Harrington, POB 7610, Little Rock AR 72217. 501-223-9056.

TEAC A-3300 SX, 2 track; also RC-120 remote control unit. D Palmer, Dynamic Sound Productions, POB 239, Isleboro ME 04848. 207-734-6484.

Ampex tube recorders and mixers. W Gunn, 619-320-0728.

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

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Denon DCM 950; Shure D600. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

IBM RT-PC 60 programs, adv operating interactive systems, will trade. R Suracci, Fine Art Prods, 67 Maple St, Newburgh NY 12550. 914-561-5866.

Want To Buy

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Creative Labs Sound Blaster 16 ASP, 16 bit sound card for IBM PC's, $125. P Cibley, Cibley Music, 138 E 38th St, New York NY 10016. 212-986-2219.

Exabyte EXP-8200 2.5 gig DAT tape drive for backup, 5 1/4" SCSI-2 drive, $495. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Hewlett Packard, Compaq, Hyundai 286 PC's (25), w/1 mb RAM and monochrome monitors; various dot matrix printers, modular active hub, other accessories avail; will sell in bulk or individually, BO. S Kornblum, WRRK, 7 Pkwy Center, Pittsburgh PA 15220. 412-922-9290.

Want To Buy

Tandy 6000HD w/at least 1 floppy drive. Mel Crosby, 408-363-1646, FAX 408-363-0957.

CONSOLES

Want To Sell

Collins IC-10A, gd cond, $2000. Barry, KWMT, Box 578, Fort Dodge IA 50501. 515-576-7333.

Ramko DC5RA 5 chnl, mono, rk mt, comp w/all parts, non wkg, exc cond, $50 + shipg; JBL 5600-2B, 6x1 mono rk mt, w/4 bal mic plug-in xfmres & bal out xfrmer, gd cond w/schem, $75 + shpg. S Hoffman, Sounds Impossible, 7109 NW Birch Pl, Lawton OK 73505. 405-536-0559.

Altec Lansing 250 SU 10 chnl tube type, can be wired for stereo w/manual, $300. N Lyda, WHKP, POB 2470, Hen-dersonville NC 28793. 704-693-9061.

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Harris Medalist Gold 12 chnl, current mod w/manual, (2); Sparta spot mono board. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

WE 23C 5 chnl console. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Newcomb KX6A tube 6x1, 5 low imp mic ins, 600 ohm bal out, rack mt, $35. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

Ramsa WRTM20, 20x8-2, 8 buss out, 3 band EQ, 4 sends, pgm mis talkbacks, exc cond, $2000/BO. E Sperry, 53 Ann St 2nd Flr, New York NY 10038. 212-732-9316.

TOA R5A-216 16 chnl w/4 mono amps avail for main & monitor mixing, exc cond, $1200. B Wilson, 4400 Old Lebanon Rd, Campbellsville KY 42718. 502-789-1505.

Yamaha PM1000, 16 input, 12 echo send, 4 monitor, 4 buss output, gd cond, w/book & stand, $1200/BO. Bernie, TV-50, 890 San Marcus Ln, Duarte CA 91010. 818-303-7161.

Ramko DC5AR 5 channel mixers, vgc, $175 each. 916-725-2434.

Want To Buy

Collins-Rockwell audio rock 10 cue monitors, or comp console for parts. T Hodgins, 14 E Main St, Walla Walla WA 99362. 509-529-6242.

Sparta A-15-B manual. R Lee, POB 61, Clarksburg WV 26302. 304-624-6801.

Pacific Recorders BMX II, need 2 mic modules, will trade for line modules. A Bishop, WMAX, 412 State St, Roch-ester NY 14608. 716-232-8870.

Stereo console; any make. R Osborne, WMOV/WFYZ, Box 667 Ravenswood WV 26164. 304-273-2544.

DISCO-PRO SOUND EQUIPMENT

Want To Sell

dbx 118 compressor-expander, exc cond, $125; SAE 5000 click-pop filter $125; JBL 2426H compression driver, new in boxes, $300/pr. R Glenn, WJGR, 1718 Shenandoah Dr, Wimauma FL 93598. 813-634-1940.

Aphex studio clock converts analog sound to MIDI infor, $299; Lexicon PCM 60 digital reverb, $425. R McMillen, Super Duper Audio Duplicating, 1634 SW Alder St, Portland OR 97205. 503-228-2222.

JBL 8306 pr of wall mt 2 way spkrs, new, $75. D Tonelli, Aquarius Audio, 679 Calmar Ave, Oakland CA 94610. 510-444-3094.

Speakers pr self enclosed; Audimetrics mike boom, 41" reach w/12" pro-base, new. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

JBL ceiling speakers (2), inc housing, speaker, control knob, $33 ea; Lil Miss Moffat 48 V phantom power supply (2), $18 ea; 6' rack rails (2), $18 ea; other pieces avail free with purchase; all items + shpg. B Lord, Lord Bdctg Co, 13313 SE 208th, Kent WA 98042. 206-631-2374.

JBL 2204 (4), 2445 (2) drivers, 2380 (2) horns, 2404 drivers in cabinets, exc cond, $1400. D Kocher, Digital Sound Makers, 1901 Hanover Ave, Allentown PA 18103. 610-776-1455.

Speakers, self enclosed 7 x 4 1/2 x 4 1/2. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

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POSITIONS WANTED

CE w/big production voice & over 15 yrs hands-on exp, seeks CE position, strong troubleshooting, RF & computer networking skills. G Morgan, 704-563-8676.

Former CE, present 2 way radio tech seeking CE position. Strong PC digital and RF background. D Rupp, 1302 S Uplands Dr, Camano WA 98292.

Graduate w/3 yrs exp incl new director & asst promo dir for small mkt stn, hard working, looking for new challenges. Natalie, 814-827-1519.

Recent graduate w/on-air promo, PR, writing, prod & concert relations exp, looking for challenge. Chad, 412-225-9436.

Seeking GM/GSM position, recently GM/GSM w/eastern NC stn built from CP, can wear many hats to reduce your overhead. B Bolton, 919-249-1893.

Southern talk show host will relocate, North, West, Midwest, great pipes and gifted intellect. J Allan, 901-324-0859.

You don't have to call him Ted, Teddy or Theodore, you do have to call if you want radio's best entertainer. 405-361-1762.

19 yrs bdct exp, 10 yrs asst, seeks AM/FM any format, DJ, prod exp, FCC, Gen/Radar, Marine, Ham & Rest. C Hamlin, 606-523-0901.

Combo manager, sales, PD, CE, anncr, prod, Tampa Bay area, coastal FL or powerful signal in gd area, 30 yrs exp. Bill, 813-844-3823.

Country DJ w/13 mos exp seeks FT on-air pos, willing to relocate, west pref. F Albaugh, POB 505, Torrington WY 82240. 307-532-2670.

Engineer/technician w/18 yrs exp seeks field pos w/bdct manufacturer, willing to travel domestic/abroad. G Howe, 217-586-3741.

Just out of school, seeking on-air, production, sales, have positive attitude, work well w/others. Brian, 405-372-2364.

Nice guy, solid friendly voice, plenty of exp in all facets of radio, speak a bit of Spanish. 408-283-9141.

Radio Vet w/morning & PD exp, gt voice, prod, personality looking for aggressive country stn in TX. Brian, 602-753-6848.

Ratings need a boost? Young, energetic, mouthy, willing to relocate, seek position w/AOR stn. Karen, 405-691-3924.

Talk show host & morning drive news anchor combined, avail now. D Diamond, 901-761-5577.

Will work for food, and a little cash too, great on-air presence & prod skills, will relocate anywhere in US and Canada. Todd, 405-321-8425.

Young, eager, wet-behind-the-ears grad, ready to commit to sports & prod for stn in TX or OK area. Steve, 405-634-5208.

Seasoned Air Talent, 8 yrs exp in prod, promo, AOR/Oldies/ Country, prefer West Coast, AZ. Robin, 602-461-8209.

Combine information & entertainment w/this controversial SportsTalk host, 10 yrs exper, top rated in medium market for 4-1/2 yrs. PBP exper. Send replies to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 94-06-29-1RW.

Combo Manager, sales, PD, CE, Announcer, production, Tampa Bay, coastal FL or powerful signal in good area, 30 years experience. Bill, 813-844-3823.

You have nothing to lose, shake up your market, 21 year major/secondary market veteran for prog or mgmt. Guy, 601-867-2023.

HELP WANTED

CHIEF ENGINEER: Georgia Class C FM & directional AM seeking exprienced chief. Applicant should be comfortable with RF and studio maintenance including digital audio. Good pay & benefits. Send Replies to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box #94-6-29-2 RW.

Engineer-Announcer, Great facilities, country living. Tape, resume. EOE. WSMI FM-AM, Box 10, Litchfield, Illinois 62056.

WNCI-FM Radio, Columbus, Ohio, has an opening for a chief engineer. Experience necessary in high power FM, studio maintenance & remote broadcasts. SBE certification a plus, management skills necessary. New FM studio & office remodeling underway. Applicant must be familiar with PC based computer network systems. Nationwide Communications Inc. & WNCI Radio are equal opportunity employers & encourage women & minorities to apply. Send resume to: Robert Reymont, Director of Radio Engineering, POB 5159, Mesa AZ 85211-0500. 602-964-4000 for more details.

ABOUT OUR EMPLOYMENT SECTION

HELP WANTED

Any company or station can run "Help Wanted" ads for $1.50/word or buy a display box for $60/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 blind 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.

Mail to: BROADCAST EQUIPMENT EXCHANGE

PO Box 1214, Falls Church, VA 22041 Attn: Simone Mullins

World Radio History

DISCO/PRO-SOUND EQUIP...WTS

TOA 480SE speakers w/18" woofer, horn & slot tweeter, $1000 pr. B Wilson, 4400 Old Lebanon Rd, Campbellsville KY 42718. 502-789-1505.

Emilar EW15-8, 15" woofer, new, $50/BO. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

UREI 539 1/3 oct room EQ (4), $250 ea; Crown MX-4 crossovers, 4 band active, (4) $195 ea; Crown VFX2A crossovers, perf cond, $150. R McMillen, Super Duper Audio Duplicat-ing, 1634 SW Alder St, Portland OR 97205. 503-228-2222.

Want To Buy

JBL 4343, studio monitors. R Glenn, WJGR, 1718 Shenandoah Dr, Wimauma FL 93598. 813-634-1940.

JBL 4312 monitor speakers. M Harrington, POB 7610, Little Rock AR 72217. 501-223-9056.

FINANCIAL SERVICES

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ON ALL RADIO EQUIPMENT

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- 100% financing, no down payment
- No financials required under $50,000
- Refinancing existing equipment

EXCHANGE NATIONAL FUNDING

Call Mark Wilson (800) 275-0185

LIMITERS

Want To Sell

CRL AM-4 mono, audio prep proccesor, spectral energy processor, peak mod controller with NRSC kit, excellent condition, $1800/BO. M McNeil, Guardian Comm, 800 Compton Rd, Cincinnati OH 45231. 513-931-8083.

Valley People Gain Brain II, new modules (2), no boxes, $90 ea/ or BO + shipping. M Shea, Precision, POB 723, New York NY 10276. 212-989-3684.

CBS Audimax 444, automatic level control. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

CRL PMC 300A & CRL APP-400, Fairchild 658 B reverb, and Collins 21221, remote bdct amp, BO. C Ratliff, 325A N 6th St, Albemarle NC 28001. 704-982-6141.

Cutting Edge Vigilante processor, approx 1 yr old, BO. J Michaels, WCOW/WKIJ, POB 539, Sparta WI 54656. 608-269-3100.

Optimod 8000A, $1500. R Henry, WPIO, Box 6501, Titusville FL 32782. 407-267-3000.

Symetrix 522 compressor, limiter gate, duck stereo, $250. G Haltman, Haltman Media Services, 300 Limpy Creek Rd, Grants Pass OR 97527. 503-474-6466.

CBS Audimax 444, auto lvl control. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

CBS Labs Audimax 443 auto lvl cntrl, tube type w/manual, $150; Dynamic Presence Equal 450 w/manual, $150. N Lyda, WHKP, POB 2470, Hender-sonville NC 28793. 704-693-9061.

MAP II; CRL SEP 800; PMC-300; Orban 424A; Modulimiter; DAPS; Aphex II. J Phillips, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Moseley TFL-280, SCA limiter, BO. E Monskie, WLPA/WROZ, 1996 Auction Rd, Manheim PA 17545. 717-653-0800.

Orban 8100 factory tuned, excellent conditio, $2499. J Katz, 396 Buckley, San Luis Obispo CA 93401. 805-541-8798.

Want To Buy

Fairchild 670 or 660 tube compressor/limiter, Teletronics LA-2A tube compressor/limiter or UREI LA-3A solid state compressor/limiter, call after 3PM CST. 214-271-7625.

MICROPHONES

Want To Sell

Audiometrics mic boom, 41" reach w/12 pro-base, new. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

Shure 514 dyn mic w/12" barrel (2), $20 ea or both for $35. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

Shure SM80-LC. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

EV 668 dynamic, ultra directional, shock mounted, variable impedance, BO. T Boddie, 12202 Union Ave, Cleveland OH 44105. 216-752-3440.

Lectrosonics M185, CR185 wireless mic system, like new, $1100; Vega R33, 77D2, wireless mic system, VGC, $600. D Scales, 3142 Market Place, Bloomington IN 47403. 812-339-4446.

RCA 44BX ribbon mic, mint cond, $700/BO; WE 639-A & 639-B, mind cond, BO; Altec 639B, BO. T Boddie, 12202 Union Ave, Cleveland OH 44105. 216-752-3440.

RCA 77DX (1), RCA 44BX (1), both in exc cond, BO over $800 for either. R Burns, RF Studios, 1326 Highmeadow Drive, Garland TX 75040. 214-271-4386.

Sennheiser ZS100 mic shock mounts, $75. C Scherer, WZAK, 216-621-9300.

Shure SM80 LC microphone. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

Shure SM48 perf cond, w/clip & case, $45. S Russell, Russell Stud, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

Manley Labs CR3A, new, $795 w/shock-mount, windscreen & case, no risk trial in your studio. Also have used mics & everything else. Get our catalog! Liberal trade policy too. Audio Village, 619-320-0728.

Want To Buy

AKG C-60 cable from mic to power supply; Bruel & Kjaer 2801 mic power suply. C Hertzburg, Kinura Records, Box 660236, Miami Springs FL 33166. 305-887-5329.

AKG C 414EB condensor mic. P Cibley, Cibley Music, 138 E 38th St, New York NY 10016. 212-986-2219.

Mic fishpole, 2 /12 - 12'. R Suracci, Fine Art Prod, 67 Maple St, Newburgh NY 12550. 914-561-5866.

New non-commercial FM needs EV 666 mic with connectors, donations greatly appreciated. WDFH-FM, 21 Brookside Ln, Dobbs Ferry NY 10522. 914-693-3963.

Shure SM5B in gd cond. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

Shure SM-5B. J Mauk, KMJ/KSKS, POB 70002, Fresno CA 93744. 209-266-5800.

77-DX's, 44-BX's, WE KU-3A's On-Air lights, recording lights & audition lights. Top price paid. Fast response. Bill Bryant Mgmt, 2601 Hillsboro Rd, G12, Nashville TN 37212. 615-269-6131, FAX: 615-292-3434.

Neumann U87s, KM84s, AKG 451s, EV RE20s, Sennheiser 421s. W Gunn 619-320-0728.

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

Double plug tip sleeve patch cords, 2' (10) & 3' (10). M Muderick, Muderick Recording, 101 Earlinton Rd, Haver-town PA 19083. 610-449-6970.

Equipment racks, like new (4), 74" high, 66" high, assorted rack pnls (10). F Nienow, WYTE, POB 1030, Stevens Point, WI 54481. 715-341-8838.

Topaz 12000 W true UPS with batteries, 230V/3 phase in, 120V/220V single and 3 phase out, $2995. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Assorted consoles, turntables, carts, limiters, all as is, you inspect and pick-up, will sell all for $2000/certified check, must sell fast. B Coleman, Coleman Comm, POB 6701, Rocky Mt NC 27803. 919-443-7870.

Rotron Blowers for Elcom, Harris, CCA, CSI, McMartin, rebuilt & new. Goodrich Enterprises Inc. 11435 Manderson St. Omaha, NE 68164 402 493 1886 FAX 402 493 6821

Brute power supply, 120/240V, input, 24/48 V @ 50/25 amps, fully variable & regulated; PU or pay to crate, $50/BO. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

Step-down transformers, step-down pri 240/480 K to sec 120V @ KVA, filament 6.3V @ 10 amps, pri, 115/230V, Chicago Std, #FH610 new, UTC CG-315, bias power, DC taps from 3V to 100V, new, $15. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

Topaz power conditioner 1000 VA 120 input 120 output, $135 ea plus shipping. Steve Slater, Apex Jr, 3045 Orange, La Crescenta CA 91214. 818-248-0416 FAX: 818-248-0490.

World famous psychic to stars and celebrities, 30 years experience, can help you to obtain love, health, wealth and luck. Will do free interviews. Call David Guardino anytime, 703-978-1754 or 615-539-0434.

Onan 30-35 kW generator, auto weather, proof housing, propane/wat gas 324 hour, excellent condition, new battery anti freeze, oil & filter 30 transfer 5 W also avialable, $7500. J Schloss, KICD, 2600 N Hi Way Blvd, Spencer IA 51301. 712-262-1240.

Switchcraft switch panel containing 22 sets of 11 non-interlocking, lighted switch strips, 4 PDT, wired to AMphenol 50 pin connectors. M Muderick, Muderick Recording, 101 Earlinton Rd, Havertown PA 19083. 610-449-6970.

Shure ST3000 teleconference/speaker-phone syst, $395. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

WE telephone equipment, 1A2 key system relays, many types, power plants, battery feed coils, etc; magneto phones (2) fully enclosed, $35 pair; six button key phones, wall & desk. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

Want To Buy

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

MONITORS

Want To Sell

Delta DAM-1 directional antenna monitor, 2 twr, gd cond, factory calibrated 12/93, $1000. M Hendrickson, Hedberg Bdcting, POB 249, Blue Earth MN 56013. 507-526-4044.

McMartin FMR-1D EBS rcvr, tuned to 102.9, gd cond, $150/BO. S Carter, WJNT, 1985 Lakeland Dr, Ste 212, Jackson MS 39216. 601-366-1150.

Collins 900C-2, FM stereo modulation monitor, solid state, rack mount with manual, condition unknown, $150/BO. A KZZZ, 2534 Hualapat Mtn Rd, Kingman AZ 86402. 602-753-2537.

Want To Buy

Motorola, Delta or BE C-QUAM AM stereo mod monitor. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

RENT IT HERE! *Call Steve Kirsch for Details*

COMREX 1, 2, & 3-Line Extenders Switched 56/ISDN Systems
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McMartin (buy & sell) any model. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886 or fax 402-493-6821.

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McMartin TR-55C, SCA multiplex receiver. R Williams, WIOV, 44 Bethany Rd, Ephrata PA 17522. 717-738-1191.

GE Superadio III, custom modified w/noise free SCA w/improved selectivity & sensitivity, $95. Other modifications avail. Performance guaranteed. ***800-944-0630.***

Altec Lansing 711A FM receiver, selective stereo, early solid state, $50. E Davison, POB 7167, Springfield IL 62791. 217-787-0800.

AM STEREO RECEIVERS
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708-513-1386

Want To Buy

Technics ST9030, stereo tuner. B Caithamer, WMBI, 820 N LaSalle Dr, Chicago IL 60610. 312-329-4304.

REMOTE & MICROWAVE EQUIPMENT

Want To Sell

Potomac RC-16 rem cntrll w/video interface, $3000. N Doshi, WQCD, 220 E 42 St, New York NY 10017. 212-210-2775.

TFT 7610-C remote control link, control link is STL subcarrier, return link telco, $850. M Comfort, WQNN, 3405 Frontage Rd S, Columbus MS 39701. 601-328-7124.

Burk ARC-16 w/IP-8, relay panel & voice card, 1 yo, $2200; Moseley MRC1600, exc cond, $1200; Gates RDC 10, older, BO. B Spitzer, KKLS, Box 460, Rapid City SD 57709. 605-343-6161.

Gates remote control & metering system RDC-10AC w/manual, $200; TFT 7610-R digital remote ctrl sys, w/manual, $300. N Lyda, WHKP, POB 2470, Hendersonville NC 28793. 704-693-9061.

Integrated Network Corp 1056R, 4 wire switched 56 DSU, $495. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Marti RMC2-AXT (A), AXT 10, needs stepper relay (furnished), $350 cash or bank check. C Sigmon, WBZK-AM, POB 398, York SC 29745. 803-684-4241.

QEI Catlink dig rem cntrl sys w/all interfaces, needs repair, $5000/BO. D Fiedler, WVLT, Vineland NJ. 609-692-8888.

Micro Control RCR-9 & RCT-9 xmtr remote units, 1 for studio, other for xmtr, designed w/digital techniques to monitor and control 9 diff functions, $795. B Walker, WGNS, 306 S Church St, Murfreesboro TN 37133. 615-893-5373.

Moseley TRC-15 studio unit, working when removed from service, $125 or trade for clean Gates RDC-10 remote cont system. D Tonelli, Aquarius Audio, 679 Calmar Ave, Oakland CA 94610. 510-444-3094.

RENTALS RENTALS RENTALS

COMREX
3-line extender
Frank Grundstein 610-642-0978
Audio/Video Consultants

Moseley aural STL PCL303, Moseley TRC-15 remote control, TRX only & RPT25#700, BO. C Ratliffe, Long Pine Rec, 325A N 6th St, Albermarle NC 28001. 704-982-6141.

Comrex 3XR 3-line decoder, with remote control. Perfect condition. $2950. S Kirsch, Silver Lake Audio, 2590 Hillside Ct., Baldwin NY 11510. 516-623-6114.

Want To Buy

Rood 2 line freq extender, need 1 xmt unit only. T MacDonald, WWDB, 166 E Levering Mill Rd, Bala Cynwyd PA 19004. 215-686-3687.

PHONE: 703-998-7600 FAX: 703-998-2966

Call Simone Mullins, Classified Ad Manager, to reserve space in the next issue. Use your credit card to pay, we now accept VISA and MASTERCARD.

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Falls Church, VA 22041

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Brokers	Limiters	Tax Deductable Equipment
Business Opportunities	Microphones	Test Equipment
Cart Machines	Miscellaneous	Transmitter/Exciters
Cassette & R-R Recorders	Monitors	Tubes
CD Players	Receivers & Transceivers	Turntables
Computers	Remote & Microwave Equip.	Positions Wanted
	Satellite Equipment	Help Wanted

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	1x	3x	6x	12x
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10-19 col inch (per inch)	55	52	49	44
Distributor Directory	100	95	90	85
Professional Card	65	60	55	50
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Blind Box Ad		$10 additional		

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World Radio History

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SATELLITE EQUIPMENT

Want To Sell

Wegener 1601 Panda II demod cards (2), tone decoders 1645 & 1646, 1606-21 receiver, exc cond, $1250. K Crosthwait, WTNN, 13206 Buttermilk Rd, Knoxville TN 37932. 615-690-8807.

Zephyrus 304 mainframe recvr w/card to get CNN News & CNN Spanish, $400. B Parker, WSLV, POB 96, Armore TN 38449. 615-427-2178.

Equatorial Micro Earth Stn, C-100 w/30" antenna & 5100 controller w/man, $400. N Lyda, WHKP, POB 2470, Hen-dersonville NC 28793. 704-693-9061.

Microdyne 1100 PCDR (5) SCPC demod, BO; Scientific Atlanta 2.8m dish/pedestal only, no electronics, BO you pick up. E Monskie, WLPA/WROZ, 1996 Auction Rd, Manheim PA 17545. 717-653-0800.

Prodelin 6' dish w/digtl LNB, BO, you pay shpg. J Michaels, WCOW/WKIJ, POB 539, Sparta WI 54656. 608-269-3100.

Wegener 1601 mainframe & cards for SMN Pure Gold, $500/BO. J Davis, WZVU, Long Branch NJ 05540. 908-222-1071.

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Drake ESR 2220, tunable rcvr w/stereo subcarrier audio rcvr, gd cond, $100/BO. S Carter, WJNT, 1985 Lakeland Dr Ste 212, Jackson MS 39216. 601-366-1150.

Scientific Atlanta 7300 & 7325, in gd wrking order, or will part out, $2995. Paradis Bdcting, POB 69, Alexandria MN 56308. 612-763-3131.

Want To Buy

15D IO6C Wegener 1806-24, incl stereo Panda I demod & 15 function relay board. M Robers, WKAA-FM, 128 1st St #322, Tifton GA 31704. 912-387-0977.

SOFTWARE/ DATABASES

Want To Sell

Editor software version 1.2 for CardD, $99. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

PC SOFTWARE for Broadcasters. Traffic, Billing, & Accounting. Powerful, inexpensive. Works with automated, satellite or live operations. INTERFACES with popular DIGITAL AUTOMATION SYSTEMS. Try it for 90 days, no obligation.
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STATIONS

Class 3 AM stereo, on air w/new equip in Santa Barbara, good ratings, $295K cash or terms to qualified. G Erway, POB 40309, Santa Barbara CA 93140. 805-568-1444.

1 kW AM fulltimer in S Central VA, single sta town, fully equipd, incl 3 yr old Nautel xmtr, real estate for sale or lease, $50k cash/BO. G Jones, WCDI, 1230 Radio Rd, Brookneal VA 24525. 804-376-5534.

700 W w/7 room house all same as new. D Parsons, POB 1313, Poplar Bluff MO 63901. 314-778-0944.

Technic SP-25 (2), w/Micro-Trak arms, probase & isolators, $275 ea. M Comfort, WQNN, 3405 Frontage Rd, Columbus MS 39705. 601-328-7124.

5 kW AM, Daleville AL, terms or cash. E Carroll, WTKN, POB 81 Daleville AL 36351. 205-894-6530.

N CA FT AM 1000W, non-directional, ABC affiliate, w/wo 5 prime acres, FM possible. 510-547-4388.

Want To Buy

Small AM & FM combo, owner/operator, cash. A Toriello, 718-893-4328.

Seeking small AM & FM combo, owner/operator, cash. A Toriello, 718-893-4328.

AM/FM or LPTV, w/at least 51% control, prefer SE but will consider other. B Coleman, Coleman Communications, 114 Circle Dr, Rocky Mt NC 27804. 919-443-7870.

SE Coastal AM/LMA, or we'll help you fix your AM. P Fernie, 165 Evian, Hilton Head SC 29928.

Husband/Wife bdct professionals with 25+ yrs experience, wishing to relocate to small market. Interested in FM only, or AM/FM combo, in NW Ohio, Michigan, Wisconsin, Minnesota, or N Dakota only. We will locally own and operate station. We have good track record for sales, operation, and community service. Send rate card, description of assets and property, year end statement, and terms. All replies will be kept very confidential. Serious replies only! Send replies to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box #94-06-01-1RW.

STEREO GENERATORS

Want To Sell

Inovonics 705, 1 yr old, BO. J Michaels, WCOW/WKIJ, POB 539, Sparta WI 54656. 608-269-3100.

TAPES/CARTS/REELS & CD's

Want To Sell

Cart carousels, 120 slot (2), $75 ea; 200 slot, $100, you pay shipping. J Michaels, WCOW/WKIJ, POB 539, Sparta WI 54656. 608-269-3100.

Classic AOR library, all on 7" reels, $300. D Pulwers, Dave's Price Audio, 310 N Howard St, Alexandria VA 22304. 703-751-9346.

Country library, 300 CDs inc boxes of LPs, $1,800. S Ponek, KXBT, 3267 Sonoma, Vallejo CA 94590. 707-644-8944.

Fidelipac, Aristocart :40 & :70 carts (528); Fidelipac TR-96 cart rack; Aristocart AW-20 plastic cart racks (25), new. F Nienow, WYTE, POB 1030, Stevens Point, WI 54481. 715-341-8838.

Huge music format recorded on Scotchcart IIs w/over 3200 hits from 50's - 80's, used 6 mos, $8500; Scotchcart II's (320) 3.5 min, $2 ea, used 6 mos, shipping extra. B Lord, Lord Bdcting Co, 13313 SE 208th, Kent WA 98042. 206-631-2374.

Scotchcart II's, 1000 btwn :40 & 7:00, most are btwn 2:30 & 5:00, all in exc cond, $1.89 ea. R Burns, RF Studios, 1326 Highmeadow Drive, Garland TX 75040. 214-271-4386.

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Jazz LP collection, 1209 pieces, min bid, $10,500; also Big Band LP collection, 1279 pieces, minimum bid, $13,000; both collections exc cond, serious inquiries only. Frontier Radio Network, Box 9292, Austin TX 78766.

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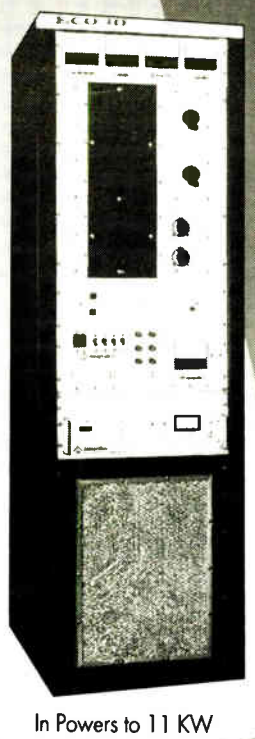

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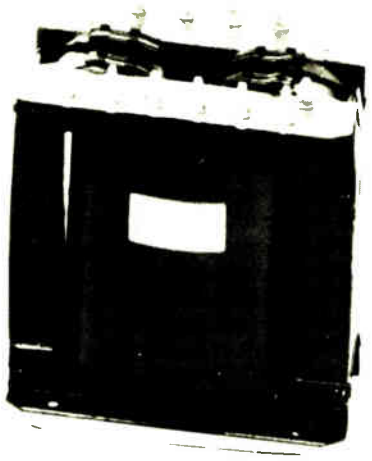

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Technics SL-220 TT 2 speed, needs cartridge shell. M Muderick, Muderick Recording, 101 Earlinton Rd. Havertown PA 19083. 610-449-6970.

BE 12C3 (4), complete w/tonearms, cartridge and Stanton 310 preamp. $150 ea. K Carpenter, KPGM, 601 W Collins, Casper WY 82601. 307-266-4003.

JVC 4-DD-5 quadraphonic disc demodulator, low hrs, $50. D Pulwers, Dave's Price Audio, 310 N Howard St, Alexandria VA 22304. 703-751-9346.

Rek-O-Kut B-12-H 2 speed turntable with S-370 Rek-O Kut tonearm & sync motor, good condition, $75. D Tonelli, Aquarius Audio, 679 Calmar Ave, Oakland CA 94610. 510-444-3094.

Want To Buy

EMT 930. Y Chung, Sleeping Beauty, 1129 S. Robertson Blvd, Los Angeles CA 90035. 310-204-1921.

Technics SP10 MK III, in excellent cond. J Hartt, Hartt Audio Archives, 2418 36th Ave W, Seattle WA 98299. 206-282-0720.

Gates pickup arm and head, T-1, RCA 16" transcription arm. B Rose, Program Recordings, 228 E 10th St, New York NY 10003. 212-674-3060.

Tonearms & turntables preamps needed by new non-commercial FM, donations appreciated. WDFH-FM, 21 Brookside Ln, Dobbs Ferry NY 10522. 914-693

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World Radio History

Andy & Debbie Montgomery and Capt'n. Pat Adams, the morning team at KIX-106 in Memphis, Tennessee.

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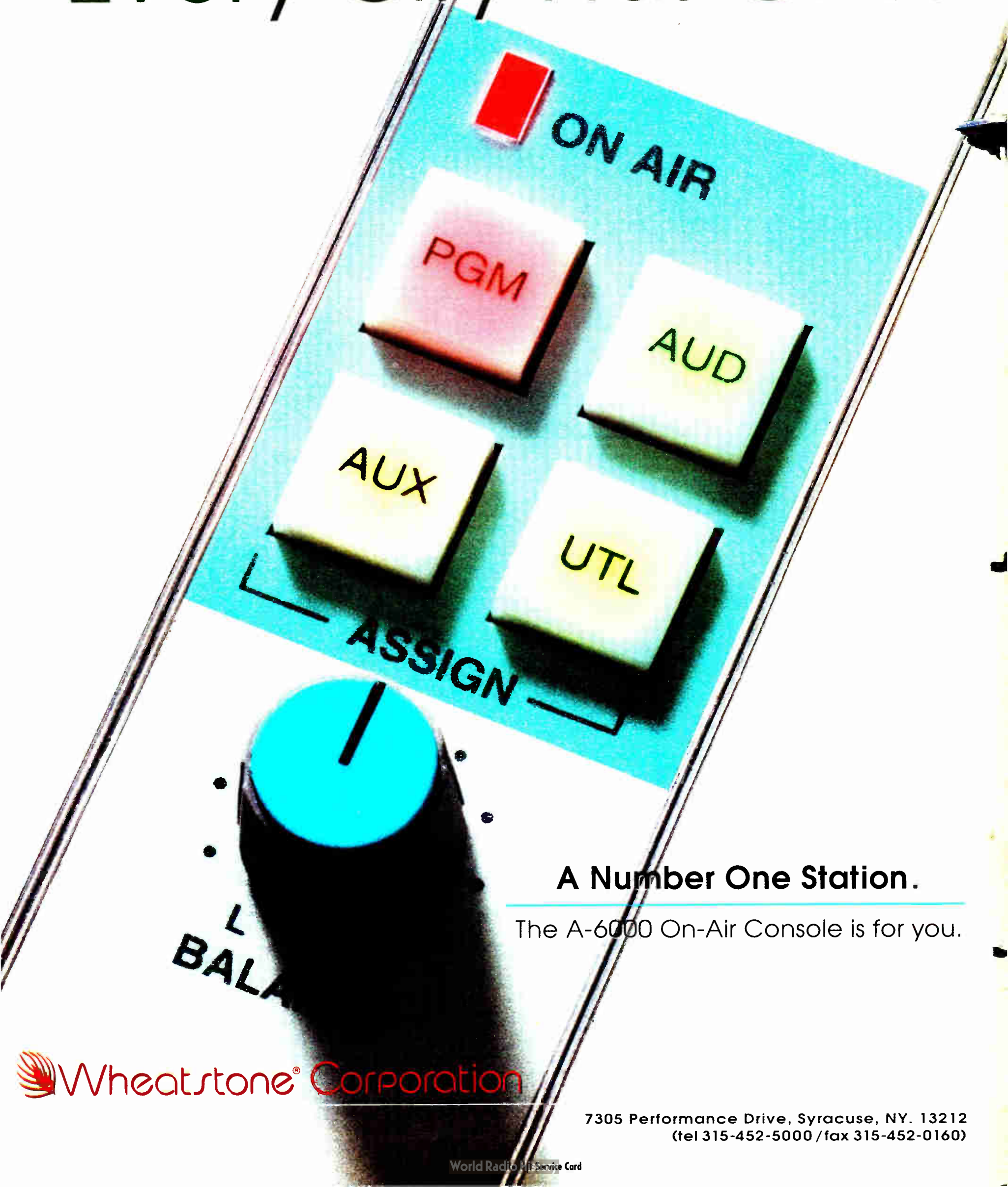

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