

## Kansas Stations Test AM Synchronocasting

by Dee McVicker

**KANSAS CITY, Kan.** The FCC has its eye on a Kansas City AM station that will soon break through the 1 kW sound barrier and leap across state some 200 miles away using synchronous broadcasting.

If the "superstation" is successful, other AM stations up against coverage barriers could benefit, according to the FCC's Chief of the AM Branch Jim Burtle.

"This isn't going to be the salvation of AM, but it could help in some situations," he said. The Kansas City, Kansas, station was given experimental authorization by the FCC on January 26 as part of the Commission's efforts to improve AM. The plan is to broadcast two 1 kW AM stations and a low-powered transmitter on the same frequency.

When completed, listeners in Kansas City will be able to drive 200 miles to the Oklahoma border and continue picking up programming on 1340 kHz (without changing frequency), according to Bill Johnson, who owns KNHN(AM) and recently purchased KSEK(AM) of Pittsburg, Kansas, as part of the plan.

The project was slated for this month, and the plan calls for originating programming from KNHN in Kansas City and distributing it over satellite carrier to an unmanned 250 watt transmitter in Amoret, Missouri, and to KSEK's transmitter 125 miles to the south.

### Super coverage

Geographically, the coverage area will have increased four-fold, giving the superstation almost the same coverage as a 100 kW directional AM.

Although dual synchronous transmission has been attempted in the past, the KNHN/KSEK superstation is one of the most ambitious to date. Of some question is whether or not the extended coverage will be offset by increased interference. "He's a pioneer in his field and he's taking a risk," the FCC's Burtle said.

Despite the risk, there are good arguments in favor of dual synchronous broadcasting for KNHN. For one, purchasing a station with the same reach would cost significantly more than the superstation experiment, according to Johnson.

But even more important, he said, is the

continuing shift of population in the Kansas City metropolitan area. In recent times, migration of the population to the southern quadrant has moved listeners and advertisers further and further from KNHN's 25-mile area set by the FCC in 1925.

In the next five years, forecasts predict that migration further south will be significant. Moreover, just south of KNHN is a 1 kW AM broadcasting on the same frequency, not only a source of competition but a source of interference that eliminates all possibility of KNHN upping its power.

Johnson said he flirted with the possibility of buying KSEK for the purpose of shutting it down, but then realized what a valuable resource it would be joined with KNHN. With listeners and advertisers slipping out of reach, Johnson began looking at the possibility of synchronizing the two stations in order to increase the market for his news/talk programming.

After drawing up engineering studies that cleared the plan of all interference to existing licensed stations in the area, he went to Washington to plead his case to the FCC.

### Helping AM

The Commission responded amiably. Said Johnson, "The FCC is looking for ways to help AM broadcasters."

But, Burtle warned, the FCC is not yet ready to grant permission in large numbers for AM superstation hopefuls. "It will take years before we have enough experimental data to determine whether it's a good idea," he said.

Of particular interest to the FCC are the characteristics of the interference zones between conflicting transmission signals. Although engineering studies predict signals will fight one another in overlap zones, and therefore, cause interference in the form of distortion, these effects are somewhat manageable.

"You can basically lay that over a very unpopulated area," Johnson said. "Plus, you can control where that zone of interference occurs by turning the power up and down at the synchronous site."

All three sites in Johnson's plan have limited terrain to shield them from signal overlap, making these sites ideal for collecting interference data.

The data collected will tell the FCC "how they can reduce the interference zone, if it varies with the seasons and the ground conductivities," Burtle said.

### Waiting for results

The results will depend somewhat on the receivers available. "There's been a lot of changes in receivers recently, particularly with the digital (tuning) receivers," he said. "Some are far less able to reject unwanted signals."

The FCC AM Branch also is interested in the effects of synchronizing audio

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## NPR Targets the World

**WASHINGTON** National Public Radio (NPR) is celebrating the fifth broadcast season of its American media showcase for contemporary African music, AFROPOP World-wide. The weekly program, which launched five years ago as AFROPOP, has expanded its musical base to include African-rooted music in the Caribbean and the Americas.

NPR and World Music Productions announced that the Rockefeller Foundation has awarded the program a distribution grant. AFROPOP Worldwide will soon be heard on two radio stations in Zimbabwe, with plans to expand

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# NEWSWATCH

## FCC Refuses Request For Time Extension On AM Stereo Docket

**WASHINGTON** The FCC refused to grant an extension of time to allow comment on the pending rulemaking that would make Motorola's C-QUAM the national AM stereo transmission/receiver standard.

Leonard Kahn, designer of the ISB AM stereo system, and a litigant in the patent dispute with Motorola, asked the FCC on March 22 to extend the comment deadline in order to meet with Commission staff "for the purpose of obtaining staff guid-

ance in the formulation" of his comments.

In denying the request, the FCC said that interested parties have had ample time (from December 10 until April 5) to file comments.

The FCC was forced to initiate the rulemaking by a 1992 law requiring C-QUAM, considered the "de facto" AM stereo standard for several years, to be chosen as the standard one year after the FCC embarked on the process.

During an interview with *RW* late last year, Kahn hinted that he may mount a legal challenge to the FCC process.

Although many industry analysts said the standard should have occurred ten years

ago when AM stereo was in its start-up period, others have said that an official standard at least establishes a benchmark.

In Japan, the government's sanctioning of C-QUAM and an organized promotion by radio stations have netted listeners and more AM stereo radios and tuners.

## Schiller is Engineering Director at ABC Radio

**DALLAS** Ron Schiller has been hired as ABC Radio Network's director of engineering and technical operations.

Prior to his new position, Schiller had helped develop ABC Radio's technical plant in New York, and he was the network's radio director of technical facilities and radio host operations for the 1984 Summer Olympics.

## Diaz-Dennis Goes International

**WASHINGTON** Former FCC Commissioner Patricia Diaz-Dennis, has joined the international law firm of Sullivan & Cromwell as a special counsel for communications matters.

Diaz-Dennis served on the FCC from 1986-1989, and was Assistant Secretary of State for Human Rights and Humanitarian Affairs until January 1993.

## FCC No Longer Giving Commercial Operator Tests

**WASHINGTON** As of March 19, the FCC suspended its February and August Commercial Radio Operators examinations that it had administered for several years.

The FCC said it suspended the program because of budget constraints, and its plan to privatize the administration of commercial radio licenses.

Those who had applications on file for the February session prior to the March 19 cutoff (there were about 1,800) were to be mailed out a one-time examination that allows the test to be taken with a

continued on page 14 ▶

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# International Broadcast Changes Recommended

## Policy Group Calls For Centralization Under USIA, VOA Should Focus on DBS, Shortwave, New Technology

by Lucia Cobo

**WASHINGTON** The U.S. Advisory Commission on Public Diplomacy has issued a 64-page report urging President Clinton to centralize country's overseas information, broadcasting and educational exchange activities as a cost-cutting measure.

The commission also recommends the consolidation of all U.S. government international broadcasting under the United States Information Agency (USIA).

radio technology, the report added.

The report also recommends VOA investment in opportunities where old shortwave markets are vanishing and new placement approaches are delivering results. It is important, however, for VOA to maintain control, flexibility, dependability with shortwave and AM/FM in China, Africa and central Asia, as well as crisis capability worldwide.

- Reduce the number of languages VOA broadcasts to ensure continued program quality and maximize listenership within budget ceilings. The commission

believes 49 language services is "artificially" high in today's international broadcasting environment. The report urges the President to work with the Congress in establishing a list of language priorities based on U.S. interests, available resources, media research and alternative technologies.

- The U.S. should terminate construction of the relay station in Israel rechannel those funds to other U.S. public diplomacy needs (particularly in light of the delays and changed

world situation). When first conceived, the relay station was to enhance Radio Free Europe/Radio Liberty and VOA broadcasts to the former Soviet Union, Eastern Europe and East Africa, and circumvent widespread jamming of U.S. broadcasts. The conditions for its original purpose no longer exist, the report said.

- VOA should pursue installation of

AM and shortwave transmitters in Kuwait, and lease facilities to strengthen its medium wave presence in the Arab world. The U.S.-Kuwait agreement is praised by the commission.

There are no operational restrictions or

for foreign radio broadcasts in China. Enhanced VOA broadcasts are carrying news and information about internal events in China and can do so more effectively and at less cost than a new station, the commission concluded.

**The Voice of America (VOA) should continue to reduce shortwave broadcasts where listenership is dropping, expand local AM placement and pursue a blend of signal delivery systems.**

constraints on the languages that can be broadcast. The Kuwait site can accommodate any remaining shortwave needs of both VOA and RFE/RL.

- Plans to phase out Radio Free Europe/Radio Liberty should be implemented, consistent with established U.S. policy and achievement of surrogate broadcasting goals.

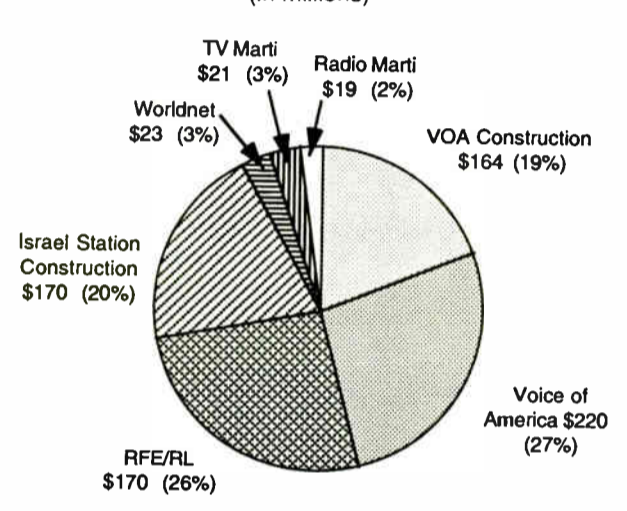
- Broadcasts of news and information about internal events in Asian countries can be achieved more cost-effectively through enhanced VOA operations than through a separate Radio Free Asia.

VOA already has the largest audience

Secondly, China is not perceived to be the closed-off society that the U.S.S.R. of the 1950's was. All of Asia is reached by radio, television, computer links, fax transmission and the many people who travel to and from the region annually.

Another concern is that shortwave is no longer the technology of the future, although it is still important. Television is the primary source of information for most Chinese adults. Lastly, a Radio Free China or Radio Free Asia would inevitably draw funds from other valuable U.S. public diplomacy operations.

Funds available for U.S. government international Radio and television broadcasting in 1993\* (in millions)



Other commissions recommendations:

- The Voice of America (VOA) should continue to reduce shortwave broadcasts where listenership is dropping, expand local AM/FM placement and pursue a blend of signal delivery systems. The commission believes VOA should strive for a balance of delivery systems that blends technologies "prudently." VOA should continue to use paid placements and DBS

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# Public Service Is Florida AM's Charter

Much has been written about the decline of the AM band, both in these pages and in the pages of other trade journals. And even though there are large market, full service "legendary stations" still churning out profits, it is no big secret that large numbers of AM stations operate in the red.

It is an unfortunate situation. It also has served as a call to action to the more dedicated and innovative broadcasters. And they are out there. The last few years have seen AM format offerings ranging from all-Elvis to all-shopping, all-business, all-kids programs, all-motivational, all-sports, and so forth. Some have worked brilliantly—all-sports WFAN is the shining example of what an aggressive operator with ideas can accomplish—and others have failed abysmally (all-Elvis lasted a month).

Through it all though, AM believers are hanging tough, looking for the perfect formula that will keep them on the air.

One such group of believers is Pensacola, Fla.'s "The Voice of Print." WKGT(AM)'s approach is really a return to one of radio's original charters: service to the public.

In a nutshell, the station recruits volunteers to read newspapers, magazines and books on the air. The station doesn't sell spots, but rather sponsorships (another idea from the past) of entire segments of programming.

According to the station manager, Bruce Lyons, a decision was made to keep the station (WKGT 1090 kHz) operating. "We are only looking for the sponsorships to cover the expenses of running the station." The group targets local businesses to buy the sponsorships, thus involving the community in serving the community.

The philosophy behind keeping the station a commercial operation is a laudable one. Lyons and crew maintain that they would rather not tap into government funds (if the station were to be organized as a non-profit venture it would have access to various grants) because they would rather see that

money used to help their audience.

According to numbers provided by the station, its target audience is a large one. The station categorizes its audience as those with vision severely impaired, dyslexic, functionally illiterate, pre-kindergarten, special education, hospital patients and residents of homes for the aged. Listeners falling into one or more of those categories make up 49 percent of the population of Pensacola, 42 percent and 41 percent of the surrounding counties of Escambia and Santa Rosa, respectively.

But as large as the audience is, says Lyons, there is an equally large commitment from the community to what the station is doing. "We have two-and-a-half times as many volunteers as we need," he said.

A sampling from the station's schedule reveals that they are striving to provide something for everyone. Daily readings include excerpts from the Bible, the Wall Street Journal, USA Today, the New York Times, and readings from an



assortment of mystery, romance, science fiction and classic novels as well as the local newspapers and a variety of national magazines.

Lyons and the crew at "The Voice of Print" are extending an offer to all AM stations in search of a formula. If you would like to try something similar in your market, give them a call. The station management is willing to walk you through what they are doing; if they receive enough inquiries they will even produce a manual.

★ ★ ★

Creative radio formats are really only part of the entire radio package. Good radio creative (advertising copy) can add to the mix to provide a clean, polished sound that won't have listeners reaching for the scan button every time there is a commercial break. You'll recall that last year a group of radio executives, led by Group W President Jim Thompson (who has since moved on to co-captain Liberty Broadcasting with former Group W VP Mike Craven), made a monetary commitment (to the tune of \$1 million over a ten-year period from Group W alone) and a concerted effort to inspire agencies and stations to elevate the level of interest and work that goes into writing advertising copy for the radio.

The end result was the Radio Creative Fund that brings together some of radio's and advertising's brightest talents. The Fund sponsors an annual competition, the Radio Mercury Awards. This year, the best radio commercial of 1992 will walk away with \$100,000. Eight additional cash prizes will be awarded, with a \$20,000 Mercury Gold prize and a \$5,000 Mercury Silver prize to be awarded in each of four categories: humor, non-humor, music/sound design, and radio station-produced.

The number of entries this year is 889, an increase of 50 percent over last year, the first year of competition. The awards will be presented at a black-tie gala at New York City's Waldorf Astoria on June 9. Dick Clark will be on hand to emcee the event.

★ ★ ★

While I'm on the subject of the complete radio package, where would any of it be without the technology? At the March AES Show in Berlin, a group of German manufacturers (the CAR Group) held a meeting to discuss how to move toward standardization in the digital audio market. The idea is to provide a common hardware communications link, i.e. a standard file format to which all manufacturers can conform.

The CAR Group, comprised of Barco-EMT, David, GTC, Management Data and Digigram (a producer of MUSI-

CAM compression cards), reached a joint accord, agreeing to put in place a common file data standard for audio compression systems operating under the ISO/MPEG Audio Standard (MUSICAM).



The Katz Radio Group named Steve Shaw vice president and general sales manager of Christal Radio. Shaw joined Christal in 1985 as an account executive and has held various positions with the rep agency since then. His most recent position was that of New York sales manager.

Tom Joyner, the well-known "Flying DJ," has been tapped by ABC Radio Networks to host a morning program that will originate in ABC's Dallas studio. Also in the works for Joyner are long-form and feature programs.

Since 1985, Joyner has worked in Dallas and Chicago—as top-rated morning man on KKDA-FM Dallas and top-rated afternoon host on WGCI-FM Chicago. Joyner flew back and forth between the cities on an almost daily basis.

Bob Edwards, the absent host of NPR's Morning Edition, returned to the popular program on April 1. Edwards took a leave of absence in December 1992 to write a book about his friendship with legendary baseball announcer and NPR commentator Red Barber.

Edwards weekly chats with Barber were one of the most popular segments of Morning Edition.



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## Bullish on AM

Dear RW,  
I must respond to Stephen Poole's letter in the Feb. 24 issue, which disagreed with your Jan. 6 editorial in which you said "there are no valid reasons not to convert to AM stereo." You are right—there are no valid reasons! Broadcasters everywhere moan, "there is no discernable public demand for AM stereo." They've been saying that for over a decade.

But thanks to the persistence of the folks at Motorola, there are some 25 million AM stereo radios in cars and trucks anyway, wanted or not. Often consumers don't know they have one with that new vehicle; often the salespeople don't know they sold them! But if the radio reproduces an AM station in stereo automatically, the station just sounds better, and that's a competitive advantage.

Mr. Poole says his students "know that AM stereo exists" but aren't interested. You can wow anyone with a well-engineered AM station reproduced in stereo on an AMAX receiver, whether a GM model bought as a demonstration device from a car dealer and powered from a battery, as some have done, or with the Denon TU-680-NAB receiver. In fact, you can wow anyone with the 12-year-old Sony SRF-A100 stereo portable, if you can find one!

Once an AM station is stereo (and any format sounds better in stereo, even all-news; check out KNX and KFWB in Los Angeles), you still have to attract listeners. Since there are many people today who will tell you, "I never listen to AM"—many of them do anyway, at least occasionally. Consider this: 33 years ago, when I started in FM, few people had an FM radio and ratings services wouldn't print numbers for FM stations, no matter how many listeners they had. Today, everybody has an AM radio, whether they listen to it or not, and AM ratings do get printed. AM today is in a better position than FM was three decades ago.

And as far as the pervasive attitude that AM can't work with music anymore, that's just hogwash. AM has a major advantage over FM in the very perception that the two bands are different. I have successfully exploited it on AM several times within the last ten years—in Arbitron-rated markets with strong FM competition—to generate big ratings among adults 25-49 presumed to be impossible today for AM stations. There was not one failure with a modern Adult Contemporary format. And such AM A/Cs build numbers without having to battle FM A/Cs head-on. Anyone willing to entertain the possibility (and an amazing number of theoretically professional broadcasters are not open-minded enough to even consider such a possibility) can get the details from me (503-232-9787), no charge.

Eric Norberg  
Radio Programmer/Writer/Teacher  
Portland, OR

## Versa-Count Update

Dear RW,

I have yet another update of the Versa-Count/Scientific Data International saga. SCI also has officially passed into oblivion like Versa Count. I just received a notice regarding the recent auctioning of the company's remaining assets. To all those with functioning Versa-Count gear... pray for God's luck, clear skies, clean power, and a more generous capital budget (ha)!!

Michael G. McCarthy, N9EAO, Owner  
McCarthy Radio Engineering  
Mt. Prospect, Illinois

## Can be undone

Dear RW,

Thank you for your excellent coverage of AKG's DSE 7000 digital audio work station in the Feb. 24 issue. Unfortunately, a typographical error incorrectly changed one of our features.

The end of the third paragraph should have said, "Because audio is stored in RAM and on disc, edits are instantaneous and can be undone." In fact, UNDO also is instantaneous and properly treated audio can be infinitely undone, all the way back to the first edit.

David Angress  
VP of Sales/Marketing

## All about local

Dear RW,

Not long ago I wrote RW asking 18 technical and management questions. You published the letter.

Many people called with great solutions and explanations. You even published whole stories in answer to some of my questions. Thanks everybody.

Here is another question: In your February 24 issue, NAB CEO Eddie Fritts is quoted as saying that satellite digital audio broadcasting (DAB) will destroy local radio. *Isn't all radio including DAB required to be "local?"* If so, DAB doesn't seem capable of meeting that requirement.

I thought that "local" is what public

# Paying the Piper Twice

Record-industry lobbying for performance royalties, a regularly recurring Capitol Hill phenomenon, has returned in 1993. William Hughes (D-N.J.), chairman of the House Copyright Subcommittee, appears to be odds on favorite to introduce such a bill in the current session. The issue takes on renewed urgency, Hughes says, because new digital audio broadcasting and cable services are coming.

DAB and performance royalties? Seems like a difficult connection to make.

Broadcasters already pay music licensing companies for the right to air copyrighted compositions. Additional performance-royalty payments are proposed to recognize every airing of a composition as a separate "performance" and the performers' voices, instrumentations and interpretations as separate entities meriting separate copyright compensation.

It is an interesting concept; a concept the Congress has chosen to reject for the last few decades.

But soon, record companies say, consumers will be making perfect copies of digital transmissions on digital recording devices. The incentive to bootleg copyrighted material will be increased. Performers and composers (read the handful of major record companies that have performers and composers under contract) will lose royalties. It could mean the end of recorded music retailing.

If this sounds familiar, it is essentially the same argument rejected by the Supreme Court in the Betamax case in the 1970s. Recorded analog audio and video have prospered since then and some say home recordings have boosted—not blunted—recorded music sales.

Consumer digital technology is not likely to change the scenario. The record industry claims there is no technological solution. But the 1992 Audio Home Recording Act already requires copyright payments on blank digital tape purchases and a chip in every digital audio recorder to prevent digital copies beyond the first generation.

If even more protection is deemed necessary, requiring anti-copying codes in the broadcast digital bit stream makes more sense than a performance royalty.

At the root of the performance-royalty argument is the assumption that broadcasters have always profited from the use of property that does not belong to them. Radio station owners are willing to pay fair copyright compensation for the music they air. The injection of DAB into the debate is a red herring.

—RW

access files were all about; proving how local you were. I thought that a requirement for localism was the result of the FCC's interpretation of the Communications Act of 1934... "in the public interest, convenience and necessity." Wasn't localism the reason that stations have their own news departments or, at least, public service announcements of local events?

Weren't hundreds of competitive hearings and license renewal challenges held to determine how local broadcasters really were?

John H. Wiegman  
Wallace, Idaho

## Faulty power supply

Dear RW,

Thanks for the opportunity to clear up a misunderstanding in the "Overtime, Ingenuity Bring RDS to 'Vegas'" article (Feb. 24 RW). The particular reference is; the receiver, Casey recalled, "was temporarily DOA." I never made the "quoted" statement and the choice of the term "DOA" may have sent the wrong message regarding the Delco RDS radio product.

In reality, it was not the receiver that was the problem. The actual box fixture that contained the Delco RDS radio and loudspeakers also contained a 12 volt DC power supply. At the time of the KFMS-FM installation, some very heavy EM/RFI conditions existed that were radiating from the dozen or so transmitters housed in the same building. Keith LaMonica and I immediately assumed the 12 volt DC power supply contained in the box fixture was shutting down due to these adverse conditions.

Once back at the KFMS-FM studio, the Delco radio display unit powered up with no problems and functioned quite wonderfully. It wasn't until the first morning of the Consumer Electronics Show that Delco engineers quickly determined a faulty power supply was causing the problem. After an on-the-spot field repair, the Delco RDS radio was successfully demonstrated at the EIA/CEG booth for the entirety of the show.

John D. Casey  
Sales Engineer/Broadcast Products  
RE America

## Correction:

In the March 24 RW article, "Radio Altered for SCAs," WPGC (AM) was described as a station without nighttime coverage. The station, however, does have nighttime coverage at 270 watts. Cook Inlet wanted to improve its post-daytime coverage using the second SCA on WPGC-FM.

## solution to 4-14 puzzle

T	A	S	C	A	M	O	R	O	B	O	E
R	C	A	D	B	C	A	R	T	I		
C	C	A			I	T	T	A	R	E	A
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# Radio World

Vol. 17, No 8

April 28, 1993

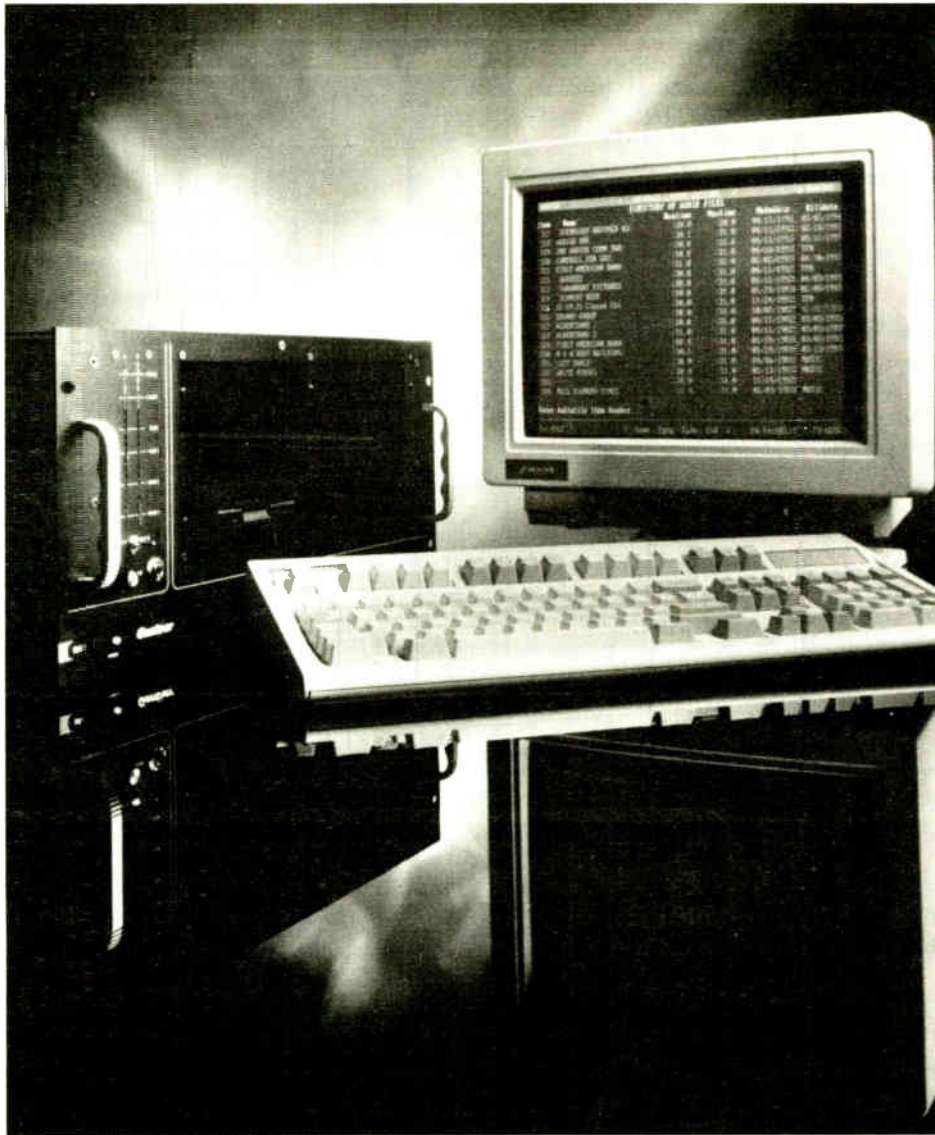
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# IEEE/ANSI RFR Standard Key Topic at EEPA Forum

by John Gatski

**ALEXANDRIA, Va.** Recent publicity about the claimed adverse effects from exposure to RF radiation from broadcast towers, cellular phones, speed radar, household appliances and power lines has created confusion about public safety.

One of the nation's premier forums on RF radiation, the annual Electromagnetic Energy Policy Alliance's (EEPA) annual conference May 3-5, will try to sort through the research, hysteria and public misconceptions on the complex subject, according to the forum's organizers.

NAB Deputy Counsel Barry Umansky said broadcasters are especially affected by the debate over RF radiation exposure in terms of restricted land use for towers, and the necessity of meeting proposed new regulations likely to be approved by the FCC later this year.

"The focus for broadcasters is the

increasing difficulty in land use," Umansky said. "I use to get calls 3-4 times a year on this subject. Now, I get calls 3-4 times a month."

Pressure for action by environmentalists and citizens groups who said their property values and their health were being threatened has forced some local governments to propose exposure limits that could force broadcasters to place a tower in undesirable locations. Some local ordinances that have been enacted are based on hysteria, rather than scientific fact, researchers claim.

Umansky said the FCC's involvement in creating a new two-tier standard, one level for workplace exposure, the other for public exposure, should give local jurisdictions a reasonable guide to enact local laws.

Without "reasonable" guidelines, radio and television broadcasters may encounter more problems if they have to

Cairo, Lagos, Abidjan, Havana and Johannesburg.

To complement the program, World Music Productions has published the 1993 AFROPOP WORLDWIDE

# NPR Aims For World

► continued from page 1

into at least 10 African nations by 1994.

Currently, the program airs on 200 public radio station in the United States and in the United Kingdom on BBC Radio 5.

Cameroon-native George Collinet hosts the hour-long program. The U.S.-based broadcaster's programs have an estimated reach of 90 million Africans. AFROPOP Worldwide is produced by World Music's Sean Barlow.

The program's spring 1993 season will feature 13 new programs including: an exclusive live recording of Yousou N'Dour in performance on the last night of his most recent U.S. tour; an all-rumba program featuring a live recording of Los Muñequitos de Matanzas; a brief history of funk; a live acoustic performance by Gilberto Gil, and visits to

Listener's Guide (pictured above), featuring discographies and record sources, suggested reading, and a guest essay by Brazilian superstar, Gilberto Gil. The guide is designed for easy reference by media professionals and music lovers.



make wholesale changes in transmitting equipment and antennas when implementing digital audio broadcasting and high definition television in the future, he said.

The EEPA symposium will be held at the Raddison Hotel. Sessions will run through the three days. Significant sessions include: "Myths and Facts: What the Science Tells Us" at 1:30 p.m., May 3; "Risk Assessment" at 3:30 p.m., May 3; "Research: Answers or

More Questions," 8:45 a.m., May 4; "Consumer Confusion: Who Pays?" at 1:30 p.m., May 4; "What is the Future? Regulation or Litigation?" at 8:30 a.m., May 5; and "Is the Public Perception Making Science Irrelevant?" at 1:30 p.m., May 5.

To register, contact the EEPA at 202-452-1070; or fax, 202-833-3636. Registration fee (minus hotel fee) is \$450 for EEPA members and \$500 for non-members.

# Synchrocasting Tried

► continued from page 1

over a long path, particularly as it relates to time delay, and will be collecting experimental information on this as well.

"Some of the (overseas) countries already allow this, so there's been some work in this area already," Burtle said.

But the challenge for U.S. stations will be in fitting synchronous broadcasting within a congested band. Heavily populated areas are not likely to benefit from the application because of the likelihood of interference, he added.

Others, like KNHN and KSEK, could find new power in synchronous broadcasting. Not only are the two stations able to increase market potential by consolidating resources, but the union will bring a valued service to listeners that otherwise would be

too costly.

"We're able to offer regionally oriented talk programming that to date had been too cost prohibitive to put into the smaller rural areas," Johnson said.

Depending on the outcome of the experiment, Johnson said he could be looking eastward to other small AMs to extend even further the reach of his superstation.

What about a nationwide superstation? Not likely, according to Burtle. "If you look at the way the nation is broken up in the AM market, there really is no situation where a station would be able to do that without causing a whole lot of interference to an existing licensee."

But, Burtle added, he hasn't ruled out the possibility entirely. "I'm always amazed at the creativity and ingenuity of businessmen."



# THE IMPORTANCE OF BEING AVAILABLE

By John Schad  
President, SMARTS Broadcast Systems

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# Performance Royalties Addressed

by Randy Sukow

**WASHINGTON** The broadcast industry is bracing for legislation expected later this year imposing performance-rights royalty payments on radio stations, digital cable radio channels and other music services.

The bill is likely to be introduced by House Copyright Subcommittee Chairman William Hughes (D-N.J.).

The recording industry and broadcasters have long grappled over whether stations, which already pay royalty fees to composers, should also pay into a performance fund. Congress has traditionally sided with broadcasters on the issue, most notably by omitting performance-royalty language in the 1976 Copyright Act.

But the expected emergence of digital audio radio (DAR), the recording industry argues, has changed the copyright debate. Record companies also claim changes in the international recording marketplace justify changes in U.S. copyright law to provide equal performance-rights protection.

"An Israeli politician once remarked about Middle East negotiations that if you're not talking about land, you're not talking," Hughes said. "In the context of [international copyright-law negotiations], it might be said that if you're not talking about changes to the U.S. Copyright Act, you're not talking."

Broadcasters and record companies tend to speak of performance rights in

apocalyptic terms. As DAR approaches, the potential loss of revenue from piracy with consumer digital recording equipment "threatens the very existence" of re-tailed prerecorded music, said Jason S. Berman, president of the Recording Industry Association of America (RIAA) in written testimony to the Hughes Subcommittee.

## Digital difficulty

"Digital transmission systems have advanced to the stage where acts of broadcasting can be more akin to a means of distribution and less like our traditional notion of broadcasting," Berman said.

The NAB, however, said the RIAA is overreacting. "There is no evidence that this phenomenon will occur," NAB President/CEO Eddie Fritts said in his testimony.

RIAA uses the same arguments rejected by the Congress and courts after other technologies—such as home VCRs, analog audio cassettes and FM stereo—were introduced, Fritts added.

But in an era of when several radio stations are going dark and the industry is threatened with higher taxes, loss of tax deductibility for advertising, spectrum auctions and new FCC user fees, it is broadcasting's existence, not the record companies' that is threatened, according to Fritts.

As in earlier copyright battles, NAB stressed the promotional value of radio

air play. "Exposure of musical recordings to the buying public through free broadcasting is a critical part of the promotion of records, tapes, CDs, music videos and concert tickets, not to mention spin-off goods and services marketed under the names of star performers," Fritts said.

U.S. Registrar of Copyrights Ralph Oman accused broadcasters of overstating their promotional value. "Such promotion benefits only certain recordings and certain lead artists. It does not benefit all," Oman said. "Even if (broadcaster) assertions are true, this does not, in the view of the Copyright Office, justify denying compensation for public performance of recordings from which the user enjoys financial gain."

(The Copyright Office has consistently sided with the recording industry in performance-rights debates dating back to the 1970s. Most recently, in a 1991 report, the office recommended new royalty payments specifically because of marketplace changes expected from DAR.)

## Other ideas

Edward P. Murphy, president of the National Music Publishers Association, did not take a direct position on performance rights payments, but suggested a number of alternative policies to protect the record industry. Broadcasters could agree to limits on the consecutive cuts aired from a compact disc and could agree to inclusion of anti-copying codes in their broadcasts.

In time, Murphy said, a new industry of home-shopping music service, perhaps replacing all prerecorded tape and disc sales, is likely to grow as consumers buy digital recorders. Those new industries could be established to provide fair payments to composers and performers.

NAB is "amenable to negotiating" a limited fee policy for such subscription audio service, Fritts said.

Broadcasters are not willing, however, to discuss new royalty payments for tradi-

tional radio music formats, digital or analog. Provisions of the 1992 Audio Home Recording Act, in NAB's view, insure that the recording industry gets its due from home digital-audio dubbing.

The 1992 act adds a copyright royalty charge to consumer purchase of blank digital audio media and requires all recorder manufacturers to add a copy limiting feature, such as the Serial Copy Management System, which blocks digital dubbing beyond the first generation, into their products sold in the U.S.

"No consumer hardware solution presently exists nor is it likely that one will be developed that will function without broadcasters cooperation," RIAA's Berman said. The 1992 act was never meant to be a final solution to the problems raised by digital innovation. It protects record companies and composers from illegal copying.

## A world view

The United States, performance-rights supporters say, has long been the foremost supporter of international intellectual-property law. "Our trading partners naturally question our commitment to such standards when we fail to accord sound recordings the basic protection of a performance right," Berman said.

The World Intellectual Property Organization (WIPO) is in the process of assembling a committee of experts, Hughes said, "conclude a protocol to the Berne Convention [international copyright treaty] and to establish a new convention for the protection of the rights of performers and producers."

Several key U.S. trading partners already have performance-rights laws, including most of the European Economic Community. Ironically, Oman said, U.S. performers often do not benefit from even other countries' performance fees because "they grant rights to foreigners only on a basis of reciprocity."

Fritts said, "To ask U.S. broadcasters to pay new royalties to the recording industry so that it can go abroad to obtain still more royalties is unfair and inequitable. Overall, U.S. interests are more likely to be harmed than helped."

A Broadcast Industry

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# One FM Simulcasts Two Games Via Stereo Split

by Gary Hart

**SULLIVAN, Mo.** The laws of time and spectrum space were against KTUI-AM-FM of Sullivan, Missouri the night of March 3, 1993. Two local high school basketball teams were playing in different state tournaments at the same hour, and this was not the first time this had happened.

On this occasion, however, the station devised a way to air both games live on its single FM frequency.

## Two winning teams

The Sullivan Eagles were playing in their class "3A" District Tournament in Owensville, Missouri starting at 8:00 p.m. while the Bourban Warhawks were going to begin their drive in the Class "2A" Sectional Tournament in Rolla at 8:15 p.m. KTUI's Sam Scott read of a solution from KSHN in Libertyville, Texas and brought it to the attention of General Manager John Rice.

KTUI-FM broadcasts in stereo with 3,000 watts on 100.9 MHz. The Warhawks' play-by-play team headed down the interstate to Rolla with an audio set-up Scott built with a telephone, two beyerdynamic DT-108 headsets, and a Realistic amplifier and 5-channel portable stereo mixer. The announcers sent audio down the phone lines to the AM's 10-channel Gates board.

KTUI(AM) is a 1,000 watt daytimer on 1585 kHz. The AM was off the air by the time the game started and had plenty of Gates and Harris cart machines on which to run spots. The personnel back at the station routed the audio from the AM board, through the Switchcraft patch panel, and into the right channel on the

FM's McMartin 5-channel board.

The Eagles' game came in over 161.76 MHz on the Marti RPT-440L 40-watt, single channel directly to the FM board and then out again on the left channel. The overlap began around 8:00 p.m. and lasted for more than an hour. Did they need special permission? Scott laughs, "the FCC doesn't care as long as you run your station IDs."

General Manager Rice says KTUI's studios were expanded and rebuilt when the FM station was added in 1981. Both stations were linked through the patch panel at that time. Scott says it's not unusual for an FM jock to be working out of the AM

**...it was almost certain the Warhawks and the Eagles would be scheduled opposite each other.**

studio while the FM board is being serviced. Using a "Y" patch cord, they route the mono signal from the AM mono output bay into the "Left" and "Right" channel FM bays. Getting separate signals to each FM channel involved simply plugging the AM output to the right channel and letting FM run normally.

## Listeners were told

Scott says it was almost certain the Warhawks and the Eagles would be scheduled opposite each other several days before it actually happened. After testing and making sure it would work, instructions on how to hear each game were "hyped pretty heavy" on the FM stations. Scott says they "talked it up" on KTUI(AM) (news/talk before noon and then simulcasts Country music with FM) and put ads in the local newspapers. "We were telling people they wouldn't be able to hear it on their clock radios."

Scott tells a story of one man who'd been out of the state and was driving back into the area when he heard two games being played at the same time. "He told me later he was confused until a commercial came on at which point he figured out that he should turn up the channel he wanted to hear."

Scott says they got one call before the games from someone who still didn't quite get it and after a woman called saying, "That was the dumbest thing I ever heard!" Scott says that was the only complaint.

Rice says, "I was kind of shocked I didn't think of this before." He says Sullivan and Bourban are both good teams and KTUI listeners could hear more doublecasts in the future.

Scott is the morning-drive jock on FM along with sales duties and he says advertisers were pleased with the experiment. Scott says they "don't want to make a habit of this" but were pleased with the experiment. Both say KTUI has gotten a number of "How did you do that?" calls from other radio stations and put the story on the Associated Press wire statewide.

The night was not a success for everybody. The Bourban Warhawks lost. The Sullivan Eagles won their game, but lost in the championship.

□ □ □

Gary Hart is a freelance writer and Assistant News Director at WCIL-AM-FM Carbondale, IL.

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## 62 Years Ago

Reprinted from Radio World April 1931.  
Editor's note: The RW of old, printed for a time in the 1920s and 1930s and today's RW are unrelated except in name.

## FIRST REGULAR RADIO TALKIES SOON TO BEGIN

Eyes are being provided for the heretofore blind radio audience, with the early inauguration of regular programs from the first sight and sound broadcasting studio in New York City. The Jenkins Television Corporation's television transmitter W2XCR and the General Broadcasting System's station WGBS, are co-operating as outlets for the sight and sound studios.

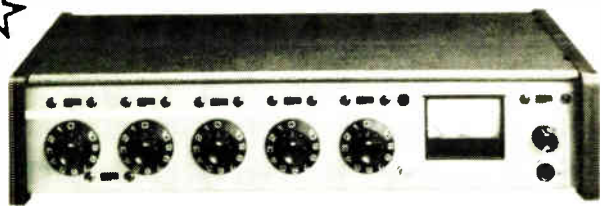
With a corps of electricians and mechanics completing their work on the radiovision studios and television transmitter at 655 Fifth Avenue, New York City, entertainment and enlightenment will soon be projected by sight and sound to the homes of the metropolitan area as well as to other parts of the country.



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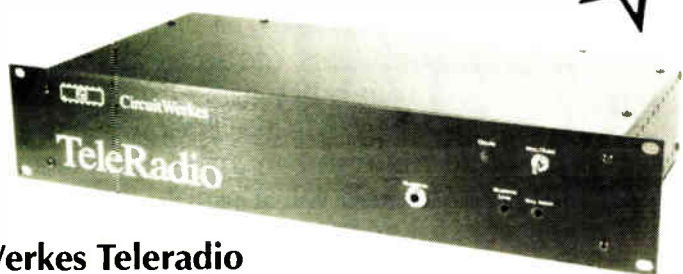
This compact audio mixer is a "must have" for every station's ENG and sports production. Take advantage of our great price — \$364. Available from stock!



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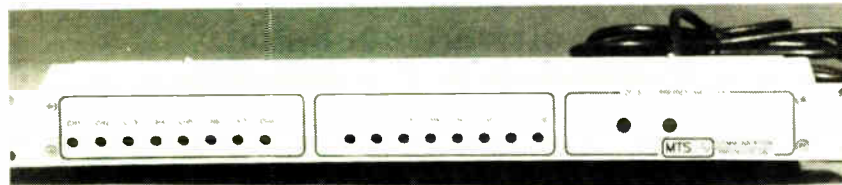
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# Rock Managers Eyeing Satellite Digital Radio

by Nancy Reist

**SAN FRANCISCO** Endangered formats, such as classic soul, roots rock, folk, bluegrass, blues, jazz and old country, which currently receive scant commercial air time, may find a haven in the proposed digital audio radio satellite service (DARS).

At least that's the plan of rock n'roll artist managers Cliff Burnstein and Peter Mensch. Their company, Primosphere Limited Partnership, is one of five which have active proposals before the FCC to deliver digital radio to listeners via satellite.

Burnstein says the most significant difference between Primosphere's proposal and the others is Primosphere's focus on programming. "We went to the effort of identifying some niches of what we call American Heritage music, that we think ought to be preserved, a kind of living museum in a way. It's stuff that really you can't hear today. You can buy a lot of it on CD reissues, but you can't buy all of it by any means, and the market for it is shrinking because most people don't have any kind of free exposure to it."

Primosphere proposes to provide twenty-three music channels and up to six talk channels on the S-band. They are proposing a 4:1 compression ratio to preserve the fidelity of the music. The plan calls for use of two satellites with single beam coverage of the continental United States. The service would be free for listeners and supported by advertising.

Burnstein, who has a B.A. in Economics and an M.A. in Demography, believes that the specialized formats would be commercially viable nationally. "We can do it because, at least by our proposal, we have enough channels that we can serve relatively small niches. As we like to say, if you can serve 1 percent on the national level, you'd be wildly successful. On the local level if you served 1 percent, you'd be a major failure."

He added that the different formats would work together and could be cross-promoted. "I also look at this as kind of a system. It gives listeners an opportunity to go across channels to hear different things, but whenever you want to hear one particular thing, you know you're going to get it."

Though Burnstein and Mensch are successful popular music managers (their acts include Metallica, Bruce Hornsby, and Def Leppard) Burnstein said he would hire programmers to do the hands-on work and would remain a "critic and overseer."

Primosphere hired experts to prepare playlists for five of the "American

Heritage" formats described in the FCC proposal: Country music recorded before the mid-1970s; Soul; Folk, Bluegrass and Blues; American Roots Rock; and Jazz.

In addition, Primosphere's proposal includes channels dedicated to show tunes, classic rock, oldies, standards, international music, CHR for younger demographics, CHR for older demographics, rock for younger demographics, rock for older demographics, alternative rock, black/urban for younger demographics, black/urban for older demographics, country, dance, Spanish language music, "top 40" classical, classical for "the more serious listener,"

contemporary jazz, news/talk, sports, business, comedy, children's programs, and audio for the visually impaired.

Although many current radio owners have objected to the proposed satellite services, Burnstein does not consider Primosphere's proposal to be a significant threat to local stations. As a radio station owner himself, (Burnstein and Mensch own three stations in California) Burnstein has



Primosphere's Peter Mensch (L) and Cliff Burnstein

a vested interest in the success of current stations.

"I think what will happen is that there will be a relatively small proportion of national business lost to the satellite system. Local business shouldn't suffer in any way at all," he said.

He pointed out that DARS is unlikely to be operational before the end of the decade, and after that, it would still be several years before it achieved a significant market penetration. He added that he believes a local station could easily outcompete a national station with the same format.

For the same reasons, Burnstein believes that in-band DAB (if it is selected as the terrestrial standard) and satellite-delivered DAB can coexist comfortably. "I hope in-band becomes a reality."

Of course Primosphere's proposal is far from a done deal. Though Loral Aerospace Holdings recently dropped out of the competition by joining with Satellite CD Radio, five satellite DAB proposals remain before the FCC. The negotiations surrounding the proposals are likely to be complicated and controversial.

"This is like the Wild West to me. It's like you make your own rules as you go along. So we'll see what happens. I don't expect it will happen quickly, because of the nature of the beast," Burnstein said.

Steve Selwyn, a staff engineer in the Policy and Rules Division of the FCC's Mass Media Bureau, said that significant decisions on the applications are still pending.



# When It Snows It Pours

Dear Luci,

I'm piecing this one together on the train back home out of Noo Yawk City. The 1993 Intercollegiate Broadcasting System's annual convention ended only hours ago and, boy howdy, this was one for the memory chest.

The IBS is the organization for college radio stations and the people who run them—all the future broadcasters of America who say to the boss: "Whattaya mean I can't bring my own records from home?"

It's always a great pleasure for me to attend the event and share what little nuggets I've picked up along the way. For anyone who's been offered a chance to speak at any convention, I say do it. There is nothing else I can compare it to.

But do you remember the phrase: "It always comes in threes?" It sure did this time.

### Bombs and buckets

Back in February the IBS package came with the list of workshops offered and the flyer trumpeting the new convention location—the beautiful New York Vista Hotel at the World Trade Center.

Right. The one that got bombed. That's "one."

Only weeks away from the convention date, IBS's home office had to scramble to get exhibition space. They found some at an old familiar haunt, the New York Ramada (a.k.a. the Penta, a.k.a. the Pennsylvania Hotel) across from Madison Square Garden.

Oh, great trivia question, Luci: What's the phone number of the New York Ramada? I'll tell you at the end.

It was a kick to see so many familiar faces again, including LPB's Ed Devecka, BSW's Laura Tyson, Lauri Deutsch of WMGK(FM) Philadelphia.

I also saw half the city of Syracuse, not to mention fans of Georgetown, Seton Hall and other basketball teams from all over attending the *Big East Semis at the Garden* and all staying at *our hotel!* The whole @#\$\$%\* weekend!!

There were victory celebrations next door at 2 a.m.; horn practice for the bands at 10 a.m., and empties sailing past my window on the way down at all hours. That's "two."

For all the time spent in prep, all of my own workshops went just fine. I repeated last year's MIDI seminar with some gear I'll be discussing in *Studio Sessions*. I chaired two groups on production techniques (cartoon-like effects seem big with this crowd, thanks in part to "Ren & Stimpy" and "Beavis & Butthead") and worked with IBS's Thom O'Hair and WHCR-FM's (New York) Frank Allan in an audition-tape workshop.

These are all solid, necessary bread'n'but-ter skills for you and me, but almost unheard of for most folks in college radio. In between whoops and hollers from the Hoyas and the UConn Huskies across the hall, we actually got some work done.

### Completing the trip

Which brings me up to "three." The Blizzard of '93. Nuff said?

New York City is paralyzed when four inches of snow falls. Imagine five times that amount and you'll see that almost everything locked down, including a couple of side trips during my downtime (a visit to the Empire State Building, a trip to Barry Electronics to see the new I-

Com Amateur gear and a jaunt to the Burrito Bar for one crummy taco).

Some of the exhibitors played it safe and split early, to razzing from the Syracuse crowd ("You call *dis* snow?"), and got home safely.

By the end of the snowfall, trains and planes were cancelled and normally-suicidal cabbies drove like grandmas on Sunday. Eventually I also figured it was time to pack my cassettes and synthesizers and grab the next loco back to Danbury. Well Casey Jones dropped me off in Croton Falls, N.Y., instead due to one line being snowed under.

Man, whatta commute that was.

# FROM THE TRENCHES

by Alan Peterson



Last time I wrote about the IBS convention, I seem to recall ending with a wish to top what I had done for the next gathering. How can you top bombs, basketballs and blizzards?

Maybe next year I'll find out.

—Al

Al used to work for big-band station WMAS Springfield, Mass., and can still dial the Ramada's phone number from that great ol' Glenn Miller tune "Pennsylvania 6-5000." Write him at WLAD, 198 Main Street, Danbury, Conn. 06810.

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## COLE'S LAW

# No EBS Witch Hunt ... But Watch Out

by Harry Cole

**WASHINGTON** I heard a rumor the other day. Two readers from Louisiana called, separately and independently of one another, each to report hearing of an impending FCC crackdown on stations operating remotely at night.

The problem, they said, involved compliance (or lack thereof) with the Emergency Broadcast System (EBS) rules by stations run by a remote operator.

"What's the scoop?," they wanted to know.

Eager to please, we asked some folks at

the FCC. Based on those conversations, it appears there is no specific "crack-down" underway in any particular geographic area. Routine station inspections are proceeding as they would normally. On the surface, then, there seems to be no immediate need to panic.

### Be ready

However, as part of the standard Field Operations Bureau routine station-inspection drill, inspectors *will* be checking to make sure each station's EBS capabilities are in compliance with the rules. While attention to that particular

aspect of station operations may not have been an especially high priority in the past, those days appear to be gone.

Now you should expect to be asked about EBS and you will be expected to have the right answers. If you don't have them, a fine is very possible.

This is not an insignificant matter. Faithful readers of this column may recall that the standard fine for failure to have EBS equipment installed and operational is a cool \$12,500 per violation. That alone should have the salutary effect of encouraging compliance.

But, you may ask, what exactly are the EBS equipment and procedures required?

Each station must have an EBS monitor to pick up EBS alerts. That monitor must be accessible to the operator on duty, who must review the EBS alerts and determine what steps to take as soon as one is received.

Since the real possibility always exists that an alert will require regular-programming interruption to broadcast an EBS announcement, each station must be equipped to give the operator on duty immediate access to the transmission system.

This last consideration may present problems for some stations. As deregulation worked its particular magic on the broadcasting industry over the last 10 years, a number of stations may have become somewhat lax in certain aspects of their operations.

We have heard rumors (generally unsubstantiated, of course) of stations being routinely left on overnight with no one in control. We have heard tell of other stations supposedly installing remote metering devices at such fanciful locations as the local Holiday Inn so the all-night desk clerk can make readings.

There's also equipment available that will let your transmitter in effect monitor itself, turning itself off automatically if problems arise. We have even heard of a system that automatically receives and records EBS alerts and dials out to station personnel to get them to the station, within minutes to review and evaluate the message.

The trouble with many of these innovative approaches is that, while they may assure compliance with some of the

Commission's operating rules, they may not necessarily provide for proper EBS procedures.

For instance, even the automatic EBS recorder/dial-out system might run afoul of the rules because it does not provide for immediate review of the EBS alert by station personnel and, if warranted, immediate interruption of programming. Falling short of the rules, as noted above, could mean getting dinged for a \$12,500 fine.

### Deus ex machina?

As you may recall, the Commission is considering a rulemaking proceeding that could lead to a massive overhaul of EBS requirements. That proceeding cranked up in mid-1991 and the initial comment period wrapped up about a year ago.

However, in light of the complexity of the issues involved, any changes flowing from that proceeding are not likely to happen for another year or more. Don't count on the pendency of that rulemaking to get you off the hook if you happen to be caught with your EBS down in the meantime.

Bottom line on all this: While no FCC witch hunt

appears to be on, there are indications that commission inspectors may be assigning a greater importance to compliance with the EBS rules than has previously been the case. In light of the potential penalties, broadcasters would probably be smart to review their EBS operations in detail and be sure everything is running smoothly and (most importantly) in compliance with the rules.

If you have any questions about EBS requirements, you can always call the Commission's EBS Office directly (at 202-632-3906). As a general matter, though, Commission personnel—no matter how helpful they are (and the folks at EBS are certainly helpful)—are not in a position to advise you on how to conduct your business. All you should expect them to do is to give you a straight reading of the rules.

If you want to discuss "what-ifs" or assess the relative merits of several different courses of action, your best bet is to take it up with your own counsel.

□□□

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

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KEYBOARD CONNECTION

# MS-DOS 6 Doubles Disk Space at Low Cost

by Barry Mishkind

**TUCSON, Ariz.** Not so long ago a computer was a rarity in a radio station. Today it's unusual to find a station without at least one running everything from traffic and billing to music selection.

No matter what application is being run, all computers have something in common, an operating system (OS). The OS takes your commands and programs and tells the computer what to do. Computers with disk storage (the vast majority) have a combined disk operating system (DOS).

Since DOS is so important to the operation of the computer, it makes news whenever Microsoft upgrades its MS-DOS™, the world's heaviest seller. By the time you read this, a sixth version of MS-DOS, offering significant improvements, will be on the street.

True, many of the utilities have been available from third-party products or in alternate DOSs, like Digital Research's DR-DOS™. But DOS 6 combines them all into a single, conflict-free system.

Should you consider upgrading, especially if the DOS you currently use is working without problems? Indeed, many still use version 3.1 or even 2.11 every day without hassles. What features can DOS 6 provide to make it worth the upgrade?

**More room**

Probably the most common user complaint today is the "shrinking" hard drive. Not so long ago, we wondered what to do with 10 megabytes (mB) of storage space. New computers now often come with 80 or 125 mB and still "free space" disappears quickly as we load the newest feature-filled application. For example, Microsoft Windows™, a word processor and spreadsheet, can take up to 40 mB before you start saving your work.

If free space is your headache, you'll

enjoy DOS 6's new DoubleSpace real-time disk compression utility. Similar to some third-party products, like Stackler and SuperStor Pro, DoubleSpace links right into the central DOS code or "kernel." This makes operation more seamless and trouble-free. I've been testing DoubleSpace for about four months now and, as its name implies, I've virtually doubled my storage space without any problems.

Integrating utilities into the DOS is a key feature of DOS 6. While many third-party utilities work fine, sometimes we worry about possible interactions between DOS and the utility. Microsoft has worked hard to make sure everything works together well in DOS 6. From the basic install program to DoubleSpace and the other utilities, getting DOS 6 up and running is pretty smooth and easy.

**More features**

What are the other utilities? MemMaker is a new way to maximize the memory configuration of your computer. MemMaker looks at your CONFIG.SYS and AUTOEXEC.BAT files and automatically loads as many drivers as possible in high memory, freeing your main memory for programs. There's even a safety undo feature in case you get nervous.

DOS 6 includes a new menu driven backup program. This is great news for those users who've used and cursed the DOS backup program of prior years. Remembering all the arcane syntax was such a pain that many people bought other programs or simply bypassed backups. That's no longer necessary.

Microsoft Anti-Virus (MSAV) takes away some more worry. While not as exhaustive as some other packages, it'll handle most situations found in stations where you don't have lots of diskettes coming in from outside. DOS 6 includes Windows versions of MSAV and backup.

Sometime back we wrote about the

need to periodically optimize your hard drive, getting rid of fragmented files which can slow down operation. DOS 6 includes a defrag, a subset of Norton's famous SpeedDisk™. Both Defrag and the diagnostic utility CHKDSK automatically recognize when they're dealing with compressed drives and run appropriate operations on them.

Laptop users will find two DOS 6 utilities especially useful. One helps conserve battery life on many laptops. The other, Interlink, makes it easy to transfer files from the laptop (or a desk computer) to any other computer. Interlink creates a mini-LAN, in effect letting you make any computer a server and any other computer the client. The server appears as just another hard drive on your system and file transfer is a snap.

A major problem when adding peripherals is what to do if a conflict develops causing crashes or making operation unreliable. Before DOS 6, the common advice was to edit the CONFIG.SYS and AUTOEXEC.BAT to a minimum, adding one driver at a time until the conflict reappears. It was a lot of work.

Under DOS 6, pressing the F5 button while booting bypasses CONFIG.SYS and AUTOEXEC.BAT, automatically providing a "clean boot." Pressing F8 allows you to step through your CONFIG.SYS one line at a time, loading only the drivers you want.

Would you like to automate that? Use the new multiple-boot configuration feature. With it you define a menu of customized start-up options, allowing different users to boot the machine to their individual needs.

There are even more little enhancements to make users happy. If you hate having the number lock "on" when the computer boots, you can now set it "off" with a line in CONFIG.SYS. The MOVE feature lets you put a file from one directory in another without copying and deleting. DEL-

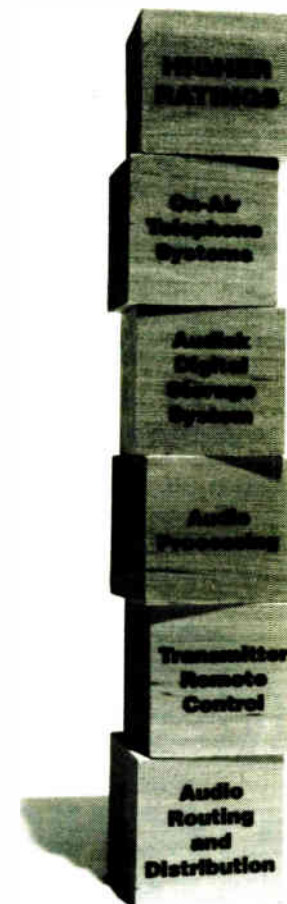
TREE allows you to kill an entire directory without deleting files or subdirectories.

As you can imagine, purchasing each of the main utilities included in DOS 6 would cost hundreds of dollars. Until May 31, the entire upgrade package is being marketed for a list price of \$49.99. Even if you only need one of the utilities, it's hard to find a better deal.

□ □ □

Barry Mishkind, a.k.a. RW's "Eclectic Engineer," can be reached at 602-296-3797, or on FidoNet at 1:300/11.3 or @barry@coyote.datalog.com on Internet.

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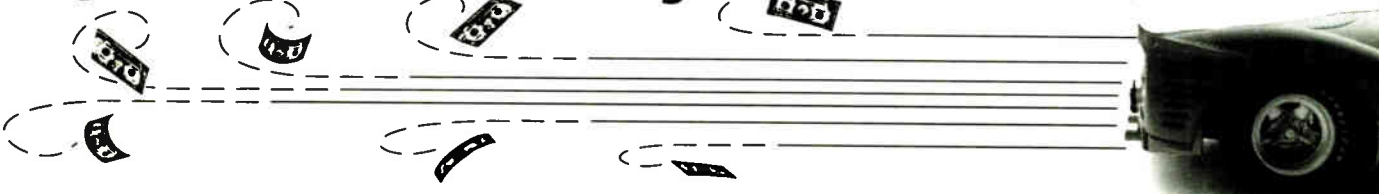


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# WORKBENCH

## Maintenance Rites of Spring, Radio Style

by John Bisset

**FALLS CHURCH, Va.** As the bees begin to buzz, thoughts turn to insect-proofing the satellite dish. Before you turn your attention to the dish, however, take a look at the RF connections. Oxidation on connectors can cause intermittent problems. Moisture can also corrode the connector.

Clean the connector with Scotchbrite®

or use a contact restorative such as Cromolin® to remove the corrosion. Replace the connector in severe cases. Remember to remove the DC power before you clean so you won't short the supply. Once you're done, seal the RF fitting with layers of electrical tape or the waterproofing putty sealant that you find at Radio Shack.

A lower signal or higher noise level can be traced to defective low-noise amplifiers (LNAs). With lightning season upon us, a spare LNA is a good investment at prices under \$200.

When you climb up to inspect your LNA, look over your shoulder and make sure the dish has a clear view of the satellite. Clear any tree growth from this window and inspect for loose or missing hardware.

While you're at the dish base, take an indelible ink pen, like a Sharpie®, and carefully mark the adjustment angles. If someone vandalizes or misadjusts the dish, these marks will be invaluable in getting the dish back into alignment.

These satellite maintenance tips were compiled by Bill Young, service engineer at Scientific Atlanta, and were contained in SA's publication, "Spectrum."

For a free subscription to this periodic update, circle **Reader Service 99**.

★ ★ ★

If the change in season means some studio or office remodeling, consider the new series of Mod-Com faceplates, provided by Panduit, for your cabling needs. Designed for data and networking use, the plates make a lot of sense when routing phones, video or other signals around a station.

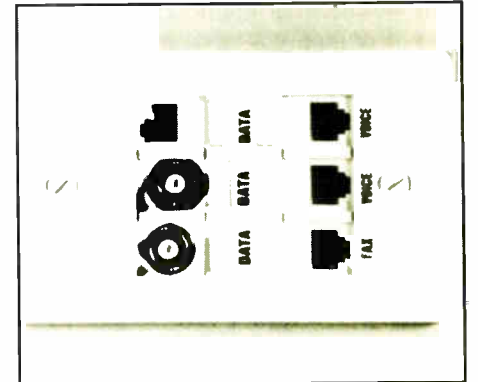
The faceplates can also be used for their original function, LANs. Office or studio decor can be matched using one of four colors. The Mod-Com is one of a series of network products produced by Panduit. Circle **Reader Service 144** to receive the Pan-Net System Catalog.

★ ★ ★

This great spring weather will be bringing some severe lightning storms. Accompanying the storms will be surges that will tax your high-voltage rectifier stacks. George Nicholas from KHAK-AM-FM Cedar Rapids, Iowa, sent in a schematic that turns a standard extension or drop lamp cord into a handy rectifier tester (see Figure 1).

Using a cheap drop light, George cuts off the plug. He carefully strips back the outer

insulation about two feet from the lamp exposing the hot, ground and neutral wires. The hot lead is snipped in the middle and two heavy-duty insulated clip leads are soldered onto the hot wire. A new wall plug on the now shorter lamp and a heavy-duty 60-watt bulb complete the project.



A new outlet box faceplate combines modular and bnc outlets.

To use the tester, remove the rectifier from the circuit. With the tester unplugged, attach the two clip leads to the rectifier stack terminals. Plug the lamp into any 120V AC wall plug. If the rectifier stack is working properly, the lamp should glow at half-brightness.

Generally, if the stack can handle 120V  
continued on page 30 ▶

## NEWSWATCH

▶ continued from page 2

commercial operator licensee witness.

Those who filed after March 19 had the option of a special interim procedure that allows applicants who need the license for employment to be evaluated through the FCC.

These applications have to be filed with the engineer-in-charge at their local FCC field office. For more information, call your local FCC field office.

### Westwood One Sells KQLZ FM For \$40 Million

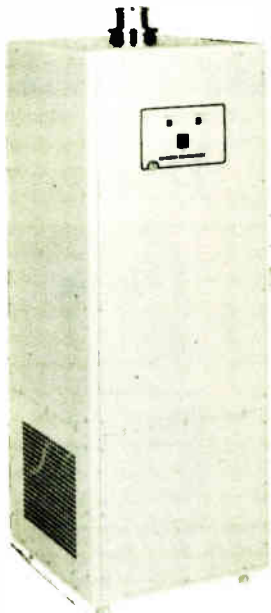
**LOS ANGELES** Westwood One sold the last of its broadcast properties by signing a \$40-million deal with Viacom International for KQLZ-FM Los Angeles. The deal follows the \$50 million sale of Westwood's other station, WYNY(FM) New York, to Broadcast Partners Inc. last January.

The company said the stations were sold in order to reduce its debt by 50 percent and its annual interest payments by 60 percent. Westwood's debt burden grew mainly due to revenue losses during the recession after taking out loans in the late 1980s to buy high-ticket items, such as the stations and NBC Radio, according to Westwood One.

The sale also allows Westwood to concentrate on its "core" network-programming businesses (NBC Radio, Mutual Broadcasting, Talknet and others), the company said.

Meanwhile, Viacom, will be taking advantage of the FCC's new duopoly regulations by acquiring its second FM in Los Angeles, where it already owns country-formatted KYSR-FM. Prior to FCC approval of the transfer, however, the two stations have entered into a local marketing agreement to sell advertising time in combination.

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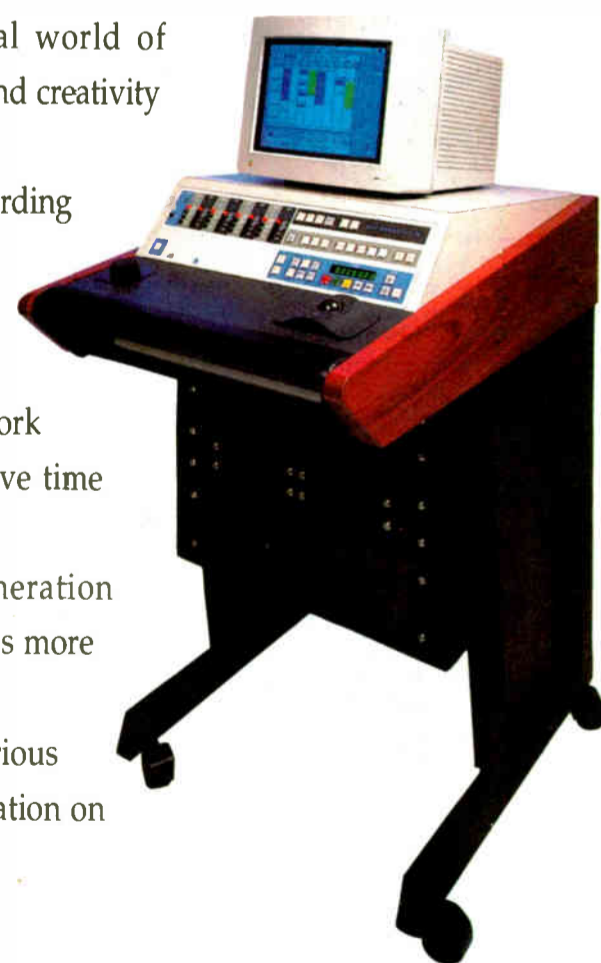
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# Studio Sessions

Antex SX-7 p. 25.

Equipment and Applications for Radio Production and Recording

## Les Paul Recalls Recording Past

### Part I of II

Les Paul jokes that a lot of people don't know that he plays guitar. "They think I am one," he says with delight. As father of the solid body electric guitar, thousands of guitarists in the world covet Gibson's famed Les Paul guitars. But few realize the other contributions Les Paul has made to recording.

As an inventor, Les Paul, now 77, is credited with creating sound-on-sound, over-dubbing, the electronic echo effect and multitrack tape recording. He made the first eight track recorder in the late 1940s by stacking eight Ampex tape machines and synchronizing them. RW's Frank Beacham interviewed Les Paul at Fat Tuesday's in New York City prior to a recent performance.

RW: Do you think of yourself primarily

as a musician or an inventor?

**Paul:** A musician. The only reason I invented is I needed something as a performer that I couldn't buy. If something was missing, I invented it.

RW: Is it true that you invented the electric guitar because the conventional acoustic guitar wasn't loud enough?

**Paul:** In 1928 I'm playing in this little joint...a car hop in the country...and the people were complaining that I wasn't loud enough. I was singing through a telephone hooked to a car radio, but you couldn't hear the guitar. So I just took a phonograph needle, jammed it in the top of the guitar, and it made it louder. And then I took the other half of the telephone, held that underneath and.....oh my goodness.

RW: You jammed the needle where in the guitar?

**Paul:** Right at the bridge, but the feedback came up with it too, so I had to keep moving my father's radio farther away.

RW: How did you conceive the idea for multitrack recording?

**Paul:** That idea came about in the

1920s...long before tape recorders...with my mother's piano roll. You have to align a piano roll so it will play the right notes. I saw that the piano keys go down when there is a hole in the paper. I thought if I punch a hole somewhere else in that paper a key's gonna go down....and it did. There's a space on the roll with nothing on it. Now when the real roll came on...say it was Fats Waller playing some-

continued on page 22 ▶

# 10

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## SIGNAL-TO-NOISE

## MIT Researches 'Virtual Acoustics'

*Editor's note: In this issue, RW contributor Frank Beacham begins Signal-to-Noise, a monthly column that discusses new technologies, trends and techniques relating to audio production.*

by Frank Beacham

**NEW YORK** Fasten your seat belt. Dr. Barry L. Vercoe and his students at the Media Lab at the Massachusetts Institute of Technology (MIT) are blazing the research trail with some new audio technology so revolutionary it sounds like the stuff of science fiction.

First, there is a prototype virtual

acoustic room capable of duplicating the reverberant acoustics of other rooms. Using an active boundary system of microphones and speakers and a lot of computing power, this electronic room simulator can take any audio signal—say a CD or DAT tape—and from it synthesize a reverberant soundfield that is rendered via a circular array of loudspeakers.

How is this different from standard reverb devices? Reverb information used in today's recordings is folded in at the studio without consideration of the characteristics of the ultimate listening room. The MIT system takes into account the actual listening environment of the audi-

ence by electronically creating room ambiance in real time during the listening experience.

Since the prototype system uses a concept called "scalable audio" it is not restricted to any number of channels. It can adapt to any system, whether three, ten or 100 channels. The user can configure the listening room to personal taste or go to an "auto" mode that allows the system to take instructions generated by the mixer of the original sound material.

The possibilities of such a listening system are extraordinary. The post-production mixer on a motion picture

can deliver little digital "packets" of audio instructions directly to home receivers and playback devices through the digital data stream. The home system can take these instructions and shape the reverberant characteristics of the listening room to exactly match that of the mixing theater on a scene-by-scene basis.

#### Malleable performances

Live concerts to the home could also be enhanced with the system. Dr. Vercoe, himself a composer and musical performer, said concert sound is often close-miked and artificial. With the MIT system, however, a performance could be made to acoustically fit the individual listening room.

"Think of watching Isaac Stern playing his violin on the tube and suddenly he is *there*—in your living room," Dr. Vercoe said. "Your living room becomes an intimate solo recital ball. Ultimately, we'll be doing holographic video and then you'd have Isaac Stern performing in your living room."

If that's not futuristic enough, the MIT researchers are also using genetic algorithms to "grow" listening rooms in order to determine the salient features of good listening environments. "It's like digital sex," Dr. Vercoe said. "We combine two rooms and they make children. We are breeding good rooms." Ultimately, the key features of these "good rooms" could be incorporated into a computer tool kit so that users could design their own ideal listening environments at home.

#### Working with sine waves

In another Media Lab project, Dr. Vercoe and students are working on a perceptual encoding scheme that breaks down complex orchestral sounds into the equivalent of about 20 pure sine waves. Control signals, rather than complete audio signals, are sent to the loudspeaker. At the loudspeaker, the sound is reconstructed using 20 simple digital oscillators.

Ordinarily sound transmission requires air and motion, Dr. Vercoe said. When the air moves, the sound is transmitted. In today's recording, we don't record air because we presume air is available on the receiving end. "I suggest that we needn't bother to record and package the sinusoidal motion either," Dr. Vercoe said. "What we really hear is the control information, the sine waves are only the carrier signal."

"Future microphones will analyze the sound and just record control information," he said. "Future loudspeakers will have 20 digital oscillators inside, and all we'll send to these oscillators are the low bandwidth control signals."

Bottom line: Because of the low-bandwidth of transmitting only the control signal, very high quality audio can be transmitted down common twisted pair telephone lines with ease. To this listener's ears, the difference between the original and reconstructed audio was indistinguishable.

Working with Dr. Barry Vercoe on these two projects are graduate research assistants Bill Gardner and Dan Ellis. Remember where you heard their names first.

□ □ □

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

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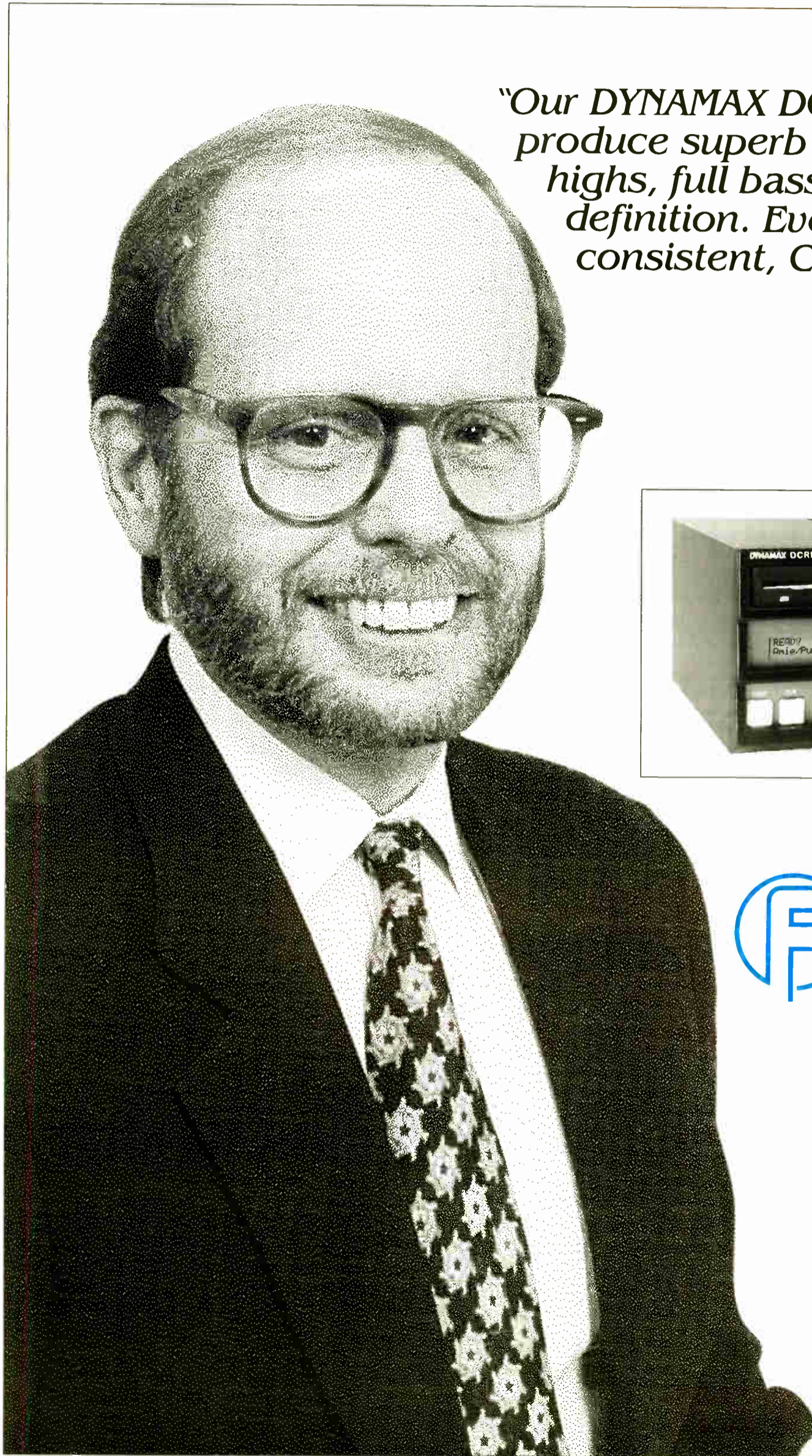
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# MIDI Use Increases In Radio Studios

by Al Peterson

**NEW MILFORD, Conn.** The Musical Instrument Digital Interface, or MIDI, changed the face and the sound of music upon its introduction ten years ago. Visionary production directors already immersed in multitrack and analog synthesis for homemade "lasers" took to it almost immediately.

But MIDI isn't limited to synthesizers anymore. Entire compositions, mix-downs and control over enhancement and "sweetening" can fly down a MIDI cable at 31.25 k Baud, at extremely attractive prices. This kind of control over sound on the cheap has made MIDI

irresistible to even budget-conscious radio stations. Jingle production for small and medium market facilities is a reality, and is limited only by the imagination.

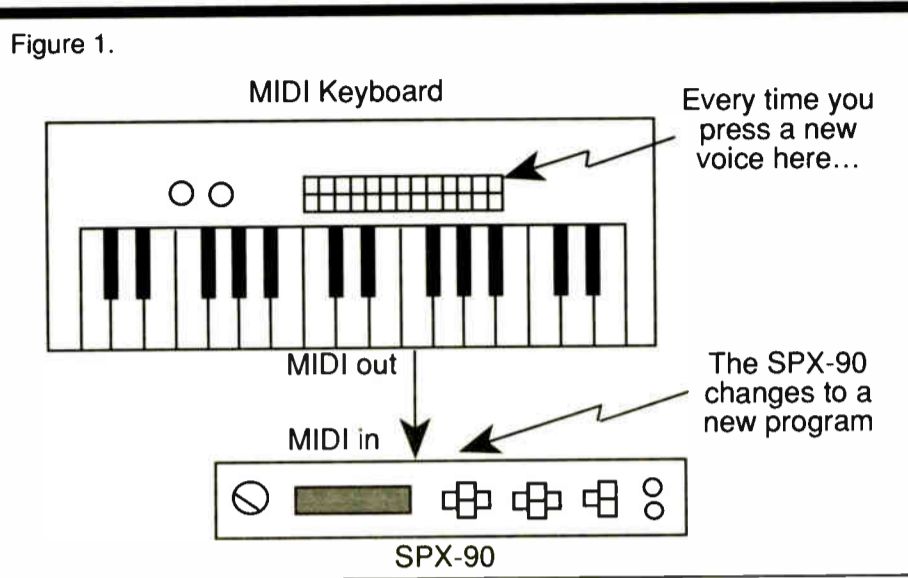
Over the next four issues, I'll be pre-

it's a very good bet the signal processor now in the production room has one of those little five-pin DIN plugs on the back. This installment will help to teach your DSP to jump through a hoop or two.

12 kHz effect bandwidth and only one effect at a time—it remains a popular choice some seven years after introduction. The SPX-90's MIDI abilities are equally limited, but remarkably useful.

The SPX-90 responds to Program Change commands via MIDI. Figure 1 shows the SPX connected to a department store keyboard (with a MIDI OUT jack). Every time you change the sound of the keyboard—let's say pushing the "organ" button and then the "fuzz guitar" button—the SPX will jump directly from one program to another. This becomes a big time saver if you're recording something requiring different processing on-the-fly, such as a modified voice that's tracking one already on tape. Program Change allows you speed via MIDI, instead of having to scroll through programs with the front-panel buttons.

Yamaha's "Freeze" program is as close as we all get to Max Headroom's stutter. While a MIDI keyboard cannot give us pitch change and a retriggered sample, it does allow us the ability to hit the stutter rhythmically. A MIDI drum box does it even better. When a drum pattern plays, one single note can fire the sample playback on the SPX-90. For example, say



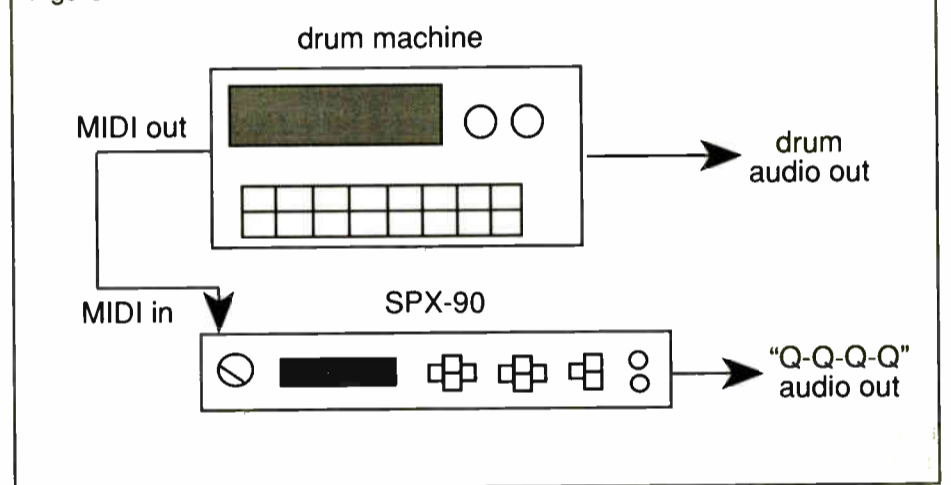
senting ways MIDI can be incorporated into your station (if not already), demystifying some of it along the way. The series will include methods in use now, ways to overcome limitations of some gear you may already have, and how to put a MIDI rig right into your production room for creative promo and commercial use.

I won't delve too heavily into the jargon used by most of us "MIDIots." Your objective is to pump out the best production you can—knowing Channel Voice Messages or SysEx codes really won't move you along any faster. For now, let's just plug in and go to tape. You can read up on pro-level MIDI from one of many fine musician magazines now in print.

### Not just for keyboards

You needn't be a keyboard player or even know music at all to get into MIDI;

Figure 2.



At present, it seems the Yamaha SPX-90 (and its cousin the 90-II) is still the processor of choice for low-cost radio station use. In spite of its limitations—

my station wants a drum track for a promo bed. I'll load my voice saying, "Q" into the SPX-90, and set things up

continued on next page ▶

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► continued from previous page  
 so every time my drum box plays a cowbell, it'll trip the sample. Now the drum track has "Q-Q-QQQ-Q" as part of the beat. Figure 2 shows how.

**Repitching your voice**

Back to the cheap keyboard for a moment. Calling up the Pitch Change programs on the SPX-90, you can switch your voice between Satan and a Smurf instantly, simply by hitting the appropriate note on the keyboard. Again, this takes no musical ability, just enough "ear" to know what sounds right. And MIDI makes the change happen right away without having to scroll through the numbers. On a personal note, my biggest gripe regarding the SPX-90 is that it cannot read Pitch Wheel data (the part of a pro keyboard that "bends" a note up or down). It would be a kick if the SPX could change pitch the way the Eventide H949 "knob" Harmonizer can, with a smooth up-and-down (Figure 3).

**This kind of control over sound on the cheap has made MIDI irresistible to even budget-conscious radio stations.**

More contemporary DSPs can perform nearly everything via MIDI. I am currently using the ART Alpha 2.0, where reverb mix, flange speed and more can be changed by MIDI continuous controllers (additional data provided to add expression to music via pedals, wheels). Since the controllers are assignable to anything, a great deal of articulation can be realized. Plus the ART is software-updatable, so I need not buy the next "new box" right away.

Even the "older" boxes have life. I still have an Alesis MIDIVerb which allows me to jump from a tiled shower to Grand Central Station in under 50 milliseconds, thanks to MIDI Program Change. This makes for some very funny promo possibilities.

Should your production room have a processor from any of the major companies and be micro-based, it's got MIDI. Find the manual to find the MIDI implementation chart and see what it can do.

Next time, in part II, samplers and synthesizers in your studio, with a sidebar from folks who are getting it done down by the ol' MIDI data stream.

□ □ □

*Al Peterson is Production Director for WLAD/98Q, Danbury CT, 06810. A synthesist since the '70s, he MIDified in 1986 and has never looked back.*

# The Origins Of MIDI

by Al Peterson

**NEW MILFORD, Conn.** The seeds for MIDI were planted back when dinosaurs roamed the earth, around 1981. Up until then, there was no five-pin DIN on the back of anything, save connecting a Nagra or Uher deck to the rest of the world.

Most processors, the ones that did exist, had voltage control (i.e. the "knob" Harmonizer) scaled to the 1 volt/octave standard. Up until then, it was all EQ and manual flanging that made up a producer's outboard bag of tricks.

In the late '70s, Sequential Circuits cooked up the Prophet-5 synthesizer; the first in a long line of microprocessor controlled instruments. The companies of the day, including Oberheim, Roland and others, followed with their own gear run by on-board computer chips.

The hassle was, their machines could only talk to *their* machines through proprietary interfaces. Plugging a brand X into a brand Y device wouldn't have made a peep, but would have made for a great fireworks display—assuming you could interconnect an RS232 jobbie with someone else's ribbon connector with some shielded twin-lead and a supermarket twist tie.

Rather than risk a stalled out music industry (and Keith Emerson's stack of keyboards growing any higher), several manufacturers began chewing on the idea of an industry-standard interface. This was in mid-1981 at the National Association of Musical Merchants convention. After exchanging notes and proposed names (such as Universal Synthesizer Interface—phooey), the now-familiar name MIDI was chosen, and the early versions of instruments with this ability left the factories in early 1983.

The initial objective of MIDI was "hit-key-here, play-note-there." Now, over a twisted pair, a production director can control an orchestra, sound effects, the width and speed of digital flanging and decay characteristics of reverberation—while leaving room for level and panning of all signals on mixdown.

All told, a pretty cool trick for the creative razor rat. I recommend going back to the February 1993 issue of Keyboard magazine to look up the entire history of MIDI.

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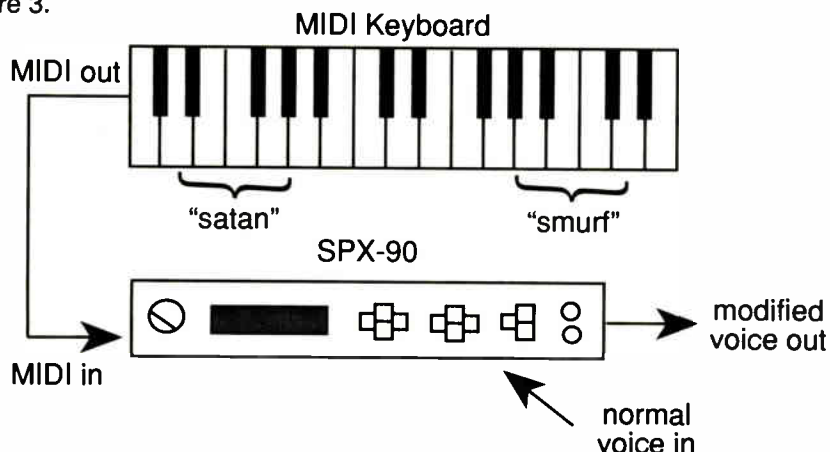
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Figure 3.



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# Les Paul Talks About Multitrack

► continued from page 17

thing on the piano...there were a lot of places for me to play along with him. So I'd punch in extra holes and out would come extra notes. So I could make him play fifths, I could make him play thirds and I was having a field day with this thing.

**RW:** Sounds like the first multitrack recorder also was digital?

**Paul:** Yeah, and it was better than on a phonograph record which I got to next. And the reason being, is that as I slowed the piano roll down, the pitch didn't change, there was no change in the veloci-

ty at all. Now I didn't know digital or analog from a hole in the head, but I knew that when I put my finger on the record and slowed it down, the woman turned into a man, the record started to slow down, and the pitch went down. But on the piano when you slowed it down, the whole remained the same.

**RW:** The story is that your mother was indirectly responsible for some of your breakthroughs in recording technology.

**Paul:** My mom came down to Chicago and she said 'I listened to you last night on the radio and you were good.' I said, 'Mom, I've been playing here at the theater with

the Andrews Sisters, you must have been listening to somebody else.' And she said, 'Well if everybody sounds like you and your own mother can't tell you from another electric guitar player, then you'd better do something about it.' I thought about it and finally I went to the Andrews Sisters' manager and said 'I'm leaving. I'm going home and lock myself in the garage and I'm gonna create a sound that my mother is gonna be able to distinguish from anybody else out there in this whole world.'

**RW:** And is that where "sound-on-sound" came from?

**Paul:** That's where sound-on-sound developed from. I'd already been fooling with it, but I had to do a lot more than just sound-on-sound. I had to make different sounds on sounds to create the synthesis.

**RW:** How did you do sound-on-sound on a tape recorder?

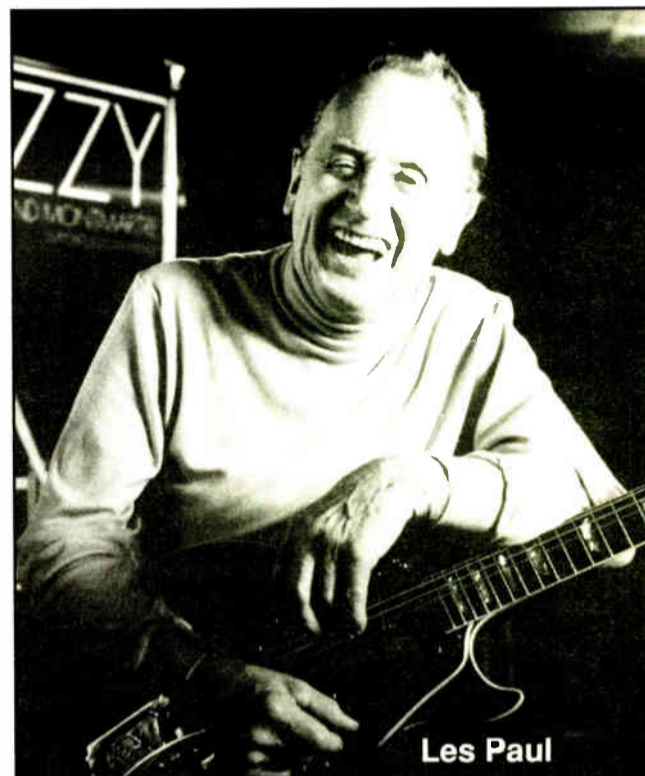
**Paul:** It happened when I got my very first tape machine. Mary (Mary Ford, his longtime wife and performing partner) was hanging up the laundry in the back yard and I'm looking at the tape machine. She asks, 'What are you thinking up now?', I said, 'Oh, I have an idea here and it's crazy. We don't need the studio anymore. It can all be done with this tape machine.' By now Mary's got her clothes pins and gone. She's not even listening to me any more....and I'm saying to myself, 'Hey, there's no reason in the world why I can't do my multitracking right here, sound on sound. If I can lay one generation down and another generation down.'

**RW:** Can you explain further?

**Paul:** There's a residence point to everything. Tape has a residence. Let's say that

the tape is at 50 hertz and it has a two dB head hump. If you go down another generation you now have a 4 dB head hump. If you go down another generation you now have a 8 dB head hump, then 16 dB and there goes the square root and all of a sudden you say, 'I'm gonna have one hell of a problem.' But I went 37 generations and it sounded like one generation. The trick is to do the least important parts first and do the most important parts last. If I'm playing my guitar and it's not important I might record that part first. But if it's my bass part or Mary's lead vocal or it's my lead guitar, I put those on last.

**RW:** So you set a list of priorities and



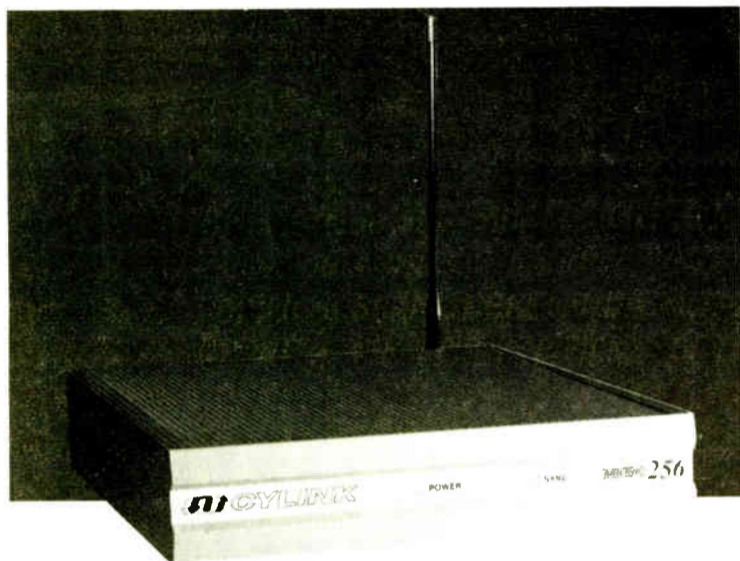
Les Paul

record them one part at a time?

**Paul:** That's right but you have to learn to think backwards. You cannot piece something together. Because now it's sound-on-sound and it means that when you start recording you play to the end. Let's say you are twenty dubs in and make a mistake. You go back twenty dubs and start all over again. So you don't make a mistake.

□ □ □

In part two of this interview in the next Studio Sessions, Les Paul tells the story of how the tape recorder arrived in America.



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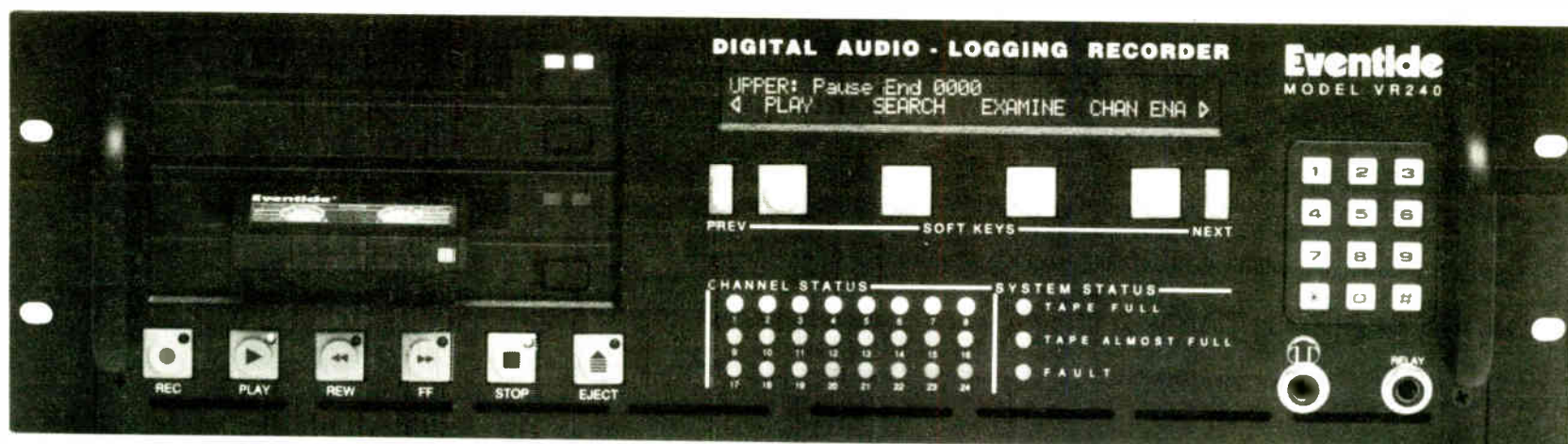
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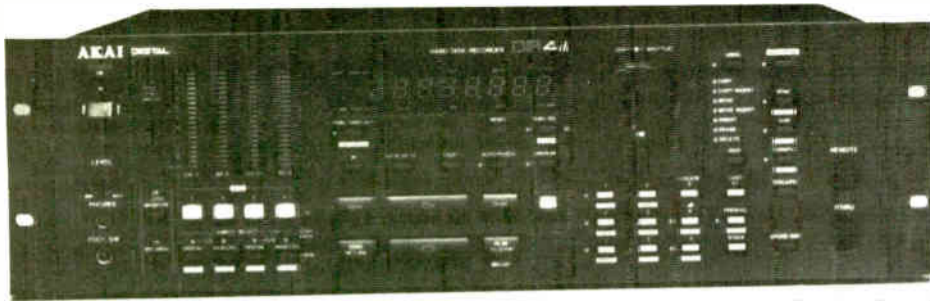
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# PRODUCT GUIDE

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



## Akai's Low Cost Multi-track Recorder

**FT. WORTH, Texas** Akai has introduced a four-track, hard disk digital recorder designed to work with any SCSI hard drive. Using a 200 megabyte hard drive can yield eight minutes of audio per track. The unit is equipped with four balanced

inputs/outputs, built-in professional and consumer digital I/Os, nine instant Locate buttons, 100 user-selectable locations, and Autopunch. Optional MIDI and interfaces will soon be available. Cost is \$1,995.

For more information, contact James Martin at 817-336-5114, or circle Reader Service 46.

## TimeLine AL-2 For Alesis ADAT

**VISTA, Calif.** TimeLine recently debuted its a companion synchronizer, AL-2, for the S-VHS tape-based Alesis ADAT recorder. The AL-2 allows interface of the ADAT unit with a variety of pro audio and video equipment.

Features include SMPTE/EBU time code chase, simultaneous Alesis BRC master remote control connection, external MIDI command input, and LTC and MTC generation.

For more information, contact TimeLine at 619-727-3300, or Alesis at 310-558-4530; or circle Reader Service 33.

## Longer MiniDiscs Available From Sony

**MONTVALE, N.J.** Sony has announced its 74-minute recordable MiniDisc, MDW-74, is available for MiniDisc consumer and professional recorders, such as Sony's upcoming MiniDisc professional "cart" recorder.

Still available, the first generation recordable MiniDisc has a 60-minute capacity.

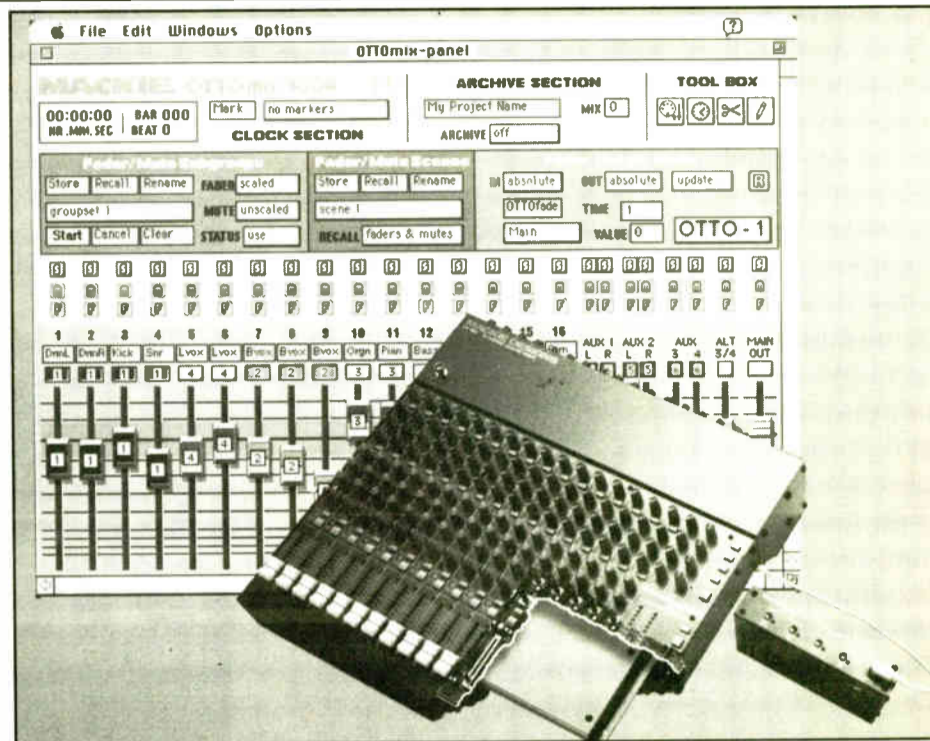
For more information, contact Sony at 201-930-6443; or circle Reader Service 211.

## Antex Computer Board For Dolby AC-2 Playback

**GARDENIA, Calif.** Antex has introduced a low-cost, playback only digital card, the SX-7, for PC use. The broadcast-quality board works with Dolby AC-2 and other compression audio formats, according to the company.

Features include real time decoding of files using the Dolby AC-2 encoding technique, which can be transmitted over T-1 phone lines for broadcast applications.

For more information, contact Allan Kari at 714-433-7400, or circle Reader Service 123.



## Mackie OTTO-1604 MIDI Automation Add-On

**WOODINVILLE, Wash.** Mackie now offers a real-time fader and muting MIDI automation upgrade for the CR-1604 16 channel mic/line mixer with the OTTO-1604.

The internal gain cell board and MIDI box provides 28 channels of automation, gain adjust/mute for all 16 input faders, four stereo AUX returns, ALT 3/4 bus and main left/right outputs. The OTTO 1604 can be controlled by any Macintosh, Atari, Amiga or MIDI sequencer that offers on-screen virtual faders and continuous controllable messages.

For more information, contact Mackie at 206-488-6843; or circle Reader Service 3.

## GET-TECH Q-218 AUDIO Voice Recorder

**NEW WINDSOR, N.Y.** GET-TECH's new customizable AUDIOQ-28 digital voice recorder can store up to 218 seconds of speech in RAM.

The unit has four selectable sampling rates (4.8, 8.5, 9.6 and 11 kHz, and optional 17.8 kHz). Up to eight variable length messages can be stored within the Q-218. Two audio outputs are provided as well as adjustable D.C. power regulator, 4 megabytes of RAM and battery backup.

For more information, contact GET-TECH at 914-564-5347, or circle Reader Service 1.

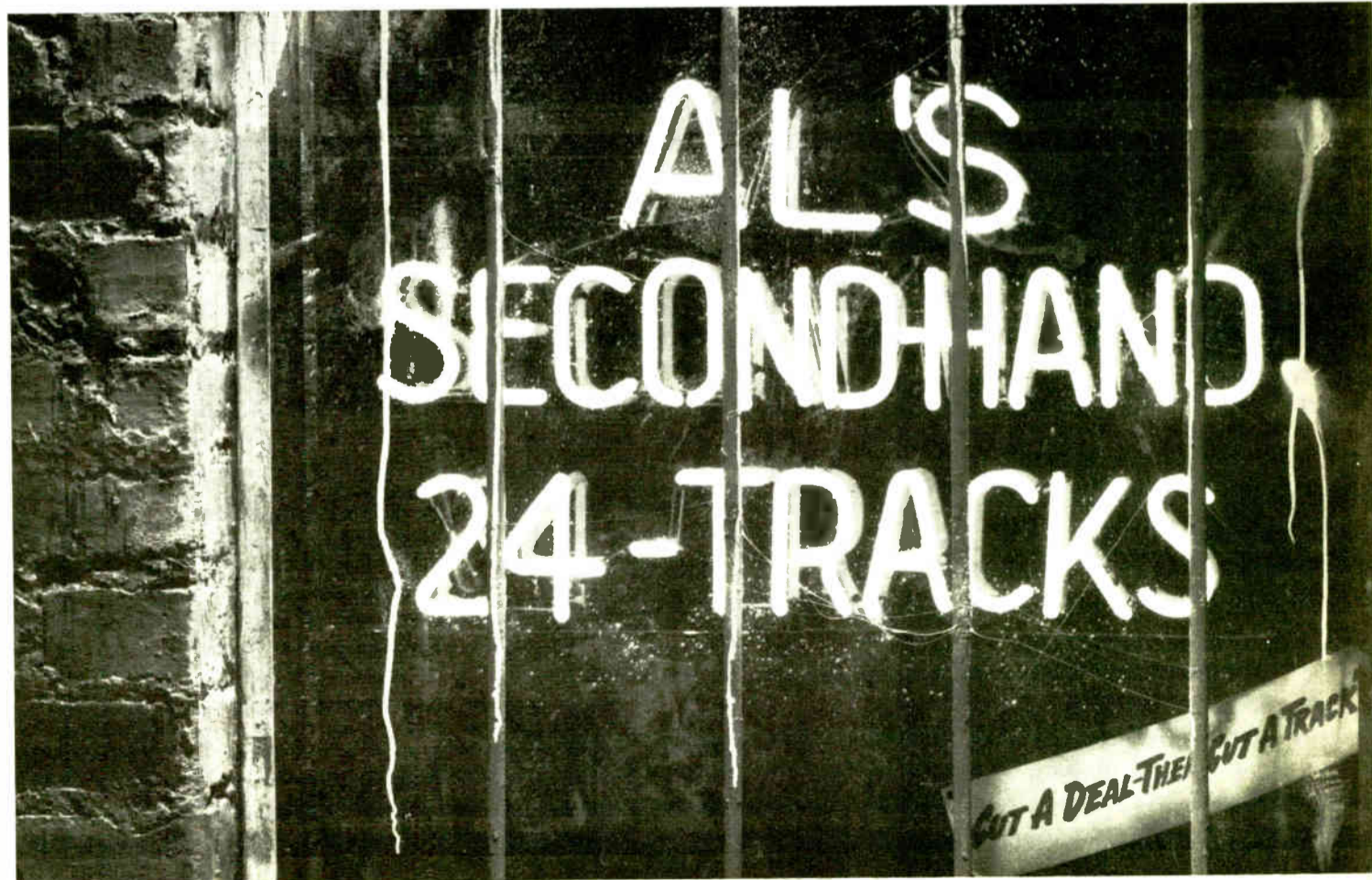


## Digital Domain FCN-1 Format Converter

**NEW YORK** Digital Domain's FCN-1 format converter is a valuable tool in editing digital audio from a variety of sources in the studio. The box allows the user to edit from consumer to professional, professional to consumer, consumer to consumer, and professional to professional.

It also enable the user to control most digital status including the ones that control SCMS, generation, copy and sampling frequency. The FCN-1 also can reduce digital jitter. Other features include S/PDIF In to S/PDIF Out, and compatibility with current and future digital formats.

For more information, contact Bob Katz at 212-369-2932; or circle Reader Service 96.





# Automation: Let a Robot Run the Station

by Bruce Bartlett  
with Jenny Bartlett

**ELKHART, Ind.** Have you been thinking about letting a robot run your station? We are talking about the new computerized automation systems. On a computer monitor screen, you see the daily sequence of scheduled events—spots, records, PSAs, intros, jingles, IDs. By tapping a single key, you can play these continuously or one at a time.

With an automated system, there are no carts to juggle. There are fewer errors

to record digital audio; a system controller box to turn audio sources on and off.

In a typical setup, the station's programmer or traffic manager types in the daily or weekly sequence of events to play, along with their start times. This traffic log becomes the playlist which shows up on a computer monitor screen in the master control room.

The list can be played continuously without attention, or can be played by an operator, one event at a time as needed. As the computer steps through the playlist, vari-

user interface, while an automation system is specialized for radio station use.

Many automated systems can work with several types of audio sources. One is a CD jukebox such as the Sony CDK-006, which holds hundreds of CDs. Another is a magazine-type CD player which carries anywhere from six to 18 CDs. Several of these are needed for a station's programming needs.

Another audio source is a digital-audio cart machine. Some examples are the Digi-Corder by Register Data Systems, the DigiCart™ by 360 Systems, and the Dynamax™ DCR1000 by Fidelipac®. Resembling tape-based cart machines, these units record, edit, and play digital audio on hard disks.

More digital-audio sources are satellite feeds and hard-disk recordings. A special type of automation system is a satellite-based system. At preset times, it records digital audio from a satellite feed onto a hard disk for later playback.

Normally, you run the system from a computer keyboard. An alternative to the keyboard is the Wheatstone Disk Control Panel. It's a small panel of buttons with dedicated functions, such as start and stop. On-air personnel find this easier to use than a keyboard, and they can't get into the computer's operating system.

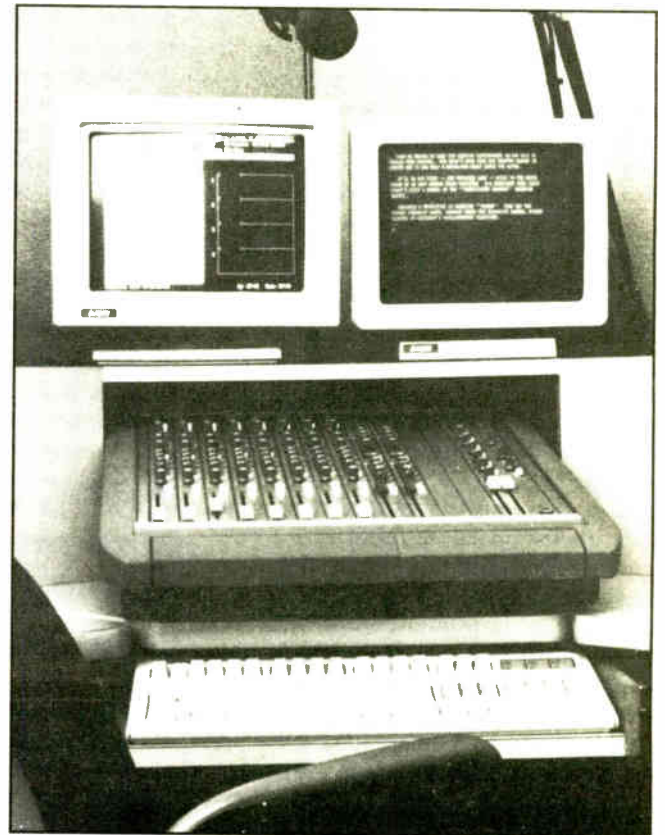
Many systems offer digital audio editing. You record an audio program onto a computer hard disk, edit it on-screen with a

mouse, and dump the edited program back to DAT.

Another feature is multitasking, which lets you do several things at the same time.



Computer Concepts Corporation's Digital Commercial System



Gentner's Dawn system

and less paperwork. Sometimes the staff can be reduced, saving the station money. Operating personnel can spend their time on creative productions instead of cueing up carts all day.

A basic system includes: a computer-running automation software; a hard disk

ous devices play on cue.

Note that an automation system is different from a digital audio editor running a playlist. While a digital editor plays cues only from a hard disk, many automation systems play cues from several types of devices. Also, a digital editor has a generic

For example, you can simultaneously record and playback. You might play a block of commercials while doing production, or read sales copy while recording a program onto hard disk.

An example of a multitasking system is the Audio Wizard by Prophet Systems, Inc. It's a centralized computing package that runs control rooms, allows realtime production, lets you edit audio for news and sports, permits copy editing, and so on.

Many systems have several workstations which are linked by a Local Area Network (LAN). Typically, one workstation is in the master control room to play the programming. It's linked to another workstation in production, used to edit speech and produce spots.

Some systems can access the traffic-log database. Most have automatic logging—they generate logs of the times at which scheduled events actually aired.

Here are some automation systems currently on the market.

Audio Wizard by Prophet Systems, Inc.; Disk Control Panel by Wheatstone Corp.; CORE 2000 by Broadcast Electronics Inc.; Jock-in-the-Box by Smarts Broadcast Systems; DAWN-9000 by Gentner Broadcast Systems; Ultimate Digital Studio™ by TM Century; R-DAS™ by Register Data Systems; Digital Commercial System (DCS) by Computer Concepts Corporation; Digital DJ™ by The Management; Audisk by Harris Allied.

There are other systems too numerous to list. All offer the potential of desktop station automation.

□ □ □

Bruce Bartlett is a microphone engineer and technical writer for Crown International, and the author of *Stereo Microphone Techniques* published by Focal Press. Jenny Bartlett is a technical writer. Bruce can be reached at 219-294-8388.

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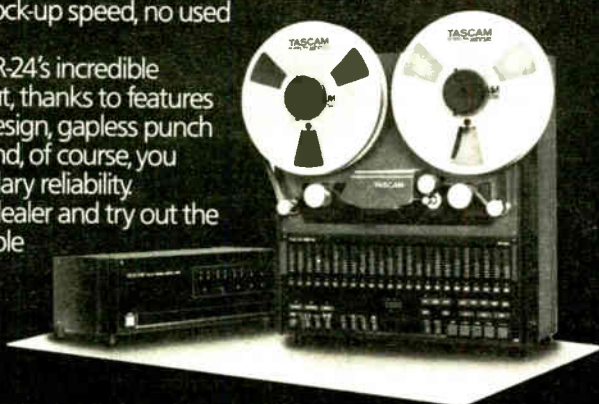
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World Radio History



# Analyzing Monitors in the Studio

by Ty Ford

**BALTIMORE** The monitors of every studio I have worked in each have their own sound. Even the three sets of HD-1s I have listened to in different studios sounded different to me when playing the same DAT master. (Of course that could be due to different DAT machines, line amps, the speed of the chips in the circuit, and the impedance interactions between the various pieces of equipment.)

Obviously, the acoustics of each room also has a lot to do with the way a set of monitors performs. It's just that; when it comes to speaker coloration due to variances in cross-over and bass response, we are still suffering from the effects of too wide a spectrum of possibilities.

When I mentioned this to Dick Pierce, a friend of mine in Massachusetts who designs speakers for a living, he snickered smugly and suggested that I toss in controlled dispersion, linear phase (low group delay error) and many kinds of small amounts of distortion. He went on to say that, "a minimum criteria for a loudspeaker to be an objective neutral monitoring system is that it should have a smooth, flat frequency response. In this country, there are home speakers that are more accurate than those normally found in the studios."

The really scary thing is that the variations among monitors become a lot less significant when you find out how they're actually being used.

## EQing not the answer

If you've thought about improving the sound of your monitors by sticking an equalizer between your monitor outs and your power amp, think twice. First, make sure the problem isn't in your power amp,

or due to some funky impedance stuff going on between your console output and the monitor amp input. If it still comes back to the monitors, use them for rear speakers in a surround system and spend the money on new monitors that you don't have to EQ.

Every box you put in the signal path changes the audio. No other circuit changes the phase relationships of an audio signal more than an analog equalizer. It's how they do it. (The jury is still out on the phase changes caused by digital equalizers.)

Live sound reinforcement people use equalizers because the problems they run into are monstrously worse than are found in most control rooms. They can't control the size of the hall, its reflection characteristics, resonances or the changes in its

## The acoustics of each room also has a lot to do with the way a set of monitors performs.

air density. They also have limited control over cabinet placement, and their coverage patterns can change every night. Studio control rooms, on the other hand, are relatively stable.

Another area that has considerable variance from application to application is monitor mounting. I've encountered very strange mounting rituals like monitors mounted three or four feet above ear level and pointed down at the console. I don't want to get too retentive here, but it's a really good idea to position the monitors so that they are as close to the same height as the operators ears as possible.

Here's why. the further off-axis the monitors are from your ears, the less direct high frequency content you hear. It's very challenging to make good decisions about EQ when the monitors are pointed at the top of your head. You can easily miss high frequency noises like hiss and buzz that can sneak into the console and into your recording. Also, the more bouncing around the highs and mids do before they get to your ears, the more messed up the stereo image becomes.

## Mounting side effects

I found another interesting variation of this sort exists in an unnamed radio station's production studio. In addition to being an "overhead array" the sound from the monitors was further compromised by the fact that the monitors were way too big and too close. The dimensions of the face of each monitor, where the speakers were mounted, was about 2.5 feet by 2.5 feet. The speakers in each monitor were mounted from six to twelve inches apart.

The monitors were suspended by cables from the ceiling so that they pointed at your forehead as you sat at the console. They were close enough that you could actually reach up and touch the bottom of the cabinets while seated at the console.

So there you sat with these rather imposing speakers looming over you. These were either two-way or three-way monitors, I forget which. Anyway, if you tilted your head back to look up at each cabinet, you were so close that you got the bass speaker in one ear and the tweeter in the other. Although this sort of placement definitely creates some interesting right-brain/left-brain stuff, you can toss any hope of cohesive sound right out the window.

Here's another one that left me scratching my head. I was contracted to produce some audio that would be used as part of a video production. The folks at the edit suite couldn't have been nicer. They agreed that the quality of the audio was important. When I got to the edit suite, I found that the only audio monitor was the two-inch speaker in a video

monitor placed on top of the equipment rack. Although there were two small Bose speakers on top of another rack, I was told that they weren't hooked up.

It dawned on me that the two-inch speaker buried inside a TV chassis sitting on top of a rack was standard to these folks. I thought of asking them how they felt about making quality and edit decisions about their video while using a "tummy TV" with a two-inch screen placed on top of a rack somewhere in the suite other than in front of the edit controller, but I didn't.

## Put them on a shelf

If you glean anything from all of this, it should be that placement of monitors is really important, that bigger is not better and that less is more. The old tried and true method of positioning monitors is to build a shelf over the console on which to place the monitors. If your work is done in a rack-mounted work bay in really tight quarters, take a listen to the Wohler monitor systems. They take up only a few inches of rack space, and although I would be hesitant to mix my next CD project on them, they sound surprisingly good. If you've got more rack space, try mounting monitors on shelves in the racks. The Electro-Voice Sentry 100s are about as big as I'd want to go. Tipped on their sides with the tweeters farthest from the center, works best for me.

For a more contemporary solution, try a pair of adjustable angle-arm computer monitor stands, the kind with a jointed arm and adjustable ends for mounting. Just make sure you get an arm that's designed to hold the weight of your monitor when the arm is extended.

For a solution that is sure to jazz your clients, there's a company here in the Baltimore area that makes a hydraulic monitor bridge. It was invented because the small near-field monitors that sat on top of the console diffused the sound coming from the main monitors. When you're ready to mix on the smaller monitors you hit a button on the console and the near-fields do a dramatic rise from behind the console. When you're done with them you hit the button and they drop out of sight. Very cool.

□ □ □

Ty Ford writes about and experiments with audio from his studio and beta test site in Baltimore. Contact him at 410-889-6201.



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ON-THE-SPOT

# Rules-of-Thumb for Effective Spots

by Ken R

**TOLEDO, Ohio** Why do half of the clients who use radio think of it as a newspaper with sound?

Turn on any medium or small market station and listen to the commercials. You'll hear advertisers list store hours for each day of the week and address, maybe a phone number or two, and not to mention a half dozen specials—all read at break-neck speed in 60 seconds with some sort of generic background music.

Of course the message is jumbled, gets lost in the clutter, and the client doesn't do well with the commercials. The advertiser then says to his/her radio rep "well, the radio spot didn't pull that well, I'm going back to newspaper." And the cycle begins again. The next broadcast sales person who visits has an uphill battle because of their "bad experience with radio."

How can we stop this cycle? I'm not sure it's possible, but I've spent the last 15 years of my life trying. At Ken R. Inc. we're often sent completed scripts to cast and produce... so we do the best we can. I will suggest to agencies or direct clients that we simplify the verbiage, take out all the unneeded words, cliches ("Why pay more?" "Quality and value," "Service you can trust," and on and on).

**Attention-grabbers**

People listening to the radio can only remember one or two key points anyway,

and not even that if you don't catch their attention or engage their emotions in some way.

When we are provided a fact sheet and asked to develop a spot from scratch, it is a little easier. Here are some of the tools we incorporate to make each project special: humor, sound effects, original music, dramatic post-scoring, a voice over the phone, or sometimes even silence. They all work!

Let me break those down and explain each one. Humor is difficult to pull off, but tremendously engaging when it works right. You must have a script that ties each funny line to a main copy point. A funny spot that doesn't relate to the product is funny, but it won't move merchandise or get people in the door. Humor also is helped by great announcer talents who understand timing.

Turn-offs are spots that make fun of specific groups of people, i.e.: minorities, folks with speech impediments or women in general.

I've heard so many so-called "funny spots" which are take-offs on TV shows such as *Dragnet* or *Star Trek*. Again, make sure there's a reason for such a sketch that illuminates a benefit of the product or service you're selling. And if you're doing impersonations, they'd better be good or your spot will sound like amateur night.

In addition to creating basic radio commercials, we are also a custom music house (actually, we started off creating

jingles in 1977). We've found the jingle to be a great way to build instant name recognition, create a mood, and develop a consistent image... something most advertisers really need. But beware! Having a jingle just to have a jingle is a waste of money. A tinny, poorly-produced jingle will do more harm than good, and a lot of guys with basement studios are cranking these horrid things out every day.

**High-quality a must**

Make sure your production company has a track record and a demo tape that compares favorably with national jingles you hear on network television.

Dramatic post-scoring can actually be quite simple. The term just means it's music written and played to follow the copy. This could be a low, sustaining bass note under an announcer to build tension, a sparkle or accentuating stab between sentences, or it could be a full 30-second or 60-second custom track designed to support the commercial.

The advantage of the post-score over more typical library music is that it's unique. It won't be heard the next hour for a car dealer or shopping center on the same station. It can be used over and over for that client to add to the consistent image. One of the most effective post-scores we have ever made was just six notes played on what sounded like a flute,

which preceded the commercial as a "signature" for a retirement community. It set the mood beautifully in four seconds.

If one of the voices in your commercial sounds like it's over the phone, the listener's ears perk up. It's different. It gets attention. I don't really know why, but try it.

And silence can be a tremendously successful tool. When you hear silence for even 2 seconds coming out of your radio, conversation in the room stops, and attention is riveted on the radio because it's so unusual. But when you resume audio, it better be worth it, or the listener will feel cheated. Don't demand attention unless you have something to say.

And remember, each successful radio spot has three elements: it gets the listener's attention; it states benefits in a way the listener can relate to; and it ends with a call to action. What do you want the listener to do? Come into the store? Dial a toll-free number? Be specific and ask for it. Saying "just remember our name" isn't going to cut it.

□ □ □

*Ken R is president of Ken R. Incorporated, a 15-year old audio production business in Toledo, Ohio. He can be reached at phone: 419-243-1000; fax: 419-241-KENR; or circle Reader Service 208.*

*Those wanting to submit future On-The-Spot columns addressing radio production of commercials and jingles, mail us the hard copy and, if possible, PC floppy disk with the story in Wordperfect 5.1. Send to: On The Spot, c/o RW, 5827 Columbia Pike, Suite 310, Falls Church, Va. 22041.*



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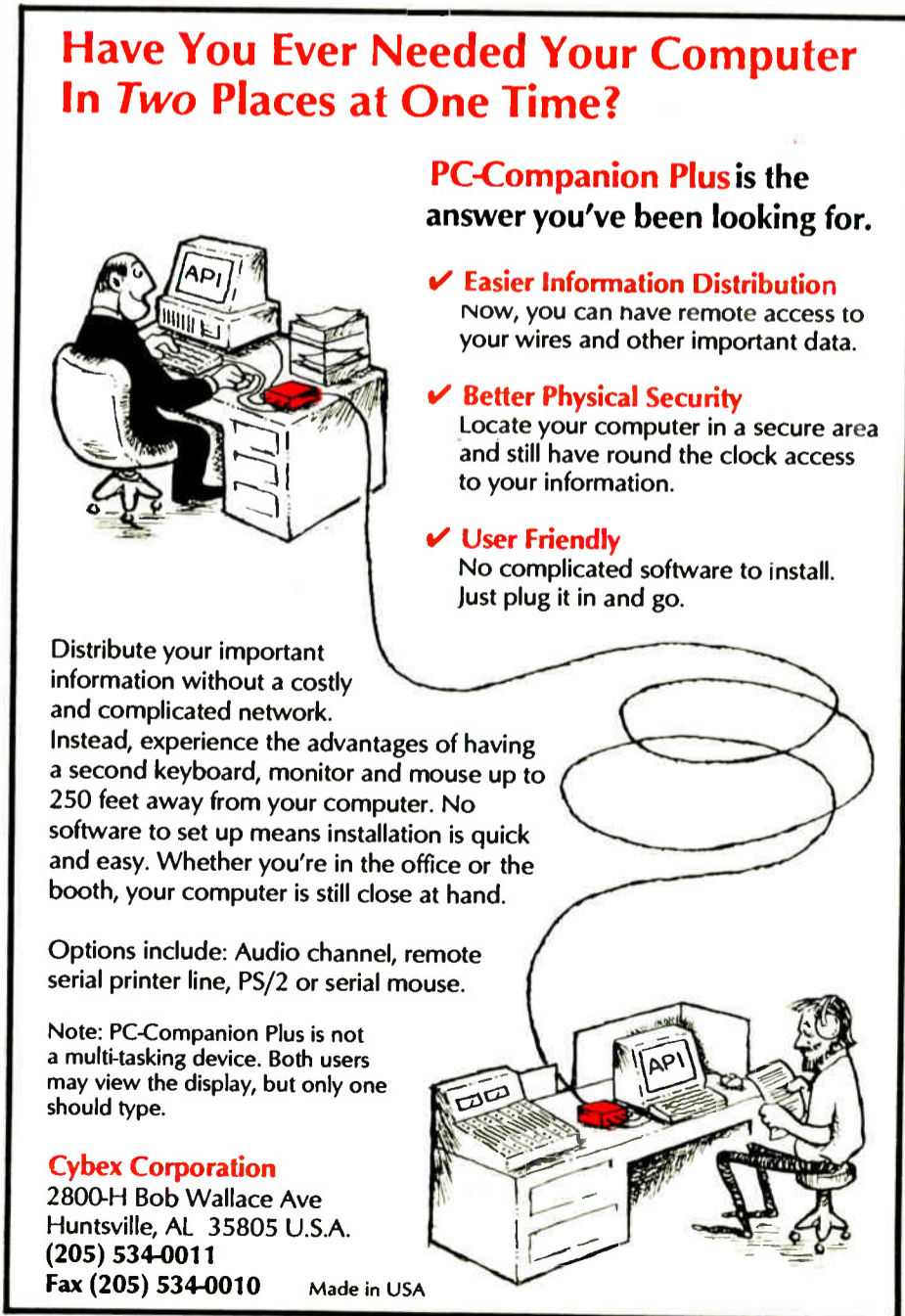
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# Mixing Savvy Sweetens Sound of Live Bands

by Bruce Bartlett  
with Jenny Bartlett

**ELKHART, Ind.** Nothing is more exhilarating than mixing a band live—especially if it sounds great. Here are some suggestions, based on a true story, on how to mix live music effectively.

A local non-commercial TV station, WNIT-TV in Elkhart, Indiana, was producing a half-hour show featuring local musicians. Because the station lacked an elaborate audio mixing console, it had been using a single stereo mic to pick up each band. Pop-music groups, however, sounded muddy, and the sonic balance was poor.

I offered to multi-mic the musicians and mix the music through my mixing console. My console's output can feed two mic inputs of the station's console, and the audio from that console would go onto videotape.

## Do your mic homework

My mixing console is a semi-pro unit with unbalanced -10 dBV outputs. The station needed a balanced mic-level signal, so I built the circuit shown in Figure 1 to convert the signal format. Several types of musicians were hired for the series: ragtime piano, country, fusion jazz, African drum and dance, and computer music. I had to accommodate the sound needs of each act.

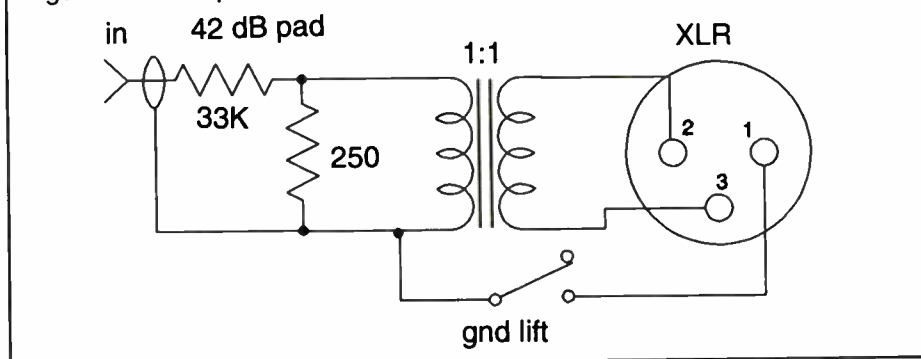
At the pre-production meeting, I talked with the band members to find out their audio requirements. "What instruments will you be playing? How many kick drums are in the drum set? Are the keyboards stereo? How many singers? Do you need monitors? Do

a table to one side of the stage, out of camera range, and ran a snake from the stage to the mixer.

In my notebook, I had assigned each instrument to a mixer input, and noted what mic or direct box to use on each. I ran cables and set up mics accordingly.

Note the extensive use of direct boxes. A direct box converts a high-Z, unbalanced line-level signal to a low-Z balanced mic-level signal. You can make one from a Radio Shack line-matching transformer. The direct boxes contributed toward a clean, tight sound since they picked up no background noise or leakage.

Figure 1. — Adapter from unbalanced line level to balanced mic level.



you want any effects?"

I also asked, "Who are some similar artists whose sound you admire?" The fusion group mentioned Spyro Gyra.

Back at home, I listened to some Spyro Gyra CDs to hear the sound production style that the band wanted. I also drew a block diagram of the audio system to be used with the band. From that diagram I generated an equipment list. Finally, I checked and packed each item on the list.

The next day, I rolled in my equipment for the videotaping. I set up the mixer on

The mic list for the fusion band looked like this:

Bass	DI
Electronic drums	DI
Cymbals	Crown GLM-200
Keyboard 1	DI
Keyboard 2	DI
Electric guitar	Crown CM-200a
Sax	Crown CM-200a
Flute	Crown CM-200a

\*DI: Direct injection or direct box

## Direct boxes a plus

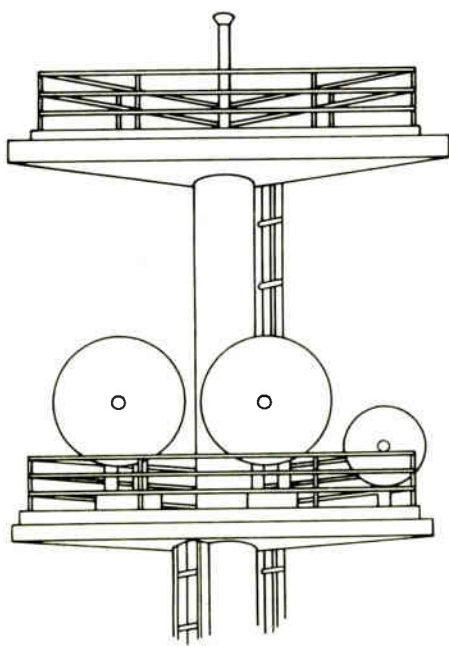
The electric guitar sounded too edgy direct, so I miked the guitar amp with a cardioid condenser mic.

The sax was miked near the bell, with the mic aiming at the finger holes for a natural sound. Flute was miked near the mouthpiece with a windscreens on the mic. Cymbals were picked up overhead with a single cardioid condenser mic (condensers are great for a crisp cymbal sound).

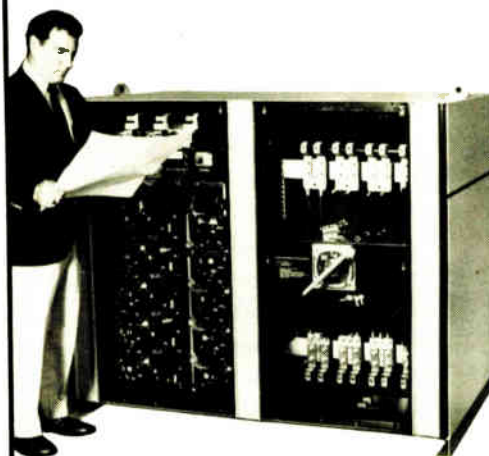
For the country band, I miked the drum set with a single GLM-100 miniature omni condenser, clipped to the snare-drum rim in the middle of the set, 4 inches above the snare and under the cymbals. Another mic went in the kick.

Time for the sound check. I set the master faders to design center (0 dB, about 3/4 up). Listening to the mixer output through headphones, I brought up the bass-player's fader and asked him to play. On the mixer, I set his gain trim pot

continued on page 39 ▶



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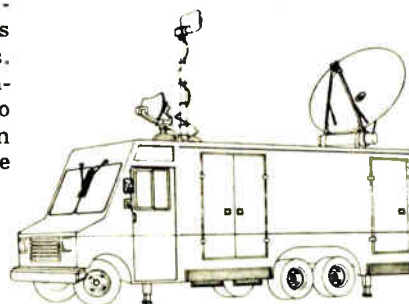
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# WORKBENCH

► continued from page 14

AC, it will probably work back in the circuit. You can confirm operation by carefully shorting the clip leads. The lamp should now go to full brightness. If there is no change either way, the rectifier stack is shorted. If the lamp doesn't glow at all, the stack is open. Usually you'll find the stack shorted.

If the stack is of open-frame construction, acquire the diodes and make the repair yourself. Remember to replace all of the diodes in the stack. Even if they check out fine now, chances are good

they were stressed during the failure and will fail sooner than new ones.

If you don't have a trouble lamp, the same tester can be made with a standard extension cord. You can plug the lamp or other device that runs off 120V AC into the extension cord and proceed from there.

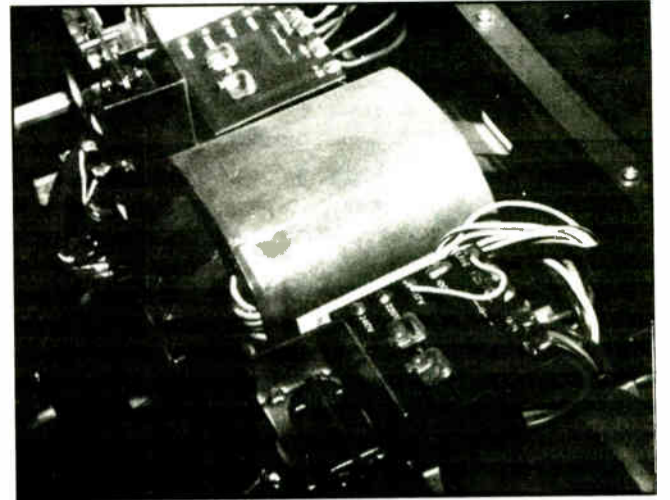
George reminds readers that they are working with 120 volts—be careful. George Nicholas can be reached at KHAK, 319-365-9431.

★ ★ ★

If you're planning on shipping your Otari either back to the factory or to a service

dealer for refurbishment, make sure it is packed *lying down*. The photo shows the massive power transformer used in the MX-5050 machines. In the upper-right corner, you will see the single metal strap used to hold the transformer in place.

The transformer is properly supported when the machine is shipped on its back. Ship the machine vertically and chances are the sharp forces applied to the metal strap as the box is lifted and dropped—even a few inches—will pop the strap and rip the transformer loose. Loose transformers and phenolic PC boards don't mix. Save yourself the headache and expense and ship the machine on its back.



The massive Otari power transformer is held by a metal strap that can snap if the machine is not shipped lying down.

□ □ □

John Bisset is a principal with Multiphase Consulting, a contract engineering and projects company. He can be reached at 703-764-0751.

## Keillor's Comfortable Return to Radio Home on the Prairie

by James T. Wold

**ST. PAUL, Minn.** Garrison Keillor is back in Minnesota with his new radio broadcasts of the "American Radio Company," a direct descendant of the long-running "A Prairie Home Companion." After three years in New York City and on tour, Keillor's nationally broadcast variety show has set up permanent residence in the World Theater. The St. Paul theater also was the home of "A Prairie Home Companion" broadcasts.



Ivy Austin with Music Director Rob Fisher on American Radio Company.

"He asked if I would be interested in putting my career on the line and doing something like that with him," recalls Sutton. "I said, 'Sure, it sounds like fun.'"

Sutton appeared on the first "Prairie Home Companion," broadcast in 1974, on the last one 13 years later, and on countless shows in between. "The first show we had more people on the stage than we did in the audience," says Sutton. "In fact, that was true the first couple of years."

The performers had no idea how long the show would last. It gathered steam when Keillor took it to the hinterlands of Minnesota. In 1987 the "Prairie Home Companion" became the "American Radio Company" when it entered into syndication with American Public Radio. The live broadcasts continued from the World Theater.

From the World Theater stage, Keillor is joined each week by guests such as Victor Borge, Bobby McFerrin, Emmy Lou Harris, Allen Ginsberg and Chet Atkins. It

continued on next page ►

Now in its fourth season, the "American Radio Company" is heard over 225 public radio stations. The popular broadcast of bluegrass music produced by American Public Radio (APR) for Minnesota Public Radio (MPR), has an estimated audience of 1.5 million.

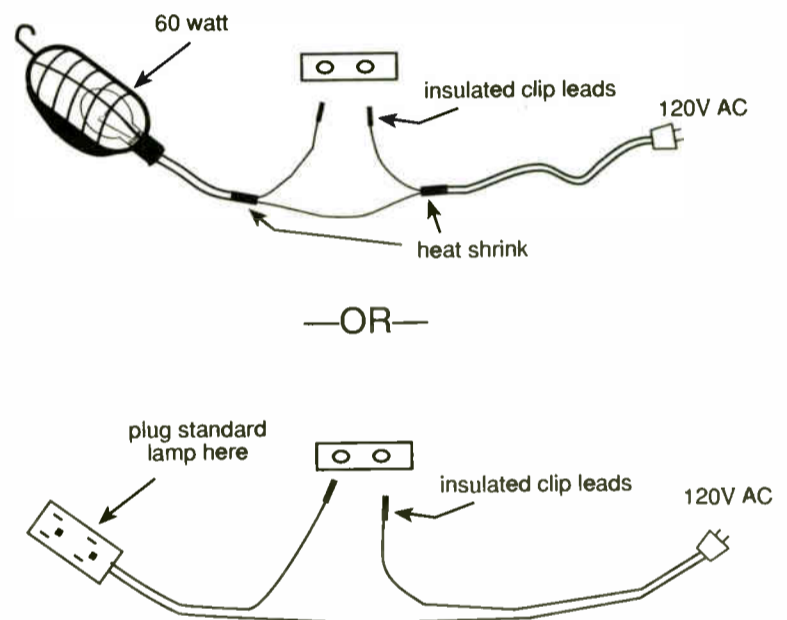
### A brief history

When Keillor came to KSJR(FM) (a member MPR station) in the 1960s, he often mentioned a mythical Lake Wobegon during his popular morning program. It was not until he moved to KSJN(FM) in St. Paul that he created "A Prairie Home Companion"—named after a cemetery he had seen in Fargo, N.D.

The idea for such a radio broadcast definitely was in the embryonic stage when Keillor worked at KUOM(FM) at the University of Minnesota. Vern Sutton, now acting director at the university's school of music, met Keillor while the two were students and Sutton used to perform occasionally on KUOM.

Sutton remembers Keillor calling to tell him about an idea he had for a new radio show, a combination of the "Voice of Firestone" and the "Grand Ole Opry."

Figure 1. — Turn worn-out extension cords or trouble lamps into a tester for diode stacks



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## Wrapping Up AC with Frequency of Resonance and Some History

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

To register, contact the Community Education Office, Annandale Campus, 8333 Little River Turnpike, Annandale, Va. 22003, or call 703-323-3168 or 323-3528. The fee for the course is \$30.

by Ed Montgomery

### Part X

**ANNANDALE, Va.** The last few lessons have presented the characteristics of coils and capacitors in circuits containing alternating current. Differences do exist between the capacitor and coil. Voltage leads current in coils, or inductors, while voltage lags current in a capacitor. This was clearly illustrated in previous lessons.

A direct mathematic relationship exists between frequency and a coil's inductive reactance, while an inverse relationship exists between frequency and a capacitor's capacitive reactance. If these relationships were plotted on graph paper, you would arrive at the curve and line depicted in Figure 1. Remember, as frequency increases, inductive reactance increases and capacitive reactance decreases.

A very interesting phenomenon occurs when a coil and capacitor are connected together in the same circuit. As frequency increases, as you can see in Figure 1, there is one location on the graph where capacitive reactance and inductive reactance are equal. At all locations the total impedance of the circuit is equal to the sum of the two reactances. The one location where the

reactances are equal is called the frequency of resonance.

### Resonant elements

Circuit designs containing coils and capacitors usually use resonant circuit elements. All capacitors and coils have a frequency where their reactances are equal. The mathematical formula for determining the resonant frequency is found in Figure 2.

A series resonant circuit is illustrated in Figure 3. All resonant circuits consist of some value of resistance (if nothing else, due to the DC resistance in the conductor, but usually an added value of resistance to create a special effect), a capacitor and a coil. It is sometimes identified as an RLC circuit. Total impedance "Z" is equal to  $R + jX(\text{SUB})L - jX(\text{SUB})C$ .

At resonance, total impedance should be purely resistive because the inductive reactance and capacitive reactance will cancel each other out. Remember, the phase angles for voltage in a coil and a capacitor are 180 degrees out-of-phase with each other. At resonance, a series resonant circuit exhibits a minimum amount of impedance and maximum current flow.

Figure 4 illustrates a parallel resonant circuit. Over the years this configuration of a coil and capacitor has been called a "tank" circuit. It got that name because it appears to store energy in the same manner as a tank will store liquids or gas. As AC at the resonant frequency enters the circuit, the electrical energy is transferred back and forth between the coil and capacitor.

Parallel resonant circuits exhibit a very high impedance at the resonant frequency and lower impedance at other frequencies. It builds up a high voltage and low current characteristic.

continued on page 33 ►

## Wobegone Lives in St. Paul

► continued from previous page

is not unusual for listeners both on radio and in the live audience to hear the unexpected from American Radio Company guests—a bagpipe player recently performed Bruce Springsteen's "Born in The U.S.A." at Garrison's request, and Paula Poundstone played the heroine in an episode of "The Lonesome Radio Theater."

### A media darling

Jane Lamb, reporter for the Portland Press Herald, once witnessed the live broadcast and described the performers on stage as having more fun performing (possibly) than the audience. A cast of regulars is featured each week on the show, including Rob Fisher and the Coffee Club Orchestra; singer/actress Ivy Austin, and sound effects wizard Tom Keith.

Every week listeners to American Radio Company will hear familiar voices such



Garrison Keillor with guests Allen Ginsberg (center) and Robert Bly (right).

as the perennial favorites Robin and Linda Williams, Kate MacKenzie, and Peter Ostroushko.

Live musical performances are combined with Keillor's whimsical remarks as he gives the "News from Lake Wobegon," an event best described by Daniel Gewertz, a

reporter for the Boston Herald: "By the time Keillor's 'News From Lake Wobegon' segment closed, the Great Woods stage resembled a pulpit of a secular church of droll truths."

David Fonder, a reporter for the Daily Bulletin in California, characterizes Keillor: "Through his subtle and salient descriptions of life appreciating the obvious with care and wisdom, Keillor's humor touches on things universally American."

Chuck Offenburger, a Des Moines Register reporter, writes: "The stories, the songs, the prairie wisdom, delivered with the wry smile, the meandering face and that soft low, slow voice—when that red stage light showed *on air* at 5 p.m.—what happened was almost flawless. Incredible!"

### A crowd pleaser

Keillor's program is broadcast every Saturday from 6 p.m. to 8 p.m. EST. Even though the "American Radio Company" is heard over public radio, the live broadcast plays to a capacity crowd of 7,000 or more. This seems to be a phenomenon in modern day radio, but as Geoffrey Himes, a reporter from the Washington Post stated, "Why did 7,000 people pay to attend a live broadcast of a radio show they could have heard free at home?"

"Everyone wanted to know if Keillor himself read from notes or simply ad-libbed his famous feature 'The News from Lake Wobegon.' Well, he didn't read from notes. He told it with such seeming spontaneity that one wondered if he had memorized it or stretched out the outline."

This live two-hour radio variety show featuring comedy sketches, music, special guests and Garrison Keillor's signature monologue, "The News from Lake Wobegon," receives constant raves from the press. Bob Hoover, a reporter for the Pittsburgh Post Dispatch, wrote about the music: "Backed by the Coffee Club Orchestra of Rob Fisher, the 'American Radio Company' sparkles with great music."

Even the sound effects man has received raves from the press. Janet Miller of the Ann Arbor News stated: "The sound effects are worth a radio show on their own. The sound effects man...becomes brilliant with sounds of screeching cars, whimpering dogs, and Marvin and Melvin the elks."

Now into his fourth season of the "American Radio Company," Keillor is thrilled to be back at the World Theater. He also had a humorous remark about the old stage: "There are three spirits who live in the flyspace up over the stage, and whenever I set foot on that stage I'm scared to death they'll cut a rope and I'll get nailed by the asbestos curtain in the middle of the monologue. It's hard to do comedy when you feel death hovering overhead."

□ □ □

James T. Wold is a free-lance writer based in Minnesota. He is author of *Minnesota Microphones*, published by Northstar Press. Wold can be reached at 1106 South Seventh St., Minneapolis, MN 55415.



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World Radio History



# Resonant Circuit Designs

► continued from page 31

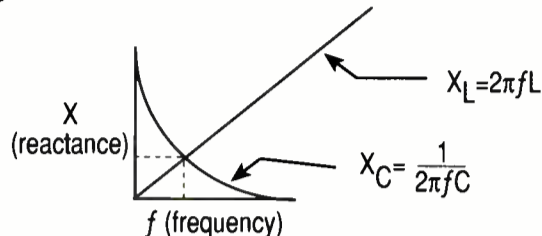
Series resonant circuits exhibit a high current, low voltage characteristic. Another name commonly given to a parallel or series resonant circuit is a "trap" circuit.

The principle of resonance permits the confinement of alternating current to a

determines the frequency at which it will radiate energy. Although not always possible, antenna designers want to have an antenna resistance of  $R-j0$  at the operating frequency. This is the value that is measured by the operating impedance bridge in AM facilities.

The reading should be measured periodically to see if it conforms to the resistance that was established when the system was installed. Antenna resistance often varies slightly with the change of seasons and the amount of moisture in the ground. Antenna

Figure 1.



specific frequency or spectrum of frequencies. This is key to wireless communications. Radio energy is nothing more than electromagnetic waves passing through free space. What makes one radio signal different from another is the frequency on which it is transmitted.

### Antenna is inductive element

The antenna is the inductive element of a resonant circuit. Its length, in association with a particular value of capacitance,

Figure 2.

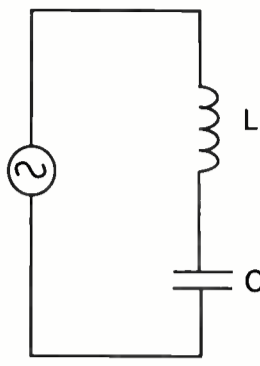
$$f_R (\text{resonance}) = \frac{1}{2\pi \sqrt{LC}}$$

$2\pi$  = approximately (2)(3.14) a constant  
 $L$  = Inductance of the coil in henries  
 $C$  = Capacitance of the capacitor in farads

resistance also changes when ground radials are broken or when they rot away.

A properly operating antenna is tuned or made resonant at a desired frequency. This enables the antenna to accept and radiate all of the power fed to it from a transmitter and connecting transmission line.

Figure 3.



If an antenna becomes detuned or falls out of resonance, it will no longer accept all of the power being fed to it, causing some of the power to be reflected back to the transmitter along the transmission line. These reflected waves are not in phase with the transmitted waves, thus a difference in waveforms is produced. That difference is known as standing waves.

The SWR, standing wave ratio, is a measurement of this phenomenon and is very important in antenna work. The ideal SWR is 1:1 when the antenna is perfectly matched, or tuned, to the transmission line, and there no standing waves on the line.

Often when operating on VHF, UHF and higher frequencies, where the wavelength is small, the size of the radiator (antenna) will change with ice build-up and sometimes even rain drops, causing the SWR to change. Often antennas operating on these frequencies are encased in plastic domes or have de-icing elements added to them to prevent the SWR from changing radically.

### Watch your "Q"

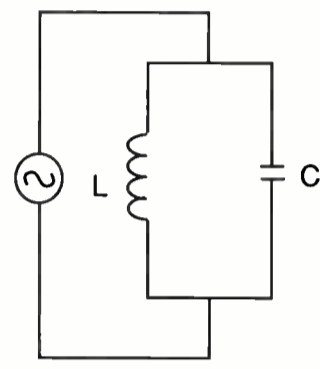
Another consideration in resonant circuits is the "Q" or "quality" of the circuit. This is illustrated in Figure 5. As resistance in a resonant circuit increases, the "Q" will decrease. The solid line in Figure 5 indicates a circuit with a high "Q" while the dashed line illustrates a low "Q" circuit.

AM stations need to be concerned with the "Q" of their antenna systems. Since the energy in the sidebands of AM radiation determine the frequency response of the station, as well as the loudness, it is important that the "Q" be as low and the bandwidth be as wide as possible, within FCC regulations. In recent

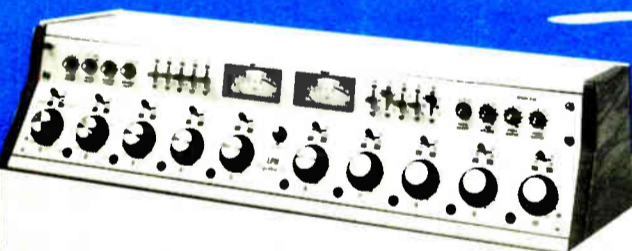
years many people have discussed the need for "broadbanding" antenna systems. Essentially, this is adjusting the "Q" of the system to pass more audio frequency

continued on page 35 ►

Figure 4.



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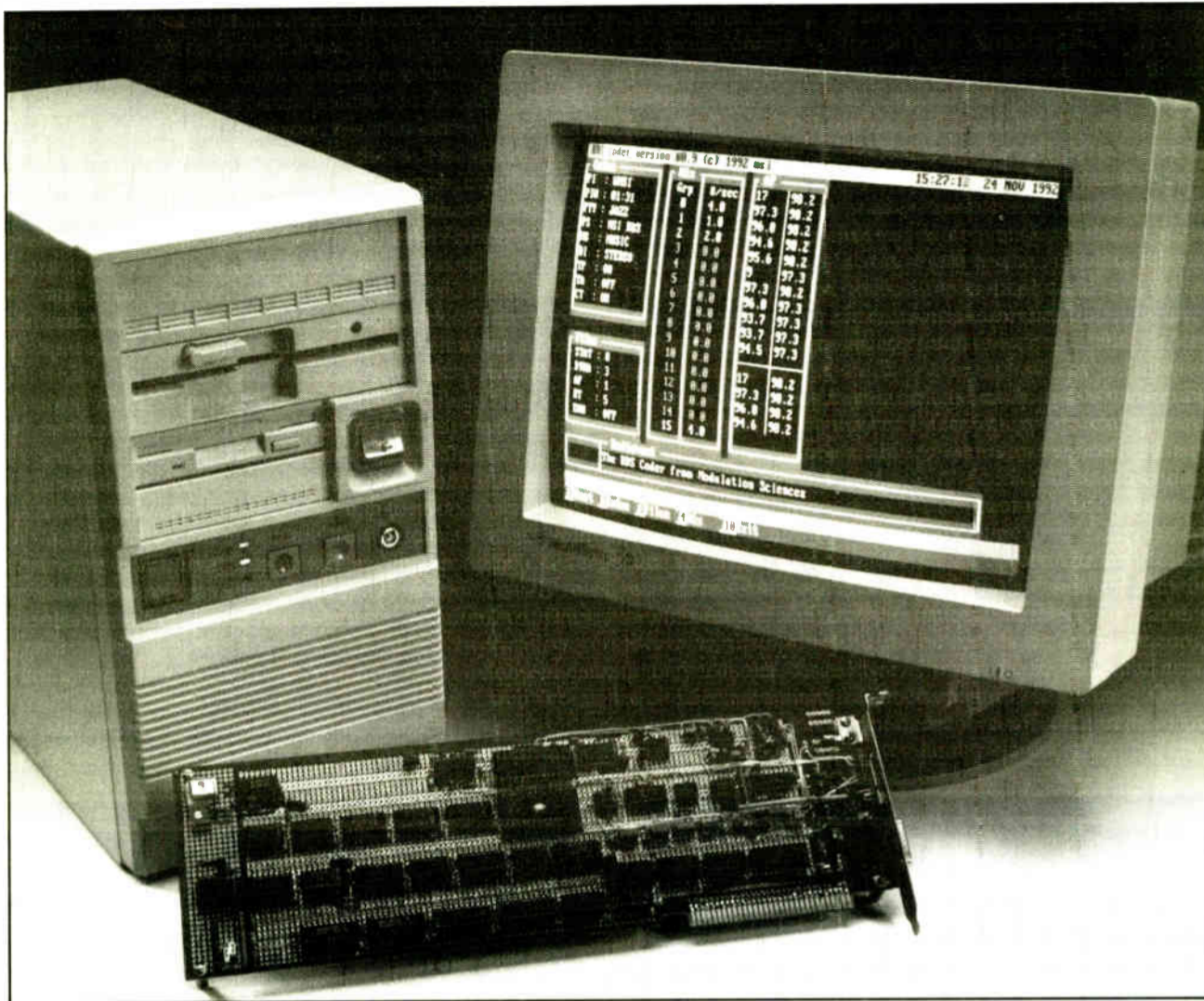
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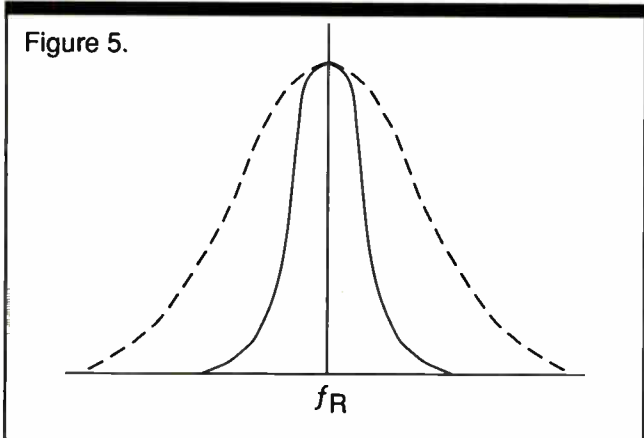


# Edison, Tesla and Early Days of Electrical Distribution

► continued from page 33

information in the sidebands. It is also a factor in FM.

In the early days of FM stereo, many broadcasters discovered that their antennas did not have the bandwidth to pass the difference channel (L-R) at its higher frequencies. The problem never existed when the monophonic channel was transmitted. The FM deviation at 100-percent modulation is

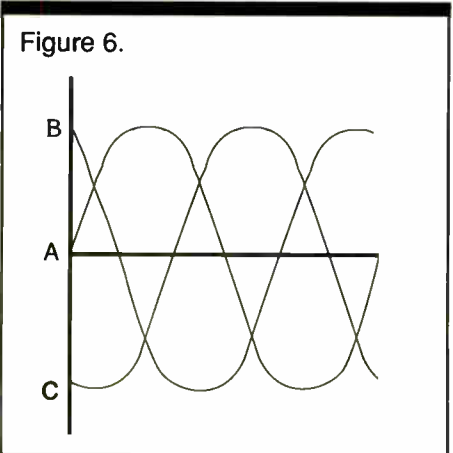


—75 kHz off of the center frequency. The transmission line and antenna must have sufficient bandwidth or low "Q" to permit proper audio and data transmission.

Further study of resonance can be found in "Basic Electronics," by Bernard Grob, published by McGraw-Hill.

## Some historical facts about AC

A study of alternating current would not be complete without considering electrical power distribution. The commercial distribution of electricity was developed by Thomas Edison. In fact, his name is part of many utility companies throughout the United States. He created the Edison General Electric Company to manufacture and market his electrical equipment. Ultimately he sold the company and it became General Electric.



Edison believed that the best and safest way to distribute electricity was through direct current.

Alternating current transmission was developed by Nikola Tesla. Born in Smiljan, Croatia in 1856, he studied engineering at the Technical University at Graz in Austria and at the University of Prague. Tesla discovered that the changing, rotating magnetic fields surrounding alternating current could be useful. He also discovered that AC could be generated at higher voltages than DC with fewer problems, notably heating and arcing.

In 1885 Tesla came to the United States and briefly worked with Edison. They fell out after a disagreement on the concept of power generation. Tesla's patents were

purchased by George Westinghouse of Westinghouse Electric, and his system of AC generation, transformers and motor construction became the standard for power transmission and consumption worldwide.

In the early days of alternating current, 133 Hertz was the most common frequency used for electricity generation. In 1891, 60 Hertz was chosen because of the design of the alternator and the stationary boiler that powered it. European research and design was somewhat different and the Europeans chose 50 hertz as their power-line frequency.

However, 60 hertz was not universal in the United States. Through 1949, Los Angeles operated on 50 hertz; 25 hertz was also used through the first half of this century. When the Pennsylvania Railroad electrified its lines between New York City, Harrisburg, Pa., and Washington, D.C., it chose a 25 hertz single-phase system operating at 11,000 volts. That system is still in use today.

Typically, electric power is transmitted from the generating plant at very high voltage and low current. This results in less line loss because of resistance in the wire. Electricity is often sent from the generating plant at levels between 200,000 and 800,000 volts. This energy is delivered to a transformer substation where it is reduced to 2,300 volts. This, in turn, is reduced to 120, 208, 240, 277, 440, 480, or 550 volts for distribution to homes and businesses.

Alternating current is generated and transmitted in what is termed a "three-phase" system. Three voltage waveforms are produced 120 degrees apart by the generating equipment (illustrated in Figure 6). This arrangement requires one ground or "neutral" wire and three lines containing power.

When three-phase power is employed, the time period between peaks of energy is reduced resulting in greater efficiency. Electrical equipment using three-phase wiring is less expensive to construct than single-phase equipment built to do the same amount of work.

## U.S. went with 120

The standard operating voltage in the United States is 120 volts. This is a relatively low-voltage, high-current system that was established in the very early days of electrical distribution. This method of power distribution requires numerous transformers dropping the voltage to serve businesses and homes. The transformers reduce the distance electricity must travel at this low-voltage resulting in less line loss because of the resistance in the wire.

The United States also uses 240 volts as an option to run equipment and appliances requiring greater energy. Most homes and businesses will find 240 volt service installed for operating electric ranges, central air-conditioning, and motors operating machinery. Operation is much more efficient as it requires less current.

continued on page 37 ►



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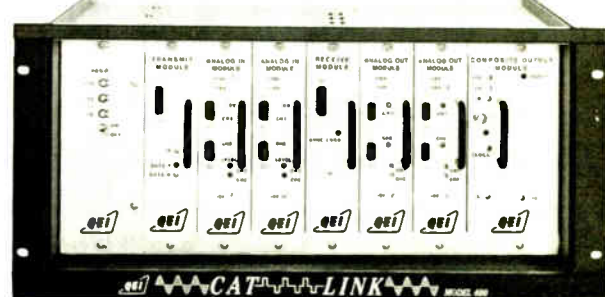
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# Power Distribution Beginnings

► continued from page 35

The standard operating voltages in Europe are 220 and 440 volts resulting in a much more efficient delivery system than in the United States. Over the years, proposals have been offered to convert the United States to a higher voltage standard. The original argument was that 120 volts had a lower fatality rate than 240 volts. That has been proven to be untrue.

Cost has become the deciding factor. The expense that would be incurred to convert every home, business and electrical distribution system over to a higher voltage would be prohibitive.

Utility companies are required to keep operating on frequency and within 4 percent of their designated voltages. Not adhering to this could cause damage to the equipment connected to the system.

Proper voltage and frequency is also necessary for utility companies to transfer

power from one company to another through the numerous power "grids" that interconnect the companies.

Aircraft also generate alternating current electricity. However, space and weight

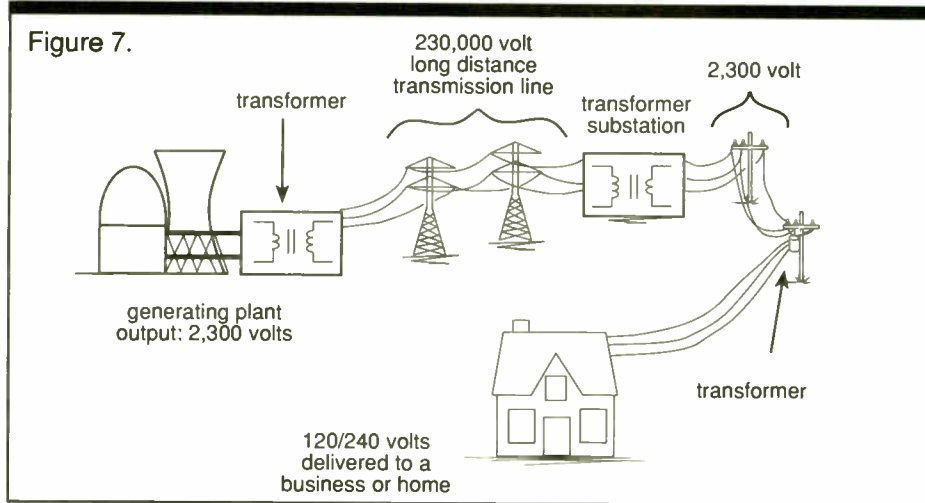
requirements prohibit the use of 60 hertz equipment. Alternators that operate on higher frequencies require less weight and space (most often 400 hertz on aircraft)

An illustration of power distribution is given in Figure 7.

This concludes the Fundamentals of Alternating Current course. For those who registered for it, exams will be mailed to you by May 28, 1993. Please complete it, and return the answer sheet to Northern Virginia Community College by June 11, 1993. Certificates of completion will be mailed out in July 1993.

□ □ □

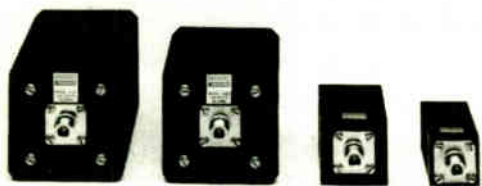
*Ed Montgomery is a communications teacher at Thomas Jefferson High School for Science and Technology. He has taught broadcast engineering at Northern Virginia Community College and worked as a broadcast engineer for several radio stations. He can be reached at 703-750-5090.*



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## STATION SKETCHES

# Frequency Response for Test and

by Tom Vernon

**HARRISBURG, Pa.** When we left off last month, we had equalized our telco lines to the transmitter for a flat response and I promised to talk about how these equalizers could be misadjusted to correct other problems.

Most of the familiar tests for frequency response involve a signal generator with discrete tones and a vacuum tube voltmeter (VTVM). When testing several sections of an audio chain, this can become a time-consuming process, sometimes

involving several overnight sessions. A more rapid procedure involves a noise generator in conjunction with a spectrum analyzer or third-octave RTA.

### Gathering the tools

Many engineers with low budgets avoid these tests due to a perception that the nec-

essary equipment is too expensive. This is just not true. Simple but effective noise generators can be fabricated with specialized ICs and a few discrete components. Audio spectrum analyzers are quite expen-

sive, but used third-octave or octave RTAs frequently show up in surplus test-equipment catalogs for very reasonable prices. When using a noise generator for response runs, it's important to match its characteristics with the measuring device you're using. Pink noise will produce a flat response when using a third-octave or octave RTA.



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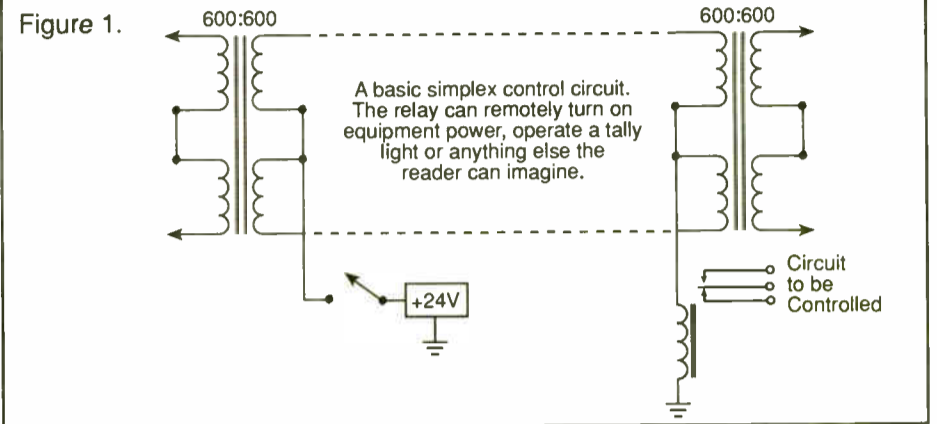
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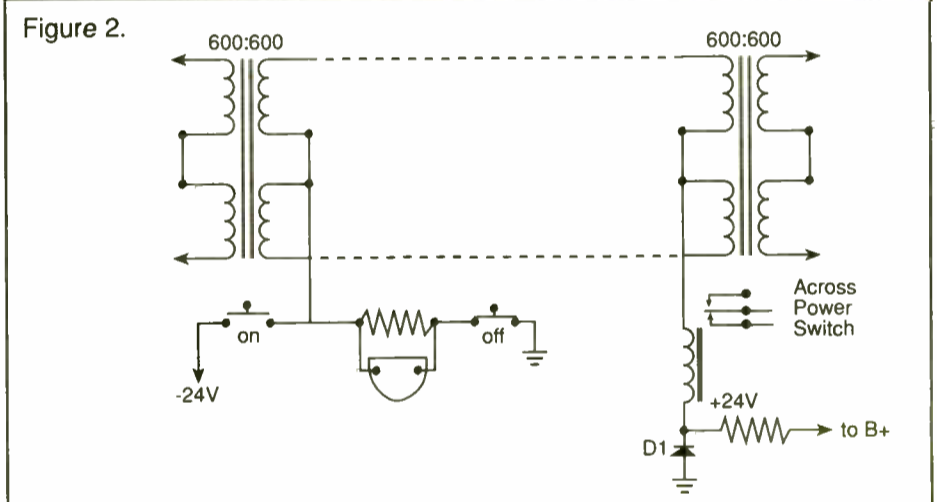
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White noise must be used when measurements are done with a spectrum analyzer. Last month we said that audio equalizers at the transmitter site are sometimes juggled to give it a flat curve when the trans-

mitter site are sometimes juggled to give it a flat curve when the trans-

mitter site are sometimes juggled to give it a flat curve when the trans-



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# Measurement Questions

mitter frequency response won't quite make it. With a little HF boost the proof looks fine, but that's cheating. Assuming flat response from telco lines or STL and flat response from limiters, failure to make proofs means there's a problem in the transmitter.

## Bandwidth troubles

Both AM and FM transmitters can develop problems that manifest themselves through poor frequency response. Older FM exciter stages have high Q stages after the modulator. Mistuning of any of these stages will produce a narrow bandpass and poor frequency response. Proper broadband tuning of these stages is essential for flat response. Verify proper operation of the exciter by doing a response run into a dummy load.

If the problem persists, connect the transmitter to a dummy load and repeat the procedure, adjusting driver and PA tuning and loading controls for wideband response. If response is flat with the transmitter running into a resistive load, and skewed when measured off-air, suspect a damaged transmission line or antenna elements. This may or may not reveal itself through poor voltage-standing-wave-ratio readings.

Bandwidth problems in AM transmitters can also reveal themselves through poor frequency response. Many of the tuning proce-

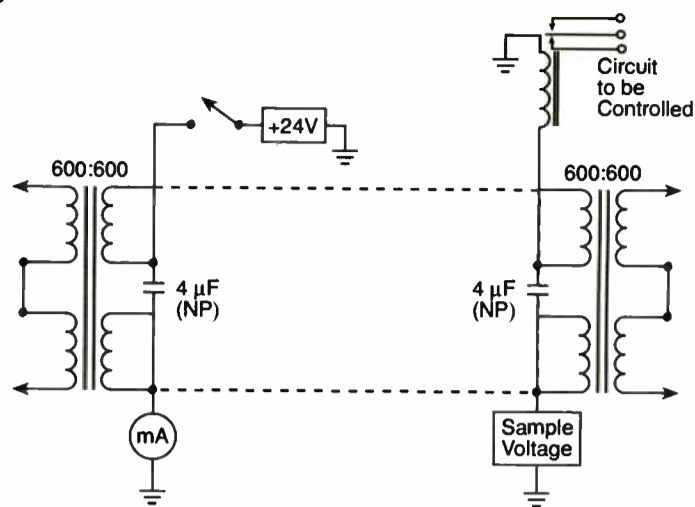
dures described in manuals (particularly for older transmitters) were written before noise testing became popular and are intended to maximize overall efficiency. It should be remembered that settings for best efficiency and best sound (broadband response) are often different.

By using the noise generator/spectrum analyzer combination, it is possible to see the bandpass while adjusting the tuning and loading controls for flattest response. As with FM transmitters, problems may persist, and it might be necessary to substitute a dummy load to determine whether there are bandwidth problems in the transmitter or phasor.

□ □ □

Tom Vernon divides his time between consulting and completion of a Ph.D. He can be reached at 717-367-5595.

Figure 3.



## How to Mix A Band Live

► continued from page 28

to prevent input overload. I listened carefully to check for hum, noise, and buzzes. Then I repeated these steps for each instrument in turn.

The musicians needed to hear what they were playing, so I set up a monitor mix with the aux knobs on the mixer. This monitor mix was sent to a power amp and two monitor speakers on stage.

Finally, the band started to play its first song. I quickly set up a mix by raising all the faders to about -15 dB. Then I adjusted the faders so that I could hear everyone about equally. That's a good starting point for a mix. I listened for each instrument in the mix, and made sure I could hear it.

It was hard to monitor the sound clearly over headphones because the band's live sound leaked through the ear seal. Given a second chance, I'd rent or borrow some longer snakes so I could monitor in a separate room.

With the balances roughed in, I tweaked up EQ. The sax needed more warmth so I added +3 dB at 400 Hz. The station's chief engineer asked that the mix not be too bright (treble) in order to prevent limiter pumping at the transmitter. So on the cymbals, I rolled off 10 kHz a few dB.

The overall sound seemed dry, so I added a little digital reverb to sax and flute. It started to sound good. By the second take, we were ready to put a performance on tape.

□ □ □

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



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**USER REPORT**

## DX-50: A Reliable Winner for Heritage

by **Andy Laird**  
VP Engineering/Radio Gp. H  
Heritage Media Corporation

**BELLEVUE, Wash.** Three years ago, we made the decision to replace the aging, 1960's era, high-level modulated transmitter in our Los Angeles radio station,

KDAY(AM). We wanted a better-sounding, less-expensive-to-operate and more reliable transmitter.

The initial decision was not easy. While Harris Allied DX-10s had been in the field for several years, there were only two DX-50s operating in stations. It was a new technology and we didn't want to be the "beta test" station for this product.

But high praise from the two users along with an in-depth demonstration trip to the factory convinced us the DX-50 was the future for high-powered AM transmitters.

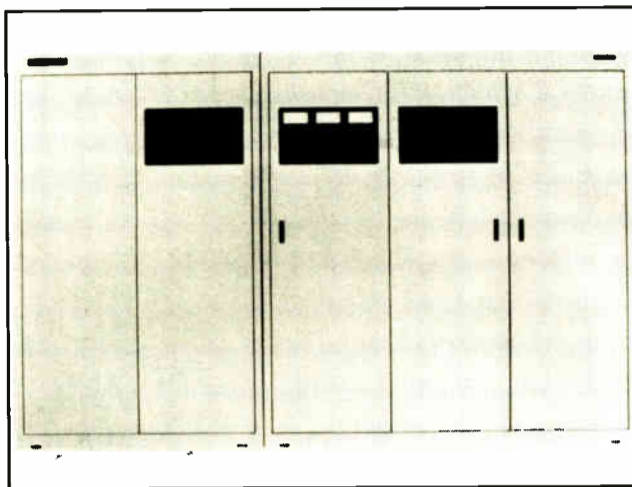
We haven't been sorry. Our first DX-50 went into operation in September 1990. A second went into operation for KULL(AM) Seattle in April 1992.

### The installation

The transmitter is fully contained within two cabinets, except for a 4-foot by 3-foot step-start assembly box mounted on the wall. The larger cabinet contains the power supplies, control system and RF modules. The smaller cabinet contains the output tuning network, low pass/harmonic filters and the cooling fans.

The entire transmitter is cooled by four very long-life, direct-drive fans. These positively pressure the entire electronics cabinets so nothing is exposed to unfiltered air.

The transmitter only requires an exhaust hood (not attached) to exhaust heat and an air supply into the room to replace the



The Harris Allied DX-50 is a 50 kW digital solid state AM transmitter.

exhausted air.

The DX-50 easily fits into the space previously occupied by our auxiliary transmitter, a Gates BC-10B. The movers delivered and placed the two cabinets, and the electricians mounted the step/start box and installed the AC cables.

We installed the grounding, RF output, stereo exciter RF/audio lines, remote meters and control/interlock wiring. The

installation is truly no more difficult than that of a new higher-power FM transmitter.

### Sound quality

Both of our DX-50s were extensively tested at the factory. Harris uses an Audio Precision computer-driven analyzing system for precise performance documentation. We were able to confirm the measurements (at both of our installations) using a Sound Technology system.

The performance of the transmitters is superb. Test measurements confirmed performance far exceeding all requirements for an FM station. From an overshoot and bounce standpoint, the transmitter reproduces exactly what you put into it.

If your processing includes heavy clipping, it will pass through without modulation robbing overshoots.

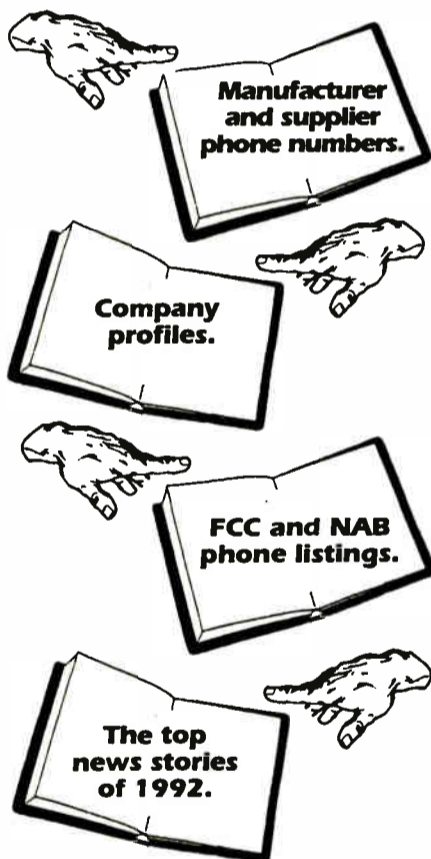
We worked hard getting good sound from our old transmitter. With many modifications, including an additional power supply for the modulators, modulator tube balancing and weekly Monday mornings off the air for maintenance, we could hold IMD to around 3.2 percent at 90 percent modulation. The DX-50's IMD was less than 1 percent at 95 percent modulation. THD measured between 0.115 percent to 0.38 percent.

The DX-50 is a great stereo transmitter. Both our day and night antenna loads are very good. IQM measured at -41 dB. Excellent stereo separation was achieved with very little delay equalization dialed into the stereo generator.

continued on page 44 ►

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**USER REPORT**

## Broadcast Electronic's AM-5 Pumps Iron into KUSA's Sound

by **Dave Obergonner**  
Vice President Engineering  
KUSA(AM)-KSD-FM

**ST. LOUIS** It was late in the summer of 1991 when Broadcast Electronics asked me to field test a new Solid State AM Transmitter.

"Wait a minute," I thought, "BE is only supposed to build FM rigs." But it was true; with over a decade of experience building reliable FM transmitters, BE was venturing into the already-competitive world of AM.

Field testing something as important to your station's reliability as a transmitter can be a bit nerve-racking. But my nerves were calmed when I was told another St. Louis station, KEZK, had been field testing the 1 kW version for several months. I thought, "Maybe that's why the station has been sounding so good lately."

### Where's the iron?

Before risking my station, I looked more closely into the new gear. Upon my first inspection of the transmitter, the biggest question that came to mind was, "Where's the iron?" Most modern AM transmitters shed the big modulation transformers and chokes years ago. What struck me was that the transmitter had no big power

transformer. How did BE accomplish this?

The answer lies in the computer technology of the 1980s—the switching power supply. It not only greatly reduces the weight and the cost of the transmitter, it reduces power consumption, improves performance, and makes it far more tolerant of line voltage fluctuations.

True enough, international broadcasters will love this: anything between 185 volts and 252 volts works just fine with no transformer taps to change, and no degradation in performance.

### True AM stereo

The new BE AM transmitters incorporate an internal C-QUAM Stereo exciter. This means the basic transmitter design accommodates AM Stereo with high quality, and certain tricks can be incorporated into the stereo generator to optimize the performance of both.

For example, all MOSFET amplifiers generate Incidental Phase Modulation (IPM) due to a change in capacitance as the voltage is varied to modulate them. The BE AM stereo exciter allows you to do a pre-correction at the exciter level to cancel this effect. The result is a transmitter with almost no IPM.

Indeed, with our AM-5 feeding the four- continued on page 42 ►



USER REPORT

# Nautel ND50 Proves Practical and Durable

by **Garrett Lysiak and Dennis Whitehead**  
**OWL Engineering/WCTS-FM**

**ST. PAUL, Minn.** When Central Seminary decided to purchase AM 1030 radio, one of the first orders of business was to replace the existing tube transmitter. On weighing the benefits of solid state

construction. Some of the most important features to us were the soft failure characteristic, low B-operating voltage and on-air serviceability.

The Nautel came through the door on a Thursday morning. By that evening, we had it fully assembled and ready for connection to the power mains. The electrician arrived the next morning and by midday, we had the simple short version of the commissioning procedures well underway.

The station was originally set up to operate on site, but we planned to operate it by remote control. There were several circuits we had to build to ensure complete switching from the 50 kW non-directional day pattern to the 1 kW night pattern.

When we switched on the transmitter, one of our control circuits started randomly switching from day to night and back again. This was later traced to a control circuit problem. The Nautel AMPFET ND50 acted just like it was handling that antenna system with kid gloves. It turned itself off before any damage could be done and really saved us.

**Easy replacement**

Another fine feature of the Nautel AMPFET ND50 is the ease in which a failed module can be replaced. The ND50 has 24 power modules that contribute equally to the overall performance of the transmitter.

We already had the Nautel on the air for a few days when a low voltage warning light was noticed on one of the modules. Because we purchased a spare module (which we would recommend to anyone

thinking of buying a new solid state transmitter), we were able to facilitate quick replacement without going off the air for even a second.

Another positive feature of the AMPFET ND50 is the use of independent main and standby exciter sections, which give redundancy. The AM stereo board is a fully integrated part of the transmitter, not just an external box attached to the outside as an afterthought. This feature helped us select the Nautel transmitter.

One nice thing about the ND50 is the ease in finding things on the well laid-out circuit boards, and in the descriptions and diagrams in the manuals. One can tell that time and effort were put into the process of documentation, so repairs and adjustments can be quickly accomplished.

**Better reception**

Because we replaced the old transmitter before even operating the station, we haven't had any experience with power bills. The former owner gave us thumbnail sketches of what he paid for electricity, but our bills haven't been close to those.

I will say that the signal sounds much clearer than the old tube transmitter. People 80 and 90 miles away comment on the clarity of the AM signal. And we've had reception reports 200 miles from the transmitter site, much farther than our former FM station.

The Nautel technical service people are quite helpful in walking you through a problem. We had a failure in a shutback circuit that we weren't sure how to fix. They waited while we found the board and tested the FET that had failed.

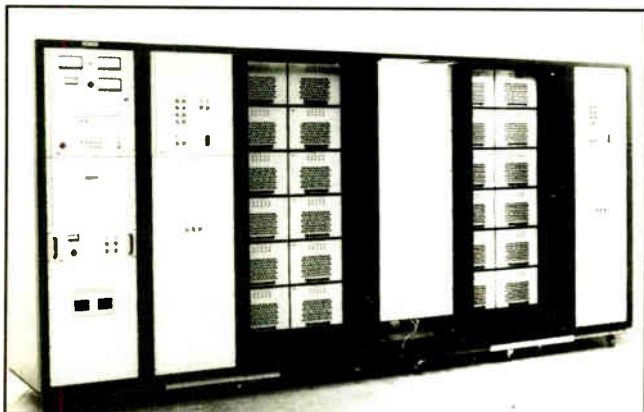
A spare parts kit, which came in handy in the wee hours of a weekend morning, was a valuable part of the Nautel purchase. The FET we needed was in the kit, and within a few minutes we were ready for "business as usual" the next day.

The AMPFET ND50 has proved to be everything we could have hoped for and more. Nautel will certainly be high on the list for any improvements we may see in the future.

□ □ □

*Garrett Lysiak, P.E. is president of OWL Engineering, Inc. Dennis Whitehead is Director of Engineering of WCTS-FM in St. Paul.*

*For information on the ND50, contact Jorgen Jensen in Canada at 902-823-2233; fax: 902-823-3183; or circle Reader Service 103.*



Nautel's AMPFET ND50 stereo transmitter features a soft failure characteristic and 24 power modules.

against tube technology, it was apparent that solid state had all the right stuff.

Plant visits were made to two high-power solid state radio transmitter manufacturers. After putting both transmitters through an identical set of tests, the choice was made more difficult.

Making the choice on color alone was tempting unless the units were analyzed in terms of build, operation in unusual situations and maintenance requirements.

Nautel's AMPFET ND50 equaled or exceeded the competition in all tests run. But it wasn't just because of the factory tests, it was the perception that this box is built for the long haul.

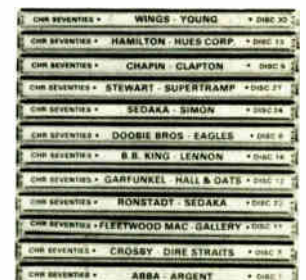
**Simple and practical**

The Nautel AMPFET ND50 stereo transmitter stood on its own in the area of simplicity and practicality of design and

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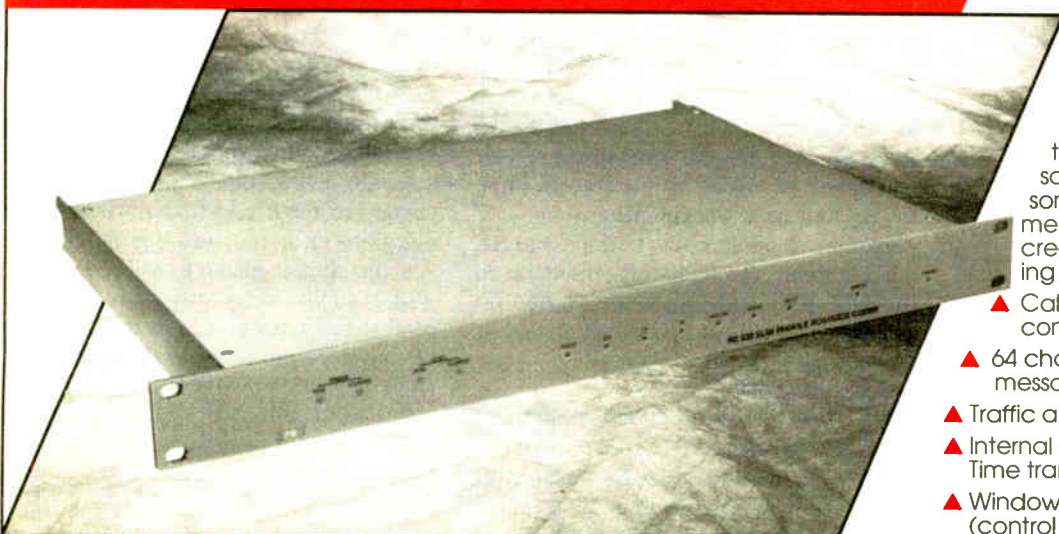
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## INDUSTRY ROUNDUP

# AM Technology Keeps Up with Changes

by Mary Ann Dorsie

**WASHINGTON** Although the world of AM radio may no longer be in its heyday, the medium is still advancing technologically.

And in the world of AM transmitters, the tune is no different, according to AM transmitter manufacturers. With solid state the established choice, technology is changing to reflect variations within the genre.

## Still going strong

"The transmitter is the strongest part of the transmission system in the sense that it's very highly efficient in producing for amplitude modulation," said Jorgen Jensen, Nautel's manager for sales and marketing. "It's an old technology in a sense, but the new transmitters produce a signal quality that far exceeds the ability of receivers to take advantage of it."

Since solid state came into the scene, the focus is on higher and higher powers, Jensen said.

"We're looking at megawatt solid state transmitters to be competitive price-wise with tube types," he said.

John DeLay, AM product line manager for Harris Allied, said the future of AM transmitters is for in-band DAB technology. If this type of technology is approved, it will help give AM a competitive edge.

"It will open the opportunity for AM broadcasters to compete on a more head-to-head basis with FM," DeLay said.

Tim Bealor, director of RF and studio products for Broadcast Electronics, also said many things are happening to strengthen AM, including the possibility of RDS/RBDS and in-band technology for AM.

David A. White, BE's sales manager for RF products, said BE has been promoting AM stereo for some time now. The company now includes some type of stereo generator in its products.

"We've been able to offer excellent C-QUAM stereo at a very attractive price," White said.

## The darker side

Despite the successes, there is a down side to AM radio right now.

"The broadcast AM market is not growing," DeLay said. "It does appear to be shrinking."

Jensen said about half of the current AM stations will have to shut down for lack of money sometime in the future.

"I think it's a pretty dark outlook for a good many stations, but there are still people who are making money too," Jensen said.

Jensen said he does think AM as a medium will survive for a longer period of time than FM because it's more of a viable option, especially in the Third World.

It's a way to provide a low-cost information service to people distributed over large areas, he said. "Everyone can buy a \$3 AM radio."

But all is not totally bleak, Jensen said. The recession did cause a slowdown, but

now things are starting to pick up.

"We're seeing a definite upswing in the number of transmitter sales domestically," Jensen said.

"AM broadcasters are making enough to buy transmitters," Jensen said. "Things must be going pretty good, because they're usually last in line."

Based on the increase in transmitter sales, the AM market has "bottomed out," Bealor said.

"The guys that survived up to this point

are starting to gain a little bit of momentum," Bealor said.

White said he believes AM will always survive.

"You drive across the western United States and there are still spots in the country where you don't have anything else to listen to," White said. "It's the medium of choice for many, many people who are on the road, or in rural areas."

Bealor said the manufacturers of AM equipment have started to listen to the needs of the users, and therefore, make more functional products.

And even though all broadcasters need a transmitter, it doesn't provide many extras, he said.

## Broadcast Electronic's AM-5 Pumps Iron into KUSA's Sound

► continued from page 40

tower KUSA directional antenna system, mid band IPM is below -50 dB. Because there's no question about which transmitter the stereo generator is fed to, setup is greatly simplified. A solid state transmitter design makes stereo very stable—no realignment necessary when you change tubes, because there are none.

The AM-5 will adjust to any of five pre-set adjustable power levels. Of special interest to stations with very low PSSA or PSRA power, the AM-5 will still make its specs down to 25 watts.

The very high efficiency of the switching power supplies and BE's class E mode of operation on the P.A. MOSFET create a transmitter using very little power. In fact, we calculate that our savings in power bills and tubes will pay for the transmitter in just a few years.

## Soft fail

The transmitter comes in a modular design. Eight P.A. drawers are hot-pluggable in seconds, and the four power supply modules can be changed in just about two minutes. There's very little down time with this transmitter.

The loss of a P.A. module or power supply module results in only a small reduction in power output, with no interruption in service. You can just pull out the failed P.A. drawer and service it, or plug in a spare—no need to leave the air.

Just a word of advice to anyone making the switch from tube type transmitters to an all solid state design: check your ARC gaps at the bases of your towers.

This is your first and most important line of defense against hundreds of thousands of volts just waiting to pour back down your coax to blitz your transmitter. After one terrific electrical storm took out several P.A. modules on our new AM-5, we discovered the gaps on some of our towers had been "adjusted" by the feet of some tower climbers to several inches.

Since we've re-adjusted the gaps, and BE has improved the lightning protection in the AM-5 several times, we've had no problems.

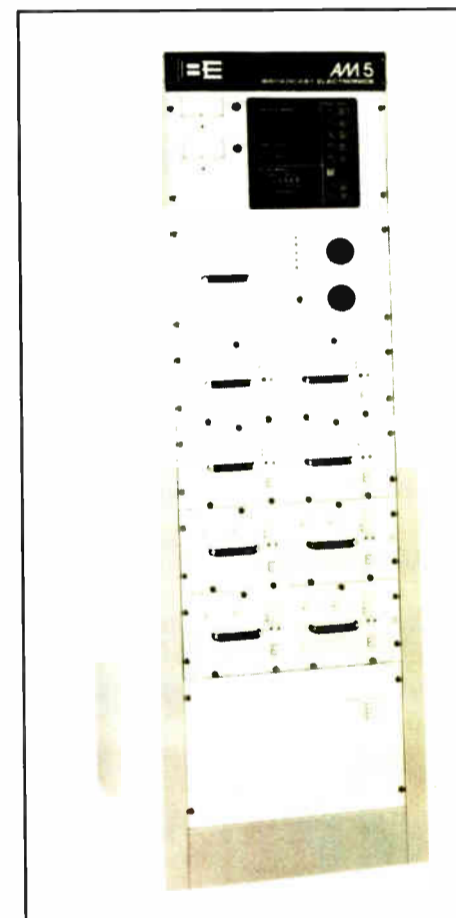
## Sound quality

One of the biggest questions to ask when faced with a new design from a company that has never sold an AM transmitter before is: "How will this thing sound?"

KUSA was the site for the field test of BE's AX-10 stereo exciter a few years ago, and we were very impressed. So I had some idea of what to expect from an AM transmitter of the company's design, but

this AM-5 goes way beyond our expectations.

For years AM has been looking for real world performance from transmitting systems that can match or exceed the quality of FM.



Broadcast Electronic's AM-5 transmitter

There is a BNC connector inside the transmitter that allows input of an external stereo exciter, RDS/RBDS, an external time base for synchronous transmitters, or a Digital Audio Broadcasting (DAB) signal.

With the advantage of a built-in stereo generator optimized to the transmitter, and a very forgiving output combining and tuning design, the BE AM-5 turns better proof numbers in stereo into our Directional Antenna System than our own FM station.

For example, stereo distortion is 0.5 percent, stereo separation is in the 40 and 50 dB range, stereo noise in the mid -60 dB range and stereo SMPTE IM distortion is under 1 percent.

These are real world numbers into a less-than-great antenna system, and this thing sounds great.

□ □ □

For information on the AM-5, contact David White in Illinois at 217-224-9600; fax: 217-224-9607; or circle Reader Service 74.

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But maybe you'd like to save twice as much. Purchase the 9100A and add digital STL capability with TFT's new DMM-92 and TFT will double the rebate offer to \$700.

The new DMM-92 can accommodate four 15 kHz program channels and two 3 kHz channels plus two MUX in a single 500 kHz channel allocation and is ideal for LMAs and duopolies.

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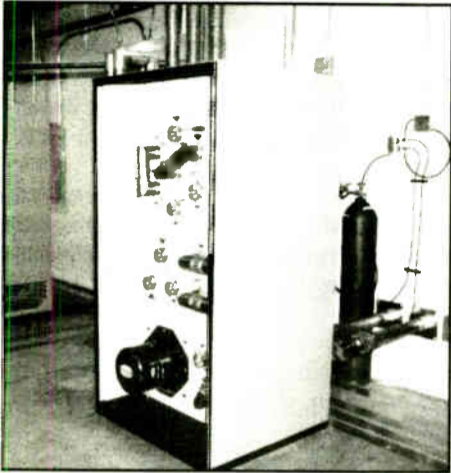
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**KINTRONIC LABS**

**WBAP's Challenge of Staying On the Air During Tower Maintenance is Met by DL-50 Dummy Load**

**BRISTOL, Tenn.** The engineering staff of WBAP Radio, the Capital Cities/ABC AM station in the Dallas-Fort Worth area, faced a dilemma as a result of the ANSI radiation exposure standards—how



to remain on the air during normal tower maintenance? The solution was to erect an auxiliary tower.

The switching challenge involved fabricating a floor mounted switch cabinet permitting either of the Nautel ND-50 transmitters to be routed to either antenna or to a Kintronic Labs DL-50 dummy load.

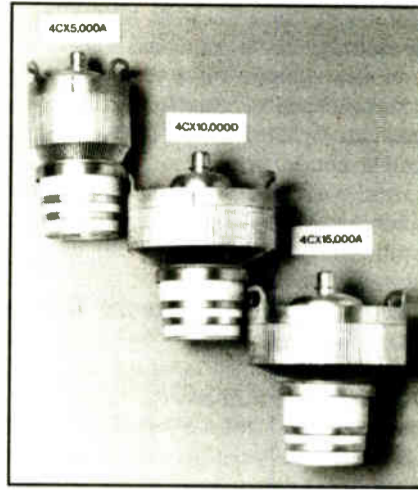
In addition, a third 10 kW transmitter was to be routed to either antenna or to a 10 kW dummy load.

The switching problem was solved using two three-port, one four-port and one seven-port Kintronic 3 1/8-inch patch panels, and a Dielectric 3 1/8-inch motorized switch. All were interconnected using 1 5/8-inch and 3 1/8-inch rigid line components. Separate interlock switches were supplied for each possible U-link location.

For information, contact Tom F. King in Tennessee at 615-878-3141; fax: 615-878-4224; or circle Reader Service 188.

**EEV**

**Tetrodes Add Longevity and Better Performance**



**ELMSFORD, N.Y.** EEV's Broadcast tetrodes are designed to enhance the longevity of transmitters and increase their audio performance.

EEV 4CX Broadcast tetrodes are manufactured with a mesh filament design. The mesh design ensures long-lasting concentricity of the filament.

EEV currently manufactures the following tetrodes: 4CX5000A, 4CX10000D, 4CX10000J, 4CX15000A, 4CX35000C, 4CW25000A and 4CV100000C.

For information, contact Greg Morton in New York at 914-592-6050; fax: 914-682-8922; or circle Reader Service 116.

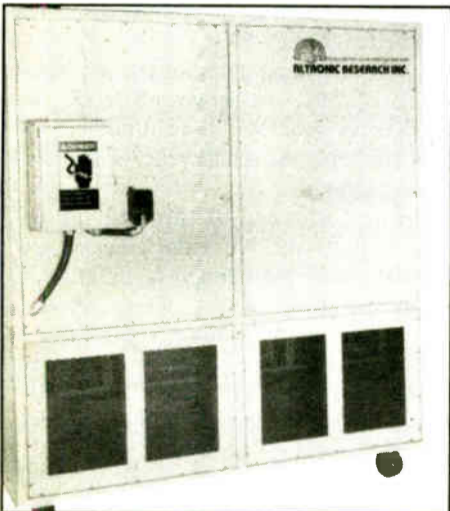
**ALTRONIC RESEARCH**

**High Power Medium Dummy Loads Bring Cooling Relief**

**YELLVILLE, Ark.** Altronic Research's newest air loads are designed for the medium wave broadcast band. The loads are cooled by pulling air into the cabinet with large fans and then forcing the air over banks of resistors on its way out of the load.

This system eliminates the worry of oil or water. The medium wave loads have RF characteristics, typically 1.1:1, from 0.5 through 2 MHz.

The high-power loads start at power



ratings of 100 kW, but are available at almost any rating. The most popular model is the 150 kW unit, but Altronic has built 600 kW loads and a 1500 kW load.

The loads can be specified for outside service and/or extreme weather conditions. The 600 kW load is approximately six-feet tall, seven-and-a-half-feet wide and nine-feet long, depending upon configuration.

For information, contact Doug Starkey in Arkansas at 501-449-4093; fax: 501-449-6000; or circle Reader Service 43.

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**ECONCO****Tube Rebuilder Will Test Station Transmitter Tubes**

**WOODLAND, Calif.** Broadcast engineers who remove tubes from sockets while troubleshooting a transmitter often are reluctant to reinstall the tubes once the problem is resolved.

Engineers have learned from personal experience that protective interlocks often don't operate fast enough to prevent high voltage arcs from doing extensive damage to solid state components.

Econco offers free testing to engineers who find themselves in this circumstance. Any engineer can take advantage of this service regardless of whether the tube in question has been

rebuilt by Econco or not.

Simply send the tube to Econco with a note asking for a "Test & Advise" on the tube. Include a name and telephone number, and within a few days of receipt, Econco's Customer Service representative will call with the test results.

Information available includes the general condition of the tube, any indication of the potential for catastrophic failure and an estimate of remaining tube life.

At this time the engineer can decide upon a course of action.

For information, contact Debbie Storz in California at 800-532-6626; fax: 916-666-7760; or circle Reader Service 127.

**ENERGY-ONIX****The AM-1K: A Low Power AM and Shortwave Transmitter Designed With RF Exciter and 4-400C Tetrode Tubes**

**HUDSON, N.Y.** Energy-Onix Broadcast Equipment Co. is introducing a low power AM and shortwave transmitter, the AM-1K.

The AM-1K is designed to meet the needs of worldwide broadcasters requiring a 1 kW to 1.2 kW output for their facilities.

The output of the transmitter's crystal control RF exciter is amplified by a broadband solid state IPA. The IPA can produce 30 watts, while only 10 watts is required to drive the final amplifier on the AM-1K.

The power amplifier utilizes two 4-400C tetrode tubes, which can produce 1.2 kW of carrier power. The input circuit to the PA is conventionally tuned, and its output

circuit is a PI-L.

Vacuum capacitors are used for both PA tuning and loading. The transmitter's modulators are also 4-400C tetrode tubes, which operate in push-pull configuration.

The modulators are driven by a solid state audio driver. The modulators in turn drive a conventional modulation transformer. The output of the modulation transformer is developed across a dual choke, which modulates both the PA plate and the PA screen.

Front panel LED lamps are located on a graphically displayed control ladder so the status of all major transmitter components can be understood at a glance. The controller is designed for local and remote, manual and automatic control. The control override system allows the transmitters to stay on the air, even in the event of a controller failure.

The AM-1K, and all Energy-Onix transmitters, use commonly-available parts. Energy-Onix's AM and shortwave transmitters range from 2.5 kW to 50 kW.

For information, contact Ernie Belanger in New York at 518-828-1690; fax: 518-828-8476; or circle Reader Service 145.

## Harris DX-50: A Reliable RF Winner

► continued from page 40

We used to listen to the demodulated IF output of our stereo generator and wonder if there would ever be an AM transmitter that could sound that good. The DX-50 achieves this.

**The payoff**

Utility rates are high in Los Angeles. Rates and billing practices were fully studied, and the station is on the best constant-demand (full-time 50 kW operation) rate available. Our utility costs dropped from \$10,000 per month to \$6,000 when we switched to the DX-50.

Annual tubes and parts for the old transmitter typically cost between \$10,000 and \$15,000 per year. We've paid nothing for parts after two and a half years of the DX-50's operation.

The performance of this transmitter remains constant. No more weekly, all-night sessions are needed to maintain a quality sound.

In a word, the transmitter's reliability is outstanding. Heritage no longer owns KDAY (now KBLA), but we had no failures while we did own it. I checked with the chief engineer about any recent failures, and he's lost one power MOSFET since the transmitter went on the air. Our Seattle transmitter has been operating since April 1, 1992 with no failures.

We've sent three engineers to the DX-50 school for maintenance training. All three came back praising both the DX-50 and the training program.

In summary, I'm convinced that Harris has its act together. The DX-50 is a great transmitter. I am totally pleased with the DX-50's performance and reliability.

□ □ □

For information on the DX-50, contact John DeLay in Illinois at 217-222-8200, ext. 3103; fax: 217-222-7041; or circle Reader Service 181.



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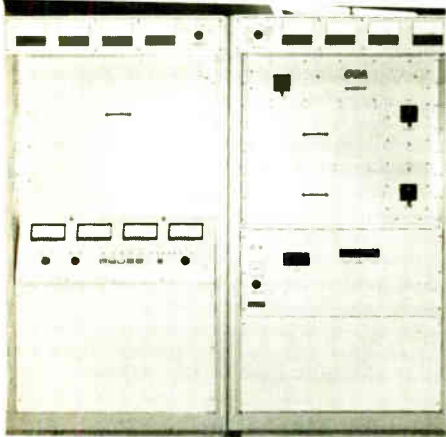
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**FAIRBURN, Ga.** For over 30 years, CCA Electronics has manufactured AM medium wave and shortwave transmitters, and supplied them to broadcasters all across the United States and around the world.

With downsizing of engineering and technical staffs in U.S. stations, simplicity is more important today than in the past. CCA's AM and HF transmitters are designed for easy installation and maintenance, and for less-complicated troubleshooting.

CCA transmitters are made with con-

servatively-rated components for operation in environments under less-than-desirable conditions. Parts are always available from CCA, but the end-user isn't "forced" to purchase replacement parts from CCA.

Plate-modulated design, low ICPM, modern relay control-logic, automatic power control and VSWR protection are some of the features incorporated in CCA AM transmitters.

CCA's 'F' series AM transmitters have RF power levels from 1 kW to 50 kW.

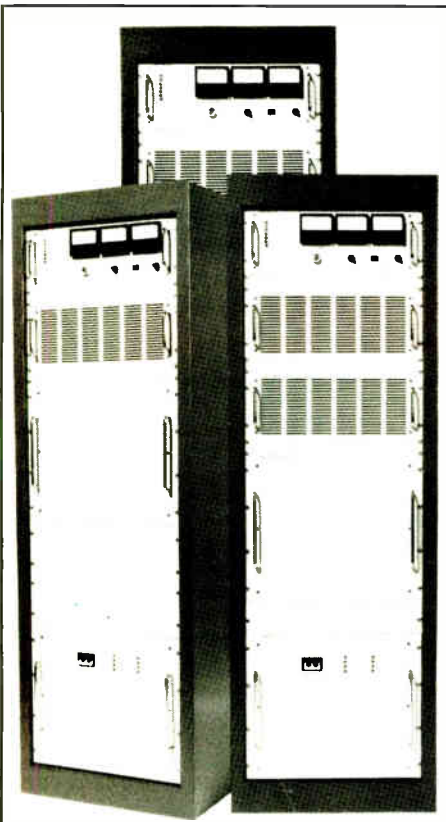
For information, contact Steve McElroy in Georgia at 404-964-3530; fax: 404-964-2222; or circle Reader Service 170.

**CONTINENTAL**

**Solid State Transmitters Yield AM Stereo Performance**

**DALLAS** The solid state AM transmitter lines by Continental Electronics Corporation (CEC) range in power levels from 300 W to 10 kW.

Highlights of the transmitters include low power consumption and the non-routine replacement of vacuum tubes.



The transmitters come standard with the following features: interchangeable modules (no tuning required), lightning protection, over-temperature sensing, full cabinet cooling, VSWR protection, remote-control compatibility, power cut-back, module construction and module status and monitoring.

For information, contact Steve Claterbaugh in Texas at 214-381-7161; fax: 214-381-4949; or circle Reader Service 153.

**ELECTRO IMPULSE**

**Important Points For AM Dummy Load Installations**

**NEPTUNE, N.J.** Selecting and installing an AM dummy load should only be done after consideration of some important information.

Power rating is important, so both the carrier and modulation should be considered when selecting the dummy load; a 10 kW AM transmitter requires a 15 kW-rated load.

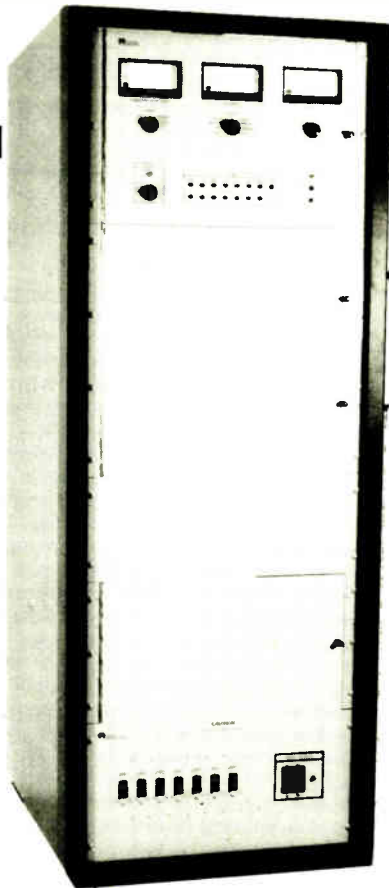
Be certain that you run a heavy ground strap to the load cabinet, in addition to the input connector ground. All Electro Impulse loads have a heavy brass ground stud for this purpose.

Dummy loads will dissipate all of the incident power from the transmitter as heat. Be certain to allow ventilation and adequate spacing from any walls, floors, ceilings, etc.

If you're going to vent or duct the heat out of the room, be certain you consider the backpressure of the duct.

Electro Impulse dry dummy load maintenance involves periodically checking the air cooling path, periodically checking the air movers, if used; and verifying the operation of the air flow interlock and checking the input resistance of the dummy load using an ohmmeter.

For information, contact Mark Rubin in New Jersey at 908-776-5800; fax: 908-776-6793; or circle Reader Service 20.



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## CURRENT TECHNOLOGY

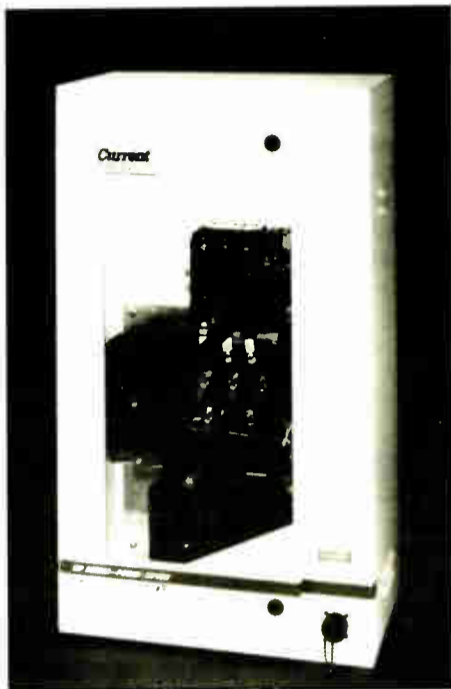
### MP Power Siftors Save Station's Broadcast Facility From Spikes, Surges and Other Electrical Problems

**RICHARDSON, Texas** For years, Dallas radio stations, KKDA-AM-FM, relied on **Current Technology MP (Main Panel) Power Siftors®** to protect the station's broadcast facility from damaging spikes, surges and other electrical disturbances.

During a spring storm, a lightning strike knocked out KKDA's unprotected off-site power transmitting station located on a hill several miles from the broadcast station. Listeners were greeted with the deafening sounds of total silence. KKDA

was off the air.

To compound matters, the transmitting station was surrounded by dangerous floodwaters resulting from unusually



heavy spring rains. A competing Dallas radio station's news and traffic helicopter transported new equipment and an MP Power Siftor to the KKDA transmitting site.

Today, KKDA uses Current Technology's products at both the broadcast facility and off-site transmitting station. Subsequent storms have hit the Dallas area, but no disturbances or downtime were reported.

The Power Siftors have saved the stations money in downtime and repair costs, said Gerald L. Dalton, director of engineering.

For information, contact **Teresa Henderson in Texas at 214-669-0818; fax: 214-669-0420; or circle Reader Service 69.**

## AM ANTENNA SYSTEMS



50 KW AM TUNING UNIT

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## People

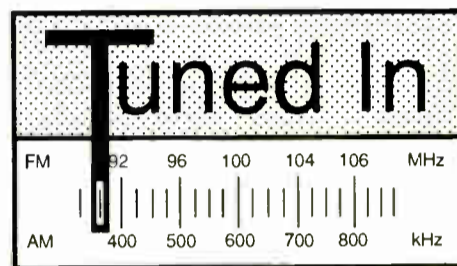
**Shure Brothers Inc.** appointed two new managers in the company's marketing department.

**Brian Hall** is Market Development Manager, concentrating on the company's sound contracting market, and **Steve Johnson** is Product Line Manager, concentrating on Shure's wireless market.

Both Hall and Johnson join Shure after working for Motorola.

**Bob Orban** was awarded an Oscar by the Academy of Motion Picture Arts and Sciences for his part in the development of Dolby Laboratories' "Container."

The Container is an audio processor that permits added creativity in soundtracks recorded in the analog domain. Orban's original basic research is used in **AKG Acoustics' Optimod®** audio processors designed for broadcast peak limiting.



**S.C.M.S., Inc.** announced that **John Timm** joined the sales department in the broadcast equipment division. Primarily covering the Florida area, he can be reached at 26646-1 Players Circle, Lutz, Fla., 33549 (phone: 813-973-1788; fax: 813-973-4877).

## Companies

**Otari Corporation** has opened a direct Sales Office at 420 Lexington Avenue, Suite 300, New York, NY 10170 (phone: 212-297-6109; fax: 212-986-1952). The office is responsible for Otari's "high tech" products, including the DTR-900, MTR-100, MTR-90, ProDisk 464 and all console/automation products.

Tape machine warranty service and sales support is handled by Greg Hanks, New York Technical Support

Inc., 35 Hardscrabble Hill Road, Chappaqua, N.Y., 10514-3009. He can be reached at 212-246-0227. ProDisk warranty service and sales support is handled by Laslo Katona and Vince Mosdar, Film-Tek and Associates, 26-07 Broadway, Suite 24, Fair Lawn, N.J. 07410. They can be reached at 201-797-4999.

**BSW** has changed its name to **Broadcast Supply Worldwide** and redesigned its logo to mirror the company's new scope. For the first time this year, BSW's 120-page catalog will reach more than 60 countries.

**Alridge Marketing** of Houston recently received the 1992 "Rep of the Year" award at the **Ramsa/Panasonic Pro Audio** national sales meeting and awards dinner.

The professional division of **Audio-Technica U.S., Inc.** experienced a 15 percent increase in sales

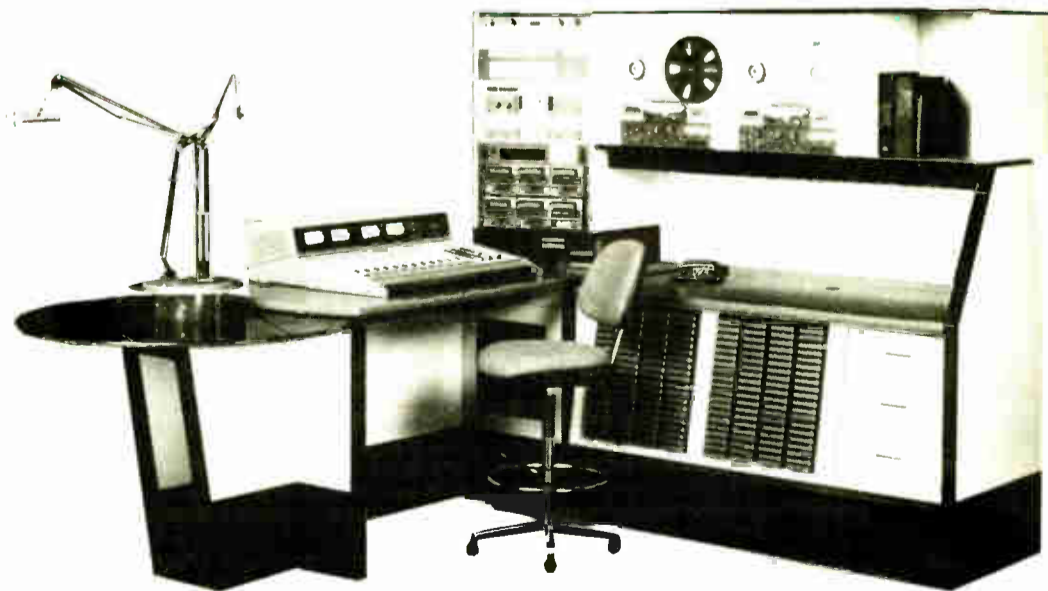
in 1992.

**beyerdynamic** has appointed MTA, North Hollywood, California, its Rep for Southern California, Arizona and Southern Nevada.

The company also appointed two reps for the metropolitan New York and New Jersey areas. **Sigmat Marketing** will focus on Pro Audio. **Contractor, Broadcast/Video** and **Musical Instrument** dealer activities, while **Audio Associates** will focus on Consumer Audio and Video dealer activities.

**Group One, Ltd.** is now the official U.S. distributor for **Focusrite**, the British manufacturer of recording consoles and signal processing equipment.

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DENNIS EVERSOLL,  
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WRHQ, SAVANNAH, GA



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STATION MANAGER,  
KSJQ & KFEQ,  
ST. JOSEPH, MO



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DAVE ANTHONY,  
STATION MANAGER,  
WCED/WOWQ DuBois, PA

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World Radio History



# MARKETPLACE

A compendium of new and recently introduced radio broadcast products

## The ADSP-2103 Digital Signal Processor

Analog Devices, Inc. has introduced the ADSP-2103, a 3.3-V powered digital signal processor (DSP) operating at 13 MHz and dissipating to 30 mW during typical operation, and to 83 mW, maximum, when fully active.

The ADSP-2103 was designed for operation at 3.3 V  $\pm$ 10 percent. Analog Devices uses transistor size reduction plus design enhancements, allowing the ADSP-2103 to attain its low active-power specification while still operating at 13 MHz.

Future design enhancements will bring

standby power consumption to less than 1 mW, and operating speed to 20 MHz.

For information, contact Analog Devices in Massachusetts at 617-461-4447; fax: 617-821-4273; or circle **Reader Service 34**.



## Mom Always Said, "Keep Your Hair Combed, Wear Clean Underwear & Put Out A Hellaciously Clean Signal."



The way Mom felt about keeping everything neat and clean, she'd love our Platinum Series® FM transmitters. They put out the cleanest signal around.

So clean, in fact, they outperform the competition, no sweat.

What does all this cleanliness mean to you? Increased market share. Because your signal will be noticeably stronger than your competitors'. You'll sweep up more revenue. And increase your profits.

What's more, our Platinum Series FM transmitters are simple to maintain and operate. Their solid-state technology eliminates the constant fine-tuning

demanding by tube transmitters. And decreases recommended maintenance by up to 90%. You won't have to worry about down time mopping up your revenue.

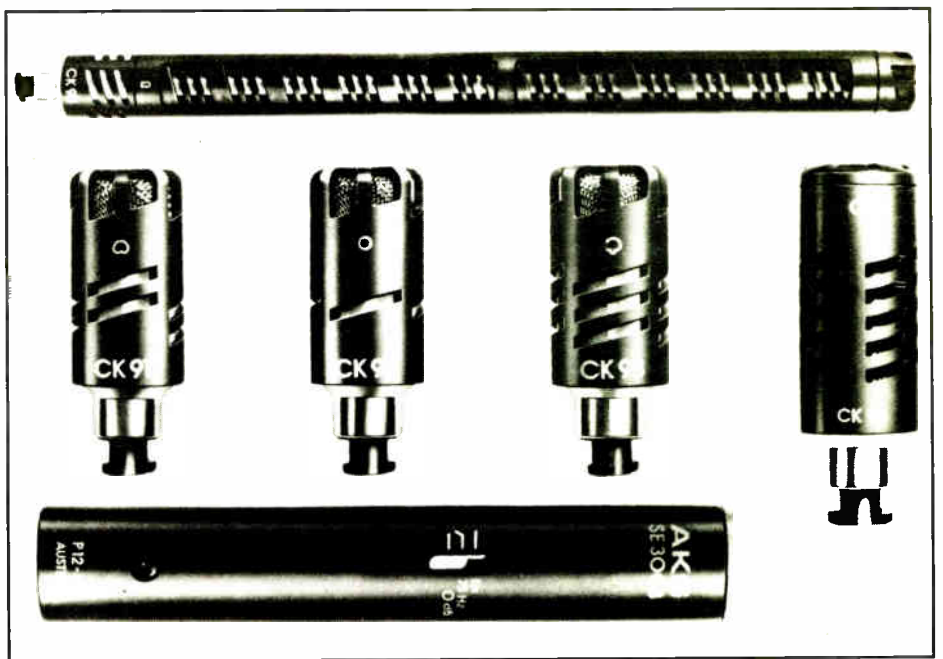
Attract more listeners with a Platinum Series FM transmitter from Harris Allied, the most trusted name in FM technology. We'll help you make a clean break to the top of your market.

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**Fax 217-224-1439**  
**Canada 800-268-6817**  
**Toronto 416-731-3697**

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ALLIED**

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## AKG Blue Line

AKG Acoustics, Inc. has introduced the AKG Blue Line, a modular microphone system for professional recording and live sound.

The line is comprised of one preamplifier, eight different microphone capsules and a range of dedicated accessories. The system's new ModuLock™ positive action bayonet coupling helps system components to be assembled quickly and accurately.

The Blue Line features two cardioid mic capsules, the CK 91 and the miniature cardioid CK 97-C; a hypercardioid capsule, the CK 93; two omnidirectional capsules, the CK 92 and miniature CK 97-0; a figure eight, the CK 94; and a short shotgun, the CK 98.

For information, contact Joey Wolpert at 510-351-3500; fax: 510-351-0500; or circle **Reader Service 141**.

## Fiber Optic STL Systems

BEC Technologies has introduced a modular, digital fiber optic STL system capable of transmitting up to 64 channels of full-bandwidth, bi-directional audio.

The maximum transmission distance is two miles multimode with the standard LED driver, or up to 25 miles single mode with an optional laser driver.

Specifications include a frequency

response of 10 Hz to 22.5 kHz ( $\pm$ 3 dB), THD+N of less than 0.01 percent and dynamic range better than 92 dB.

Proprietary Fault Tolerant Redundant Communication (FTRC™) technology is implemented for fail-safe signal integrity.

For information, contact Michael Creamer in Washington at 206-632-2431; fax: 206-547-1421; or circle **Reader Service 66**.

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Talk with Howard Enstrom, veteran broadcast consultant who, in the 70s switched to FM translators as a specialty.



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- **TERRAIN ELEVATION RETRIEVAL** determines HAAT for 8 or more radials
- **DISTANCE TO CONTOURS** plots projected coverage
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# PRODUCTS & SERVICES SHOWCASE

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

## DIGITAL PROCESSING FOR TODAY'S DIGITAL BROADCASTER



The PARAGON brings a new standard of audio processing to the digital broadcaster. The RAM-based hardware architecture enable the PARAGON to be completely software driven via a 3 1/2" 1.44 megabyte floppy drive; therefore there's never a need to install fragile, static sensitive EPROMS. The Paragon provides a continuously updateable audio processing platform with no planned or short-term obsolescence. As the future of Digital Audio Broadcast unfolds, the PARAGON is ready to be configured with new software and/or hardware updates.

- Built in Stereo Generator
- 4-Band compressor
- Fully sweepable crossover points
- Touch Screen interface
- Limitless user presets
- EQ Spectrum Graph display
- Limiter Dynamic Mapping Graphics
- 6 Band Parametric EQ
- 4-Band Limiter
- Stereo Image Controller
- Day parting
- "On-Air" A/B Comparison
- AGC Mapping Graphics display
- User friendly interface

List \$8,895.00

This is not a redo of an Analog Processor. It was made from the ground up by Audio Animation to meet the high demands of the Digital Broadcaster for today and tomorrow.

**AUDIO COMMUNICATIONS SERVICE**  
Professional Audio Products

P.O. Box 148, Deer Park, California 94576-1048  
Tel: 800-234-5616 FAX: 707-963-5723

READER SERVICE NO. 54

## AUTO-ANSWER TELEPHONE COUPLER

Ideal for unattended situations such as listen lines, IFB feeds, dial-up networks, remote transmitter sites & satellite links.

- Clean connection to phone line
- Easy to install
- Send or receive program
- F.C.C. registered



**COMREX**

Comrex Corp., 65 Nonset Path, Acton MA 01720  
Tel: 1-800-237-1776 Fax: 508 635-0401

READER SERVICE NO. 8

**NEW!**

## Composite Audio DA and Switcher!



### APPLICATIONS

- Switching Between Composite STL's
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- Feed Up to 3 Transmitters with Identical Audio
- SCA or SAP Generator Switching
- Non-Intrusive Composite Testing/Monitoring

### FEATURES

- 2 Input Switcher
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READER SERVICE NO. 217



## AUTOMATICALLY

- Switches to backup or tertiary stereo audio source when main audio source loses a channel or is missing
- Switches both outputs to the channel with audio when one channel is missing from a stereo source
- Corrects audio polarity if it is reversed
- User programmed time delays and sequencing
- FULL alarm outputs and total remote control
- ON-LINE audio monitoring and stereo audio switching
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- Locate at Studio site to monitor studio audio and make instant corrections for console, cart/tape, or satellite programming errors.

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READER SERVICE NO. 26

## INTELLIGENT TRANSMITTER OPERATION



**INTELLIGENT DIGITAL REMOTE CONTROL.** The ITO177 from Hallikainen & Friends, allows fully automatic operation of a Moseley TRC-15 remote control equipped with a TEL171 Digital Telemetry Adaptor. The ITO177 plugs into the memory expansion port of a Commodore-64 personal computer and to the TEL171 data port. Automated transmitter site control of the TRC-15 and access to the meter reading displayed on the TEL171 is by BASIC statements and functions built in to the ITO177. An "auto-boot" feature allows the control program to re-load and run in the event of a power failure. 2K of nonvolatile memory saves information from power loss. Make the intelligent choice today based on time tested tradition.

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**FAX: (215) 640-5880**

READER SERVICE NO. 63



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If there is a piece of pre-owned equipment you are looking for give us a call, we can probably help you.

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### AMPLIFIERS

#### Want To Sell

Gates MO-2696 rack mount, prof tube amp, 1950s, \$200. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401.

Dynaco ST120, fact built, gd cond, BO. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

Bext PJ-100 used less than 2 yrs, broadband, \$1295. R Newton, Family 105.3, 266 Lantz Rd, Lawrenceburg TN 38464. 615-766-1022.

BWG Mdl 85 (2) pwr amp, stereo, 35 W/chnl, 1RU, exc cond, \$250 ea/\$400 both; Shure M-267 rem, \$275. J Somich, Somich Prods, 1208 Stoney Run Trl, Broadview Hghts OH 44147. 800-334-3925.

Haeco (2) 1x16 audio DAs, \$50 ea. L Houck, Rollin Rcdg, 210 Altgelt, San Antonio TX 78201.

New 250 W solid state amp, \$1800. Call for details. Bill Hoffman, 518-583-9490.

McMartin MS-10B amp/preamp, PA/music application, \$45. B Mayor, Galaxy, 175 Bunker Hill Rd, Auburn NH 03032.

ATI (4) preamps, \$75 ea. N Doshi, WQCD, 220 E 42nd St Ste 2812, NY NY 10017. 212-210-2775.

Perma-Power S-102 w/S1420 batt pack, port PA unit, 12 W out, exc cond, \$100. R Sumner, CAVU, 3322 Applegate Ct, Annandale VA 22003. 703-968-8894.

Video DA, 1 in 3 out, stand alone, 110 VAC oper, BNC conns, \$50. D Burns, Electroman, 5960 Orleans Ave, New Orleans LA 70124. 504-482-3017.

RTS 465 mic pre w/limiter, \$150; RTS dual buffer 444 matchbox, \$100; BGW 85 pwr, stereo, 35 w/chan, \$225. J Somich, Somich Engrg, 1208 Stoney Run Trl, Broadview Heights OH 44147. 800-334-3925.

AB Syst 205A stereo, new, \$400 ea/BO. J Diamond, Blue Diamond, Box 102C Chubbic Rd RD1, Canonsburg PA 15317. 412-746-3455.

RCA, Altec, Dynaco tube amps, sell of trade. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

#### Want To Buy

Mick-Lock 2-3 line amp. M Gimenez, WPAB, POB 7243, Ponce PR 00731.

McIntosh/Marantz, Fairchild 670/602. K Gutzke, 612-866-6183.

### ANTENNAS & TOWERS

#### Want To Sell

Andrew LDF5; LDF4; FHJ5 1/2"; LDF4-50A 80'/60'/25'/25'; 7/8"; FHJ5-50A 247/45/1.50'+s/h. K Kuespert, TPC Tech, 1794 Russell Rd, Baroda MI 49101. 219-291-6996.

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Utility 340 in 9 sections, 1 tapered base section, 1 1/2-section tube leg, painted, 210' w/o base insulator/hardware, \$3500/BO+s/h.C Glasgow, KR0P, 120 S Plaza, Brawley CA 92227.

ERI cir polar 4-bay on 94.7 MHz. B Dodge, WWNH, Rte 155, Dover NH 03820. 603-742-8575.

Andrew 3 1/8" rigid, 380', 13 yrs old, \$200/20'+s/h. T Nelson, WCAL, St Olaf College, Northfield MN 55057. 507-646-3328.

160' tower, self-supp, non-guyed, galv & painted. M Latham, KAGY, POB 1307, Buras LA 70041.

Potomac Instr AM-19 4-tower ant mon & PMA-19 prec adap, like new, \$6500 both. D Dybas, WPNT, 875 N Michigan, Chicago IL 60611. 708-869-0001.

Shively 6813 2-bay, new w/radomes tuned to 96.1, BO. D Magnum, WBOG, 1021 N Superior Ave, Tomah WI 54660. 800-736-WBOG.

Belden 8281 (3) 200' pieces, yellow; (1) 150' red; (1) 250' equiv, BO; various lengths, indiv shielded, BO. L Houck, Rollin Rcdg, 210 Altgelt, San Antonio TX 78201.

Hughey-Phillips 36" flasher beacon, exc cond, BO. H McDonald, KKVJ, POB 807, Veradale WA 99037. 509-535-7535.

Dielectric Mdl 50000 motorized coax switch, \$3500/BO; Prodelin patch panel, \$500, both 3 1/8". T Toenjes, KQLA, Box 104, Manhattan KS 66502. 913-437-6549.

Dielectric/Delta 4-port, 3 1/8" coax switch, gd cond, 3 1/8-5 1/8 EIA adap. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Shively 6813 2-bay, new w/radomes on 96.1, BO. D Magnum, Pres, WBOG, 1021 N Superior Ave, Tomah WI 54660. 800-736-WBOG.

Utility tower, 500ft, 36 inch face, new in 1982. Also 2-bay antenna tuned to 101.7. C Clinton, KSOX, 345 S 7th Raymondville TX 78580. 210-689-3333.

ERI 37CP8 8-bay, hi pwr, end-fed, in storage, on 107.3, \$6000. K Reising, WRZQ, 825 Washington St, Columbus IN 47201. 812-379-1077.

ERI FMH-10AC high-pwr FM on 98.5, nds repair, burned, \$2500/BO. E Joe Eck, KSAJ, Box 61, Abilene KS 67410. 913-263-7111.

### Want To Buy

4-8 bay FM on 91.9 MHz. M Latham, KAGY, POB 1307, Buras LA 70041.

2-bay, circ polar on 91.1 MHz. B Dodge, WWNH, Rte 155, Dover NH 03820. 603-742-8575.

5-7 bay circ polar on/tunable to 103.9 MHz to handle 20 kW; 3" coax w/conns, 80' used/new. C Hall, KLOA, POB 165, Nephi UT 84648. 801-623-4010.

4-bay circ polar, on/near 90.1 FM. 414-494-9010.

Used FM, 6-bay, circ polar, 90.5 MHz pref. J Winchester, KCHU, POB 467, Valdez AK 99686. 907-845-4665.

### AUDIO PRODUCTION

#### Want To Sell

Eventide H910Hharmonizer, gd cond, \$325. J Addie, 708-579-3749.

TEAC EQA-3034 10-band graphic EQ, real time freq spectrum analyzer w/LED display, new, less than 10 hrs, \$175. H Guetzlaff, Trinity Foundation, 5634 Columbia Ave, Dallas TX 75214.

Altec 1/3 octave graphic EQ, \$55. G Wachter, 602-258-6161.

Gentner Versapatch (2) prewired patch bay, perf cond, \$360 ea+s/h. B Lord, Lord Bdctg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Soundcraftsman EQ PE2217 gd cond; (2) JVC 5-band EQs, fair cond, BO. B Spitzer, KKLS, Box 460, Rapid City SD 57701. 605-343-6161.

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Symetrix SE-400 para EQ, new, \$400/BO; (2) phase shifters, new, \$250 ea/BO; (2) SG-200 stereo noise gates, new, \$300 ea/BO. J Diamond, Blue Diamond, Box 102C Chubbic Rd RD1, Canonsburg PA 15317. 412-746-3455.

UREI 1178, dual, \$400 ea; Dictaphone logger w/2 mo tape sply, \$1000 ea+s/h. N Doshi, WQCD, 220 E 42nd St Ste 2812, NY NY 10017. 212-210-2775.

ReVox PR99 auto-ready, repro mach, gd cond, BO. E Gross, KEYZ, 410 E 6th St, Williston MO 58801.

Shure M-260 mixer, 4 mic/1 aux, \$150; M-267 rem amp, \$275; M-67 rem amp, \$250; Ramko Sidekick ENG mixer, 4 mic/2 line, \$225; Orban 622B para EQ, \$500; Auratone Sound Cube NF mons, \$60 pair. J Somich, Somich Engrg, 1208 Stoney Run Trl, Broadview Heights OH 44147. 800-334-3925.

Roland SPH323 phaser, \$75; Rockmann sustainer & stereo chorus/delay, \$350/both. W Gunn, 619-320-0728.

Prophet 600 synthesizer, \$450; Spectro Acoustics rack mount 200 W amp, \$150; Crown VFX2 electronic crossover, \$125. W Gunn, 619-320-0728.

TT (Bantam) ADC patchbays, 144 pts, 1 rack sp, \$129; Tannoy HPB385A 15" coaxial monitor pair in cabinet, \$1750; Altec 436A tube compressors, Daven attn, both \$700. W Gunn. 619-320-0728.

SKL HI/LO variable filter (pair), \$200. W Gunn, 619-320-0728.

MCI JH110A 2-trk in stand w/sound & vision remote/locator, \$1200; Orban 674A parabolic stereo EQ, \$600; Fostex 3070 comp/limiter, \$150; Fostex 3180 reverb, \$50. W Gunn, 619-320-0728.

AKG 414 P48 like new, \$675; Dynaco 410, 400 W amp, \$400; dbx 1BX expander, \$135. W Gunn, 619-320-0728.

### Want To Buy

Used, (2) cart machs, (1) R-R, (2) turntables, (1) tape deck, (1) bulk erase, (1) CD plyr, (1) mic & (1) DAT mach. Jim, 703-379-5073.

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Shure Audio Master para EQ/amp. B Ladd, WNAR, 108 1/2 E Main, Bellevue OH 44811. 419-483-2511.

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

Ampex MX10 or MS 35 mixers. W Gunn, 619-320-0728.

### AUTOMATION EQUIP

#### Want To Sell

Cetec 902 (5) ReVox I/O cards w/cables, BO. B Spitzer, KKLS, Box 460, Rapid City SD 57701. 605-343-6161.

SMC MSP-1 w/(5) Ampex 440s, (4) SMC 250s, Xtel printer, (5) racks, manuals, \$5000. Jim, KNGT, POB 609, Jackson CA 95642. 209-223-0241.

## STUDIO EQUIPMENT IMMEDIATE DELIVERY

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**CAMERAS (VIDEO)**

**Want To Buy**

LPTV studio cameras (2). J Kesler, 606-843-2209.

**CART MACHINES**

**Want To Sell**

Spotmaster 505 mono/play, good heads, new paint & pinch roller, \$250; Tapecaster 700-RP mono, R/P, new condition with secondary cue tone, generator & detector, \$750. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401.

BE Spotmaster 5302A triple-deck mono, PB, \$750. M Gollub, WMJS, POB 547, Prince Frederick MD 20678.

Great Prices on original equipment tape heads for ITC, BE, Fidelipac, Otari, Tascam & others!



(804) 974-6466 • FAX 6450

Spotmaster 500C compact desk top, solid state, R/P w/manual, refurb, gd cond, \$300+s/h. G Gibbs, KMNS, 901 Steuben St, Sioux City IA 51102. 712-258-0628.

ITC PDII R/P, 5 yrs old, excellent condition, \$250+s/h; (4) ITC PDII, play, \$200+s/h, each mono with 30 free carts. H Hayes, Hot Productions, 1748 70th St, Brooklyn NY 11204. 718-234-9374.

Disc Trak digital, triple deck with rec & keyboard, 3 1/2" discs, \$2999. J Salov, SHGR, 1 Energy Pl, Mt Pleasant MI 48858. 517-740-1165.

ITC PDII mono R/P, few hrs, exc cond, \$400. N Alexander, N Alexander Prods, 514 Goodwin Dr, Richardson TX 75081. 214-242-7777.

ITC 99B repro, \$1295/BO. J Addie, 708-579-3749.

BE 2100 R/P, exc cond, \$450; ITC PDII R/P, mini, \$450. B Spitzer, KCLS, Box 460, Rapid City SD 57701. 605-343-6161.

Audicord dual stereo, R/P, gd cond, \$500. G Smith, 915-672-5149.

Fidelipac Dynamax CTR112 (5) stereo, perfect condition, \$1300 ea+s/h. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

ITC 3D Delta 3-deck PB, mono, gd cond, \$1400/BO; (2) IGM Instacart 24-deck, \$1500 ea/BO. T Toenjes, KQLA, Box 104, Manhattan KS 66502. 913-437-6549.

Tapecaster RP-700 RP, factory refurbished, \$150; Tapecaster X-700 RP, \$150. R Chambers, Sierra Broadcasting Corp, 3015 Old Johnstonville Rd, Susanville CA 96130. 916-257-2121.

**CART MACHINES:**

For Sale: \$395 & UP

Repairs: \$100 per deck + parts  
Recondition: \$150 per deck + parts. Call Mark @ 619-598-3311

ITC 3D with WRA mono 3D single tone with stereo 3-tone WRA rec unit, exc condition, motor overhauled, quiet bearings, \$1200; Audicord S-26 stereo/RP 3 tones, good condition, \$650/BO. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Spotmaster 400A rec/PB, working, \$150/BO+s/h. T Crockett, Hot Tracks, POB 10501, Blacksburg VA 24062.

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

ITC 99B stereo 3 tone, \$795; ITC Premium 3D, \$1895; ITC Premium R/P, \$1595, all are rebuilt & include manuals, connectors & a 90 day warranty. Phil Davis, Hall Electronics, 804-974-6466.

Tapecaster R/P, \$325 ea; play only, \$200. M Powell, WWPL, 2802 Lomax Ct, Waldorf MD 20602. 301-843-8821.

**Want To Buy**

Spotmaster 5-Spot w/release button, schematic & align instr, spare parts, photocopies OK. V Bea, VJB Prods, RR 2 Box 73, W Friendship MD 21794. 202-736-9563.

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

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**Want To Sell**

Ampex ATR-700 7 1/2 & 3 3/4 ips, gd cond, \$600. G Smith, 915-672-5149.

Otari ARS-1000 (4) w/25 Hz tone detectors, good condition, \$500 ea/BO; (5) SMC 250 RS Carousel, fair cond, \$200 ea/BO. M Hendge, KLWT, Rt 2 Box 29, Lebanon MO 65536. 417-532-2962.

MCI Sony 110C 8-trk, 1" w/Auto Locator III, \$1500. R Leonardi, Voices, 16 E 48th St, NY NY 10017. 212-935-9820.

Otari ARS-1000 7 1/2 or 3 3/4 PB with 25 Hz detector, good condition, \$600. L Salge, KCMR, POB 979, Mason City IA 50402. 515-424-9300.

Ampex 350/440 parts, most new; MM 1100 16-trk 15/30 ips, little use, \$6000, both superb cond. M Gore, 415-469-0136.

**HEAD RELAPPING/REPLACEMENT**  
All tape and film formats  
30 years experience



350 N. Eric Drive  
Palatine, IL 60067  
708-358-4622

ReVox A-77, (2), \$100 ea. G Gibbs, KMNS, 901 Steuben St, Sioux City IA 51102. 712-258-0628.

ReVox A77 w/new hd, rblt 1/4" 2-trk, \$500. D Dent, Winds of Music, 3230 Pt White Dr, Bainbridge Is WA 98110.

Otari MX5050-85D 1/2" 8-trk in console w/rem control, low hrs, exc cond; Tascam M50 12x6x2, like new w/manual & cable harness, \$4800 both. G Jones, SW Mediacast, 110 Sierra Rd, Kerrville TX 78028. 210-367-4587.

Ampex ATR-700 2-chnl, gd cond, \$700. B Kidd, VPI, 510 W 2nd, Rayville LA 71269.

Ampex ATR700 with low hours, good cond, \$700; TEAC A3340s, \$800; Pioneer RT1020L, little use, \$300; TEAC A3300SX, new, \$450; TEAC X1000R, reconditioned, \$400. J Parsons, Parsons Sound, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

Ampex 440, 2-trk, PB, rblt 3 years ago with roll around cab, \$975; Otari MX-5050 BII 2-track, R/PB/mastering, 2 years old with documentation, \$1950/BO, both 1 owner. B Danton, Ewing Enter, 2927 W 141st St, Gardena CA 90249. 310-532-9216.

Ampex 30960-02 rack mount, tube R/P for parts, large VU meters, input transformers, tubes, BO; Wollensak 1500-SS 1/2-track, mono, port, built-in 10 W amp, preamp output, good condition, \$45. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401.

Scully 280 parts. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

Orban studio chassis & STL cards. M Powell, WWPL, 2802 Lomax Ct, Waldorf MD 20602. 301-843-8821.

Otari ARS 1000 (3), exc cond w/25 Hz lone sensor & cue tone relays, \$375 ea. R Chambers, Sierra Bdcg Corp, 3015 Old Johnstonville Rd, Susanville CA 96130. 916-257-2121.

MCI JH-16 24-track with Autolocator II, \$7500; JH-100 Series 1" 8-track with Autolocator III, \$3900 ea; Scully 280B 1/2" 4-trk in Ruslang cab, \$550; Scully 280B 1/2" 4-trk, \$350. C Baker, Sound Recorders, 9136 Mormon Bridge Rd, Omaha NE 68152.

Tascam 22-2 2-trk, 2-chnl rec/repro, new, less than 5 hrs, \$500; Fostex 260 multi-trk combo 6, 4-trk, 4-chnl, new, 3 hrs use, \$1100. H Guetzlaff, Trinity Foundation, 5634 Columbia Ave, Dallas TX 75214.

Tascam, \$1000. H Hoyer, KIRC, 120 E Main, Shawnee OK 74801. 405-878-1803.

Radio Syst DTC-1000 DAT rec, \$1100+s/h. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Scully 280 parts. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

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**JM TECHNICAL ARTS**  
30 Music Sq. W. #5  
Nashville, TN 37203 (615) 244-6892

Ampex ATR 700, very gd cond, \$500/BO. L Houck, Rollin Rcdg, 210 Altgelt, San Antonio TX 78201.

Ampex 601 suitcase w/elects w/o deck, gd cond, \$50/BO. J Schrack, 315-539-4240.

ReVox A77 w/rblt hds, rack mounts, 2 rem control units, fair cond. B Spitzer, KCLS, Box 460, Rapid City SD 57701. 605-343-6161.

Revox PR99 2-trk w/roll around console & mon, exc cond, \$800. G Frey, Graphic Sound Studio, 354 Rileyville Rd, Ringoes NJ 08551. 609-466-8827.

Ampex Q-Mat R/PB units, orig floppy disk, BO. L Houck, Rollin Rcdg, 210 Altgelt, San Antonio TX 78201.

MCI 110B spares, boards, etc. M Shea, Precision, POB 727, NY NY 10276.

Tascam MS-16 1", 16-trk w/dbx, rem locator & svc manual, \$5000/BO. B Westfield, Westfield Audio, 2905 Boswell Ave, Alexandria VA 22306. 703-768-8443.

Ampex 350 with Scully PB, 7 1/2, 15 & 30 ips with tentrol, mounted in wood grain console, good condition, \$400. D Humphreys, Masterwork, 1020 N Delaware Ave, Philadelphia PA 19125. 215-423-1022.

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**SEQUOIA ELECTRONICS**  
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Campbell, CA 95008  
(408) 866-8434

Magnecord 1024 1/4" stereo record PB, excellent condition, collectors item, \$75. P Russell, Bowdoin College, Sils Hall, Brunswick ME 04011. 207-725-3066.

Roberts 192FT full-trk, tube, gd cond, hums w/Sams Photofak, \$50. S Hoffman, CU Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

Tascam 22-2 2-trk, 2-channel rec/repro, new, less than 5 hours, \$500; Fostex 260 multi-track combo, 6 in 4 out, indep stereo buss, 4-track, 4-channel, new, 3 hours use, \$1100. H Guetzlaff, Trinity Foundation, 5634 Columbia Ave, Dallas TX 75214.

Otari ARS 1000DC (2), \$450 ea. J Kesler, 606-843-2209.

Norton hds (3) full-trk, erase/R/P for Ampex 350, \$150 all/BO; (3) Norton 2-trk stereo tape hds for Scully 280, \$225/BO; Technics hd set for RS-1500 series, 2-track stereo, erase/R/P, 1/4-trk play hd, unused, \$80; Otari CR-705 rem ctrl for Otari 50950/MTR-10, 5 buttons & LED rec light, 20' cable, \$100/BO; Otari hubs for 10" NAB reels, \$25 ea/BO. L Snyder, MBI, Box 182k, Floral Park NY 11001. 718-347-2940.

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450 W. Rand Road  
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**708-670-0025**

Uher 4200 rep mon, 1/2-trk, port, 3 hds, 4 spds, new, \$500. R Sumner, CAVU, 3322 Applegate Ct, Annandale VA 22003. 703-968-8894.

ReVox A77 (2), 1 OK, 1 doesn't record, fair mech cond, BO. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Ampex ATR-700 2 track 7.5-15 ips. Rebuilt w/warranty. Phil Davis, Hall Electronics, 804-974-6466.

Scully 270 14" PB, 1 stereo plus 1 mono for parts, \$200/both; Ferrograph Super 7, 10", 3-7-15 ips, 2 trk, \$300. W Gunn, 619-320-0728.

Magnecord 728; Kenwood KW5066; Sony TC355; Sony 464 CS, all work. G Fitzgerald, G Fitzgerald Music Prods, 37-75 63rd St Ste B29, Woodside NY 11377.

Scully 280B (4) PB decks, BO. D Brown, 602-645-8181.

Tascam 32, 2-track with rack ears, new in perfect condition, \$980. R Payne 313-786-1767.

Ampex ATR800 mono, like new, \$1200 & AG440-8 1" 8-track; Otari 7800 1" 8-track, \$2900. W Gunn, 619-320-0728.

Otari Mark II-IV 1/2" 4-track, multi-track, mint, less than 50 hours, BO. R Kaufman, Pams Productions, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

Tascam 40-4 with dbx & flight case, \$950; Tascam 48 8 trk, excellent for sync, \$2950. W Gunn, 619-320-0728.

Tascam 32 2-trk & 38 8-track, like new, \$2000/both; Teac 3340 4-track, 1/4" deck, \$375; Tascam 80-8 8-track never really used/perfect, \$1600. W Gunn, 619-320-0728.

**Want To Buy**

Tascam 8-trk, 1/2". F McNulty, WLS, 190 N State St, Chicago IL 60035. 312-750-7446.

Otari MK III 8-hd bridge w/o hds. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

High spd cass tape duplicator for 3 copies from master. D Vine, WTTM, 762 Mayflower Ave, Lawrenceville NJ 08648. 609-989-4747.

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

Otari MX 5050 and Revox B77. Will buy or trade for new equipment. Phil Davis or Jon Hall, Hall Electronics, 804-974-6466.

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

**CD's/PLAYERS**

**Want To Sell**

Denon DN-950FA, \$725+s/h. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

**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**

Over 5 yrs exper, young AT, seeks FT gig at AC/CHR/oldies in East, call for R/R/Philos. Rich, 716-285-0327.

Medium-sml mkt GM to sell & program. John, 502-247-0090.

DJ w/4 yrs exper, college grad w/BS in prod, concert promoter & sales exper. 908-671-6491.

On air/promotion/prod/PR, 5 yrs exper, modern/CHR/AOR/AC/oldies formats prefer, highly motivated & knowledgeable, will relocate. Brandon, 618-344-1721.

Sales & Mktg experts! sensational exper & plan to add \$30K/month min to station w/decent signal & population coverage. 813-849-3477.

Exper air personality sks FT in mid-west/southeast oldies/classic rock/AOR/C&W/AC. Jack, 414-242-4357.

Bdcter desires to make contact w/owner of big signal station for pay radio concept. 813-849-3477.

Prog/engr pos in radio/prod co, 10 yrs exper in San Fran & LA, will relocate. Bruce, 415-388-8368.

Seeking job w/talk radio, news/sports talent, promo exper, play-by-play exper. 804-474-2934.

Exper air personality seeks FT airshift, prog/sports, southeast/midwest, pref oldies/classic rock/AOR/C&W/AC formats, great voice & prod. Jack, 414-242-4357.

Skilled engr seeks FT/PT/contract maint w/AM/FM, built 1st FM to bdc from World Trade Ctr, odd hrs OK, own tools & test equip, reasonable rates, gd voice, will travel 100 miles. 718-347-2940.

CE w/big prod voice & over 15 yrs hands-on engr exper seeks CE pos w/prod/air shift in top 100 mkt. G Morgan, 704-563-8676.

GM for Fla med/large mkt, 29 yrs sales/prog/engr exper, turnaround/start ups, avail immed. 813-849-3477.

Engineer, experienced in all aspects of radio engineering: studio/transmitter maintenance, audio & AM DA proofs, new construction, rehabilitating, satellites, remotes, seeks CE or corporate position. Send responses to: Radio World, POB 1214, Falls Church VA 22041. Attn: 04-28-01RW.

**HELP WANTED**

Salesman, for very small mkt radio in southwest Arizona, retired or semi retired for Winter Visitor season. Would need to work out of a Motor Home. KBUX, POB 1, Quartzsite AZ 85346.

Christian A/C-CHR station seeks computer literate station manager. Inc sales work and air. T&R, WPF, Box 444, Sturgeon Bay, WI 54235.


Exper engineer w/RF, directional background need. AM/FM combo in So. C al mkt. Send resume to Larry Morton, 1231 Mesa Oaks CA 93436.

Chief Engr for WBAB, Long Island's Rock N Roll leader. In depth understanding of xmitters, studio expertise & rem exper req. Rush introductory letter & detailed resume to Bob Buchmann, POB 1240, 555 Sunrise Highway, Long Island, New York 11704. EEO.

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Mr. Jim Reinke, General Manager  
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Please send resume & achievements to:  
Radio World, POB 1214  
Falls Church, VA 22041  
Attn: 04-28-02 RW

**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 \$55/column inch. Payment must accompany insert, use your MasterCard or VISA; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$10. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for details.

**POSITIONS WANTED:** Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 2 issues of Radio World. Contact information will be provided, but if a 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



## CDs/PLAYERS...WTS

Denon DN-950F (2), \$300 ea. N Doshi, WQCD, 220 E 42nd St Ste 2812, NY NY 10017. 212-210-2775.

Philips CD recorder, w/2 blank unrecorded CDs, \$5395. Phil Davis, Hall Electronics, 804-974-6466.

## Want To Buy

Player w/varispd. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

Nikko NCD 600 CD auto change player service manual, and information to connect units to PCs. R Meyers, Benchmark Comms, 4700 SW 75th Ave, Miami FL 33155. 305-264-5963 FAX 305-264-2357.

Sony CDP-3000 CD players in working condition vintage 1988 or later. Call Bill or John at CD Associates 714-733-8580 or FAX 714-786-1486.

## COMPUTERS

## Want To Sell

Goldstar 286 16 MHz AT w/2MB RAM, 5 1/4" HD, 20MB HD, modem, VGA card, \$450. C King, MST Comms, 1703 Avondale St, Amarillo TX 79116.

Tandy 2000 w/software, \$375; Kaypro port, \$200; Texas Instr 810 printer, \$450. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

Univac mainframe w/printers, drives, cables, \$1000/trade. B Kelley, WYQAK, 4237 Airline Rd, Muskegon MI 49444.

## CONSOLES

## Want To Sell

BE 8M250 in excel cond, \$3500/BO; Sparta A16R in excel cond, \$1000/BO. Call Mark at 619-598-3311.

Collins 212G-1 w/9 chnls, 18 inputs, mono, very gd cond, \$800/BP+sh. J Evans, WSHF, POB 3115, Valdosta GA 31604.

Presto 900A1 1940s, tube-type, port tape/disk rec/mix, spare tubes, collectors item, \$250. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401.

RCA BC-8A 8-chnl, solid state, self contained dual output w/30 inputs, plug in mods, gd cond, \$650+sh. G Gibbs, KMNS, 901 Steuben St, Sioux City IA 51102. 712-258-0628.

Tascam M-308 8-chnl stereo, 8 mic/line inputs, EQ mod on ea chnl w/documentation, \$950. B Danton, Ewing Enter, 2927 W 141st St, Gardena CA 90249. 310-532-9216.

BE 4S50 4-chnl stereo, gd cond, \$900. L Salge, KCMR, POB 979, Mason City IA 50402. 515-424-9300.

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800-876-3135 orders  
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Ramsa WR-T820 20-input, 8-group/16-output for 8-16-trk w/meter bridge, \$3100. R Haggard, Haggard Audio Prods, 4902 Hammersley Rd, Madison WI 53711. 608-274-4000.

Russco Studio Master 505, nds minor work, \$500. G Smith, 915-672-5149.

PR&E BMX-22 Series 22 mainframe, Digitimer, Digiclock, (17) line cases, (2) mic mods, Telco mod, exc cond, \$9900. S Horner, KMRO, 2310 Ponderosa, Camarillo CA 93010. 805-654-0577.

Ramko DC5AR, clean w/plug ins, \$250 ea; Grommes Precision M5, new, \$275; Altec 1592B, \$250 ea, all 5-chnl, mono. J Parsons, Parsons Sound, 2781 Fayson Cir, Deltona FL 32738. 904-532-0192.

Eddor 400 4-chnl auto, 1 rack, \$99; JBL mdl 7510 16-chnl auto, 5 1/4" rack, \$165. G Wachter, 602-258-6161.

EV/Tapco Catalina C-12 w/20 mic/line inputs, 3-band EQ, 3 sends, patch pts, 4 subs w/road case, very gd cond, \$1000. E Kizer, CTW, 407 Park Ave Ste 102, Scotch Plains NJ 07076. 201-450-5983.

Shure M-260 mic mixer, 4 mix/1 aux, \$200; Ramko SideKick port ENG, 4 mix/2 line, master, cue, batt oper, \$225; Orban 622B para EQ, \$600. J Somich, Somich Prods, 1208 Stoney Run Trl, Broadview Hghts OH 44147. 800-334-3925.

Gates Yard Board, painted white, \$300; Bogen CSM remote mixer, \$125. W Gunn. 619-320-0728.

Altec 1628A 8-chnl auto mic mixer, 2 sp rmt, very gd cond w/manual, \$275; JBL 5600-2, 3 sp rmt, gd cond w/manual, \$135. S Hoffman, CU Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

Tascam M-30, 8x4 w/subs & EQ & Mdl 34 4-trk, \$750 ea/BO. 619-229-8307.

Harris Stereo 5, gd cond, \$550. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Sparta Centurion 6-pot, pwr sply, mono, gd cond, \$600. M Vanhooser, KSKY, 4144 N Central Exp #266, Dallas TX 75204. 214-827-5759.

Sparta 8-chnl mono, Audion, mix & prog, gd work cond, \$500; 5-chnl stereo, Audion, aux & prog on all chnls, \$250. R Chambers, Sierra Bdcg Corp, 3015 Old Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Ramko DC8MS rebuilt, \$800. 806-385-3888.

## Want To Buy

Sparta/Cetec Centurion mods, whole/parts, working, pref rotary pots. M Vanhooser, KSKY, 4144 N Central Exp #266, Dallas TX 75204. 214-827-5759.

Autogram, Auditronics, McCurdy, LPB & related consoles. Will buy or trade for new equip. Phil Davis or Jon Hall, Hall electronics, 804-974-6466.

## DISCO &amp; SOUND EQUIPMENT

## Want To Sell

Ashley SC-63 para EQ, mint cond, \$125. M Mottsey, MAM Sound, RD 1 Box 116 John St, E Kingston NY 12401.

JBL 4412 3-way, 12", low end, new telephone, \$675. K Para, Para Studio, 8562 Longwell Cross Rd, Hammondsport NY 14840. 607-868-3482.

dbx 120x sub harmonic bass proc, mint cond, \$225. M Mottsey, MAM Sound, RD 1 Box 116 John St, E Kingston NY 12401.

dbx 180 2-chnl noise reduc, encode/decode, \$225. J Tamburello, Burello Sound, 16 W 86th St, NY NY 10024.

Yamaha DMP-7 dig mix proc, prog auto line mixing, dig FX, motor faders, 30-scene storage, MIDI, 10 sp rmt, very gd cond, \$975; Garrard MRM 101 phono preamp, gd cond, \$65. S Hoffman, CU Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

Soundworkshop 262 stereo reverb, new, \$400/BO; ART DR1 dig reverb; ART 01A dig reverb, new, \$500 ea/BO; Loft 450 delay line/flangers, new, \$400 ea/BO; (2) Nexus 96-pt patch bays, new, \$300 ea/BO. J Diamond, Blue Diamond, Box 102C Chubbick Rd RD1, Canonsburg PA 15317. 412-746-3455.

BGW Mdl 10, mono, 2-way, elect crossover w/freq select, 1 sp rmt, gd cond w/manual, \$75. S Hoffman, CU Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

Yamaha MDF-1 disk drive for QX5 sequencer, \$100; Yamaha QX5 MIDI sequencer, \$150. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Pultec SP-3 stereo panner, tube, very good cond with manual, \$250; Ampex ADD-1 stereo DDL, \$500; road case for Sony 3/4" U-Matic, excellent cond, \$250; TEAC AN-80 Dolby B noise reduc unit, good cond, \$100. D Humphreys, Masterwork, 1020 N Delaware Ave, Philadelphia PA 19125. 215-423-1022.

Korg DW8000 with heavy duty case, \$500; Arp Omni 2, \$350; Roland TR707 drum machine, \$250. G Fitzgerald, G Fitzgerald Music Prods, 37-75 63rd St Ste B29, Woodside NY 11377.

TEAC EQA-30BL 10-band graphic EQ w/real time freq spectrum analyzer & LED display, new, less than 10 hrs, \$175. H Guetzlaff, Trinity Foundation, 5634 Columbia Ave, Dallas TX 75214.

Rane MP24 mixer/preamp, nice cond, \$800/BO. Shannon, WRFA, 800 8th Ave SE, Largo FL 34641. 813-581-7800.

Dolby 301 A-type stereo, discrete, \$500. W Gunn. 619-320-0728.

## Want To Buy

Burwen/KLH DFN1201A & TNE7000A transient noise eliminators. F McNulty, WLS, 190 N State St, Chicago IL 60635. 312-750-7446.

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Orban Optimod 8000, exc cond, \$1500. C King, MST Comms, 1703 Avondale St, Amarillo TX 79116.

Radio Design Labs NRSC PR & FL stick-on pre-emphasis & bandstop filters, \$100 pair. P Beckman, Filbec Audio, 5535 RTLSNK Hammock, Naples FL 33962. 813-261-4800.

CBS 4450A & 4110, BO. B Spitzer, KKLS, Box 460, Rapid City SD 57701. 605-343-6161.

Gregg Labs Series 2530 (2) tri-band audio proc amp, \$400 ea. T Nelson, WCAL, St Olaf College, Northfield MN 55057. 507-646-3328.

UREI 1176LN mono, \$400; Mdl 1178 stereo, \$625, both peak, excellent condition. J Somich, Somich Productions, 1208 Stoney Run Trl, Broadview Hghts OH 44147. 800-334-3925.

CBS Labs Audimax III Mdl 444, \$150. G Gibbs, KMNS, 901 Steuben St, Sioux City IA 51102. 712-258-0628.

Orban 8100AXT2 6-band comp chasis for Optimod FM. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Kahn Symetrapeak. G Gibbs, KMNS, 901 Steuben St, Sioux City IA 51102. 712-258-0628.

CRL AM-4 mono, excellent condition, \$1700/BO. M McNeil, Guardian Comms, 800 Compton Rd #33, Cincinnati OH 45231. 513-931-8080.

UREI 1178 stereo peak limiter, \$750; Orban 424A dual-channel, comp/lim, de-esser, \$650; Orban 622B stereo para EQ, \$600; (2) Orban 526A dynamci sibilance cont, \$175 ea; Ampex ATR-800 with remote, \$2000; A&V patch bays, mint condition. S Fox, Country Club Studios, Roslyn Hghts NY 11577. 516-626-0154.

Mod Sci CP803 composite clipper, Mod Sci CP803, new w/manual, \$675. J Addie, 708-579-3749.

Hnat Hindes Amaze proc & CO 2013 Comproc, excellent condition, BO; CBS Volumax 400 AM, new caps, recent proof, excellent condition, \$150. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Mod Sci CP803 proc, BO; Gentner Audio Prisms, both chnls, BO. J Vavriek, KSYZ, 3532 W Capital, Grand Island NE 68801.

CRL PMC 450. G Patschke, KIJK, POB 458, Farwell TX 79325. 806-481-3318.

UREI LA3A, noisy, 2 sp rack mount with manual, excellent condition, trade for Shure SM99/EV CP218 goose-neck podium. S Hoffman, CU Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

Somich Engineering composite clipper CP-803 & Orban 526 sibilance controller. Phil Davis, Hall Electronics, 804-974-6466.

## Want To Buy

Orban 8000A/8100A for educ FM. B Dodge, WWNH, Rte 155, Dover NH 03820. 603-742-8575.

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Orban XT2 6-band for 8100/A, gd shape. B Garcia, KBUR, 1411 Roosevelt Ave, Burlington IA 52601. 319-752-2701.

Orban 8100A & 8000A optimods! Will buy or trade for new equipment. Phil Davis or Jon Hall, Hall Electronics, 804-974-6466.

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## MICROPHONES

### Want To Sell

**Shure Level-loc** controller, unused, \$75. B Spitzer, KKLS, Box 460, Rapid City SD 57701. 605-343-6161.

**EV RE-20**, exc cond, \$275; (3) Sennheiser MD-421U, \$310 & \$200; (2) Neumann KMM84 condenser, exc cond, \$250 ea/\$400 both; (3) Shure SM-58, avg cond, \$70 ea/\$160 all. J Somich, Somich Prods, 1208 Stoney Run Trl, Broadview Hghts OH 44147. 800-334-3925.

**Sennheiser HD-421-u**, exc cond, \$275. C King, MST Comms, 1703 Avondale St, Amarillo TX 79116.

**Sony C-351** condenser, \$150; AKG C/414/48, \$500; beyer M107 dynamic, \$75. R Leonardi, Voices, 16 E 48th St, NY NY 10017. 212-935-9820.

**EV M/DYM 308** (2), mint cond, \$100 ea. M Mottsey, MAM Sound, RD 1 Box 116 John St, E Kingston NY 12401.

**Beyer M58** dynamic stick, \$125; EV RE-20, \$250; Sennheiser MD-421U, \$200; Sennheiser MD-421U, \$275; EV 635A, \$85; AKG D-1000E, \$40; AKG D12E, \$50; AKG D12, \$40. J Somich, Somich Engrg, 1208 Stoney Run Trl, Broadview Heights OH 44147. 800-334-3925.

**Shure SM-7** w/metal case, \$295; EV RE-27ND, new, \$400. J James, Marin Voice, Box 1802, Sausalito CA 94966. 415-331-5346.

**Sennheiser 441** (matte), new w/all papers & response curves, \$450. R Payne 313-786-1767.

**RCA 77DX** and 44 ribbon mics, will pay shipping. P Davis, 804-980-2940.

**EV 676** supercardioid mics 3/\$200; EV RE10 mic, \$125. W Gunn, 619-320-0728.

**Telefunken tube mic pre amps** V-76, U-73 limiter's; RCA BA-21As, BA-1As; Altec tube mic-pres. Tracy Eaves, 615-821-6099 (eves. before 10PM EST).

**Telefunken M-250**, U-67, 221-A; Neumann U-67, KM-56, UM-57; RCA KV3A-10,0001, 44-BX, 77-DX, BK-4, BK-5, 74-B, varicustics; Altec M-20, M-11, M-30 tube type mics. Trade or sale. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

**Telefunken M921** dual (2-way, not front/back) nickel capsules, cardioid only, classic tube mic; Neumann KM84 pair, mint, \$1100. W Gunn. 619-320-0728.

### Want To Buy

**RCA 77DX** dead/alive, complete. D Repino, Repcomco, 1 Glen Cir, Hummelstown PA 17036.

**RCA 44BX** to rebuild. E Coker, KTRH, POB 1520, Houston TX 77251. 713-630-3530.

**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.

**Shure M-267** & M-67 mic mixers. Phil Davis or Jon Hall, Hall Electronics, 804-974-6466.

**77-DX's, 44-BX's, KU-3A's** On-Air lights. Top price paid. Fast response. Bill Bryant Mgmt, 2601 Hillsboro Rd, G12, Nashville TN 37212. 615-269-6131.

## MISCELLANEOUS

### Want To Sell

**Symetrix T1-101** telephone hybrid, \$279; TFT 7601 remove control. Phil Davis, Hall Electronics, 804-974-6466.

**Audiolab TD-3** in excel cond, \$325/BO. Call Mark at 619-598-3311.

**Star case**, black, used once, 45x21x21. R Hagger, Hagger Audio Prods, 4902 Hammersley Rd, Madison WI 53711. 608-274-4000.

**Henry Telecart II**, \$95; (2) Lil Miss Moffat, 48 V phantom pwr sply, \$25 ea+s/h; 6' equip mounting rails, \$25 ea+s/h; (2) Electrocom JBL ceiling spkrs, housing & vol controls, \$39 ea+s/h; Realistic TM 150 AM/FM tuner, \$25 ea+s/h. B Lord, Lord Bdctg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

**Lyrec** tape timer, 15 ips; MAP 2-unit rack shelf, \$25; 3M 1/2" paper loader tape, \$5/roll; Yamaha MDF-1 disk drive & QX-5 MIDI sequencer, \$150 ea/\$250 both. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016.

**Superior Elec Stabiline** pwr cond, \$140+s/h. B Lord, Lord Bdctg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

**Alertlite 3V** on-air warning light, new, \$50. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401.

**Valentino prod library** w/220 10" recs, 78 rpm discs, excel cond, including catalogue, \$300/BO+s/h. M Kuehl, Passage Prod, 1418 N Stevens, Rhinelander WI 54501. 715-369-4007.

**Key phone system**, 1A2 type, 5-6 phones, 1 wall set, 6-button, intercom, 4-line KSU, TT, \$300. L Houck, Rollin Rcdg, 210 Altgelt, San Antonio TX 78201.

**Radio sales training tapes**, (16) VHS, covering 30 topics, \$2000. R Trumbo, New Life Bdctg, POB 117, Quincy CA 95971.

**1972 motor home** mobile studio w/announcers booth large window, A/C, carpet, bench seats, table, insulated, 20' length, \$5000. H Hoyler, Real Country, 120 E Main, Shawnee OK 74801. 405-878-1803.

**WE 189D** xformers, \$35 pair; UTC LS-141 hybrid xformer, new, \$50; Cinema Engrg 64266 xformers, \$30 pair; 6" Anvil case w/whls, \$1000; Moog 902 VCA mod w/PS, BO. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

**Studio equip**, \$14K. M Lobaito, Teletek, 156 Burbank Ave, Staten Island NY 10306. 718-987-2318.

**Teletype**, various, one each mdl 28RO, mdl 28KSR, mdl 19KSR, mdl 32ASR, manuals included, BO. R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963 FAX 305-264-2357.

**ADC Jackbay** unwired, 52 1/4" TRS jacks w/normals, \$125; ADC Ultra-patch 4-26290-0010 jackfield punch-down block, \$50 ea/\$125 for 3; Sescom mic splitter, 1 in 2 out x 4, \$75 ea/\$200 for 3; Gentner Microtel, \$100; ESE MS-570 dig timer, \$40. J Somich, Somich Engrg, 1208 Stoney Run Trl, Broadview Heights OH 44147. 800-334-3925.

**RCA BA 146** limiter amp manual. J Graham, Graham Bdct Svcs, POB 242, Sandy Springs SC 29677. 803-242-1005.

**MAD** black rack shelf, \$20; 3M 1/2" paper leader, \$5/roll. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

### Want To Buy

**Instruc book** for Gates tube-type Yard console & GTM88S stereo mod mon; Gospel programming for NC educ FM, tape & satellite. F Hollon, WAHI, Rt 1 Box 72, Plymouth IL 62367. 217-392-2340.

**UTC LS-10X, 12X, LS-15, LS 15X, LS-18, A-10, A-11, A-12, A-24, A-25 & A-26** xformers; W Electroacoustic Labs PS 120A; Hycor 4201 passive EQ; Gates Sta-Lvl M5167 & M3529B lim-iters manuals; CBS Decibel meter mdl 600 manual. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

**RCA/Collins/Gates literature**, 40s/50s. T Knapp, 1937 Valley Dr, Las Vegas NV 89108.

**RCA M1-11718-1** lighted studio sign w/on-air glass. M Neff, WARM, Wilkes-Barre Scranton Hwy, Avoca PA 18641. 717-655-2271.

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

**Radio transformers** by Chicago, UTC, Triad, Peerless, Freed, Sola, send list. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

## MONITORS

### Want To Sell

**Harris M6659** AM mod mon w/manual, gd cond, \$100. P Beckman, Filbec Audio, 5535 RTLKSNK Hammock, Naples FL 33962. 813-261-4600.

**Belar SCA**, \$1500. H Hoyler, KIRC, 120 E Main, Shawnee OK 74801. 405-878-1803.

**McMartin TBM 3700/2200A** FM stereo, \$1200/BO; TBM-2000B SCA, \$600; TBM 8500B AM, \$600. T Toenjes, KQLA, Box 104, Manhattan KS 66502. 913-437-6549.

**McMartin EBS/2 & TG2**, gd cond, \$600 both. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

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**McMartin (buy & sell)** any model. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886 or fax 402-493-6621.

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Micro Dynamic TC-8 8-channel dig. mint condition, \$1300. A Beaulieu, WBWC, POB 156, Ripon WI 54971.

Moseley PCL-303 STL TX, fact recond, gd cond on 948.5 MHz, BO. G Gibbs, KMNS, 901 Steuben St, Sioux City IA 51102. 712-258-0628.

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Intraplex TDM-153 T-1 syst w/2-15 kHz, 3-7.5 kHz, 3 voice mods per side & CSUs, 9 mos use, BO. R Russ, KBLA, 1700 N Alvarado St, Los Angeles CA 90026.

Moseley 505, 950 MHz, \$2500; TRC-15, BO. H Hoyler, KIRC, 120 E Main, Shawnee OK 74801. 405-878-1803.

Comrex RRB (2) dual-chnl xmtrs & dual-chnl rcvr, BO. M Aldridge, Remote Sound, POB 616, Ooltewah TN 37363.

Orban Studio Chassis for Optimod 8100A/1, use before discreet L&R phone lines/STL, used less than 3 mos, orig box, exc cond, \$450. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Gentner EFT 3000 pair, 3-line freq ext, very gd cond, \$5000/BO. Randy, WHFS, 8201 Corp Dr #550, Landover MD 20785.

Marti RPT-15 RPU 15 W UHF, dual freq. P Baillon, KMCM, 1218 Pioneer Bldg, St Paul MN 55101. 612-222-5555.

Burk TC-8 for Telco 2 wire link w/relay panel. J Webber, 518-382-5400.

Rust RC 1000 syst w/manuals, clean mech cond, BO; Moseley TRC 15-AR 15-chnl w/Hallikainen dig add-on, gd cond, \$950/BO; Marti STL-10 on 946.875/947.125 w/ xmtr/rcvr combiners, less than 3 yrs old, exc cond, \$5200; Gentner VRC 2000 & interface panels. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Marti RMC-15 w/manual, \$390. R Chambers, Sierra Bdcg Corp, 3015 Old Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Gentner SPH-3A telephone interface syst, \$325. R Sumner, CAVU, 3322 Applegate Ct, Annandale VA 22003. 703-968-6894.

Symetrix 108 8-line/3-hybrid phone syst w/2 consoles, nice cond, \$800/BO. Shannon, WRFA, 800 8th Ave SE, Largo FL 34641. 813-581-7800.

TFT 7601 C/R, gd cond, \$1225; SCA gener, 110 kHz, \$450. B Bales, KNDR, Box 516, Mandan ND 58554. 701-663-2345.

Comrex SLX 4-channel console & encoder, \$2495. Phil Davis, Hall Electronics, 804-974-6466.

Two HP-21A120F-2 radiation prod. 2110 to 2200 mHz dishes for sale. 800-356-2342.

## Want To Buy

Moseley Composite STL xmtr & rcvr, 505C/later, in compliance & exc cond. C Phillips, WXVO, POB 987, Clinton TN 37717. 615-435-0987.

Marti RPT xmtr & rcvr, any freq, working. J Steele, WKBX, Box 2525, Kingsland GA 31548.

Moseley 505/C or 606/C rcvr & xmtr. L McGowan, KCBQ, 9416 Mission Gorge Rd, Santee CA 92071.

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

Moseley SCG-8 185 kHz subcarrier gener & STL SCD-8 demod. H Scott, WCKH, 12146 Cedar Ridge Rd, Williamsport MD 21795. 301-582-0285.

Comrex TCB-1 telephone voice coupler. S Kirsch, Silver Cake Audio, 2590 Hillside Ct, Baldwin NY 11510. 516-623-6114.

Moseley & Marti STL 8 & 10 STL equipment! Will buy or trade for new equipment. Phil Davis or Jon Hall, Hall Electronics, 804-974-6466.

## SATELLITE EQUIPMENT

## Want To Sell

Sci Atl (3) decoders, (2) 15 kHz dual, (1) 7.5 dual, BO. B Giordano, 617-728-1957.

McMartin SDR-1 IF demod, exc cond, BO. G Reynolds, W2G0AB, 333 Fayetteville St Mall, Raleigh NC 27602.

Macom/Prodellin 161-6 10' fiberglass dish, 8-bolt sections, hand crank, \$350. B Dickerson, WEAG, 1421 S Water St, Starke FL 32091. 904-964-5001.

Sci Atl 7300/7325 DATS rcvr w/3, 7.5 & 15 kHz cards, \$3000. Shannon, WRFA, 800 8th Ave SE, Largo FL 34641. 813-581-7800.

Zenith ZS 6300 dual low noise block-down converter, \$150. B Beck, WPPL, Box 909, Canton NC 28716.

Microdyne 1100 sat rcvr/downconverter w/LNA & 20' Helix, exc cond, \$2600. M Vanhooser, KSKY, 4144 N Central Exp #266, Dallas TX 75204. 214-827-5759.

SCPC SATELLITE AUDIO RECEIVE EQUIPMENT: New & used, many brands, complete units, downconverters, commercial LNB's. All in excellent condition, good prices, perfect for low cost SCPC uses. SASE for list. Universal Electronics, 4545 Groves Rd #13, Columbus OH 43232. 1-800-241-8171.

## Want To Buy

Fairchild Dart 384/similar. M Rollings, Rollings Comm, 16005 Nantuket Pt. Ct., Grover MO 63040.

Harris 6550; Sci Atl 7550. A Morris, KSWM, 126 S Jefferson, Aurora MO 65805.

Standard Comm CST-810/CST875 SCPC/subcarrier rcvr. B Davis, WBTV, 1 Julian Price Pl, Charlotte NC 28208. 704-374-3639.

Scientific Atlanta, Wegener & Fairchild. Will buy or trade for new equipment. Phil Davis or Jon Hall, Hall Electronics, 804-974-6466.

## STATIONS

## Want To Sell

FM 90.5 educ, 700 W, \$75K. D Parsons, KLUH, POB 1313, Poplar Bluff MO 63901. 314-785-0006.

AM 5 kW in north UT univ town, owner moving, \$475K; AM/FM combo, \$525K. M Skinner, KSGI, Box 1450, St George UT 84771. 801-628-1000.

AM & FM in Wyoming, dark, FM can upgrade to full C, \$155K. R Moore, KRAL, 2617 Cutty Sark, Rawlin WY 82301. 307-324-6942.

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5 kW AM, univ town, north UT, \$475K. Morgan, 801-628-1000.

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Southeast FM, only FM operating in county of 70,000. Exc mkt acceptance. Good operation w/almost new equip. Owner retiring. Bargain! Respond to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box # 04-28-03RW.

Indiv seeks FM CP/dark in mkt of 25K/less. R Ritchey, River City Bdcg, 400 Bitters #602, San Antonio TX 78216. 210-490-7487.

New group seeks AM or FM or non-commercial FM, dark or on anywhere, will consider lease, send or call terms and price to: Radio World, POB 1214, Falls Church VA 22041. Attn Box #04-14-01RW.

Small market, prefer FM, consider AM, \$100,000 maximum, anywhere USA. Joel 508-535-6355.

## STEREO GENERATORS

## Want To Sell

Catel 2000 Series in excel cond, \$1500/BO. Call Mark at 619-598-3311.

Mod Sci CP-803 comp clipper w/rack-mount kit, \$250; Dorough 80-B, \$50. J Somich, Somich Engrg, 1208 Stony Run Trl, Broadview Heights OH 44147. 800-334-3925.

Inovonics 705 rk mt stereo w/removable FMX, gd cond, \$750/BO. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

## STUDIOS

## Want To Sell

Complete like new radio studio, all brand name equipment, still available new in the market, Arrakis FM just factory reconditioned board, R-R, 112 & 122 cassette, etc. Complete spanish discoteque, LP's, cassettes and CDs, all kind of spanish music, reasonable offer takes all. Rotando Rios, 201-539-5749 day or night.

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## Want To Sell

Oldies on Scotchcart II, 6 mos use, \$9000; Scotchcart II 3.5, 4.5, 5.5 & 7.5, new/used, \$2.25-\$3/s/h; Abco & Fidelipac racks, \$20 ea+s/h. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.



Fidelipac 300 (2) NAB type B, 16 min ea, BO. M Saady, 1st City Rec, 141-60 84th Rd 3E, Briarwood NY 11435.

ITC-AA new in boxes, (90) 4.5 min & (40) 5.5 min, \$900/BO. C Brennan, 508-775-6800.

Airchecks from 50s/60s/70s. B Eckart, OK Classic, POB 803, Mustang OK 73064.

Large quantity carts, various lengths, 2 1/2-5 1/2 mins, \$.75 ea. M Gollub, WMJS, POB 547, Prince Frederick MD 20678. 410-535-2201.

Library AC/oldies, many CDs, exc cond; Tascam w/3 bal outputs, \$275. M Powell, WWPL, 2802 Lomax Ct, Waldorf MD 20602. 301-843-8821.

Mastercarts (200), Gold, various lengths, \$1 ea; (300) Gray from 70s, \$.50 ea. J Callow, WAGN, 413 10th Ave, Menominee MI 49858. 906-863-1340.

Ampex 4-400, \$200. B Lacy, KARX, 3611 Soncy #6A, Amarillo TX 79121. 806-359-4000.

Fidelipac Mastercarts many, comm length, \$1 ea/BO; Audiopaks. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

Fidelipac Scotch various, \$.75 ea. M Powell, WWPL, 2802 Lomax Ct, Waldorf MD 20602. 301-843-8821.

Pams Jingles ref tapes, 1951-1976, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625.

## Want To Buy

Burned down library, needs any year & type, ASAP. S Stevenson, Stevenson Corp, POB 1288, Blaine WA 98231. 604-531-4576.

Amy Grant promo singles. W Hildenbrand, 412-776-2322.

Gold Discs, all kinds. K Kenze, KFEX, 13 E 11th, Washington MO 63090. 314-239-0209.

45/78 records. K Gutzke, 612-866-6183.

Radio/TV history, various mkts. B Eckart, OK Classic, POB 803, Mustang OK 73064.

Fidelipac Mastercart II Gold/Audiopak AA-4 2 1/2-4 min lengths, gd cond, many. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625.

## TAX DEDUCT EQUIP

## Want To Sell

Educ FM nds bdcst & test equip, will pay s/h. C Hicks, WEAX, W Park Ave, Angola IN 46703. 219-665-7310.

New student FM nds equip. S Smith, WLKR, Lake Superior State Univ, Sault Ste Marie MI 49783. 906-635-2107.

CREI course materials, text & lessons, used, useful for bdcst engrg students. G Garrison, Tr 6 Box 48, Warrenton VA 22186.

Christian, new, non-comm, any appreciated, will pay s/h. 414-494-9010.

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## Want To Sell

HP 334A dist analyzer w/low pass filter & alum case, \$800; Tek TM515 suit-case, port w/SC502 oscilloscope & probes, DC502 freq counter w/TXCO timebase, SG502 oscillator & storage module w/scope probes; Delta TCA-20-EX RF ammeter w/toroidal current xformer, \$450; Altec Decade Step attenuator, \$200, all very gd cond w/manuals. H Ginsberg, 404-964-3530.

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Natl Instr IEEE488/PC interface & software, new, \$95; Tek 5441 storage scope w/5A26 diff input & dual 5A17 time bases, gd cond, \$455; HP HP1741A 100 MHz dual-trace storage scope, VGC, \$495. G Wachter, 602-258-6161.

Westcom Hameg HM103-3 oscilloscope, \$275+s/h. B Lord, Lord Bdcg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

B & K 1403 3" oscilloscope/phase meter, \$75. J Somich, Somich Engrg, 1208 Stoney Run Trl, Broadview Heights OH 44147. 800-334-3925.

Tek 529 Mdl 188D waveform w/PAL frame selector, exc cond, \$525. R Sumner, CAVU, 3322 Applegate Ct, Annandale VA 22003. 703-968-8894.

Sanborn 323 dual-chnl variable chart spd recorder w/DC amp, 2-chnl & extra rolls paper & access, \$350. S Horner, KMRO, 2310 Ponderosa, Camarillo CA 93010. 805-654-0577.

Soar MS 60-40 oscilloscope, little use, gd cond; LDM 170 distortion meter; Dynascan sweep function gener; Heathkit IT-28 capacitor checker; Soar FC-864 multifunction counter, all BO. J Vavrirek, KSYZ, 3532 W Capital, Grand Island NE 68801.

Avcom PS-65A Spectrum Analyzer, General Radio 1450 TB 600 ohm Decade Attenuator, HP 650B 600 ohm Decade Attenuator. Steve Schuh, Intelligo Corp., 1-507-454-4839.

Continental 816 tube assembly for IPA driver. B Giordano, 617-728-1957.

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Ampliphase AM 50 kW parts, gd cond. C Sloan, 804-685-2924.

RCA BTA-1S very gd cond, 1 kW on 1410 kHz, \$5000. T Gaiser, KERN, 1400 Easton Dr #134, Bakerfield CA 93309. 805-328-1410.

Naute/Harris 10 kW AM. M Berlinger, WDAY, 301 8th St S, Fargo ND 58103. 701-241-5350.

Tubes (500) amp, Rx & Tx, BO. T Nelson, WCAL, St Olaf College, Northfield MN 55057. 507-646-3328.

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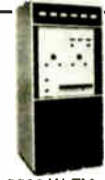
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CCA FM 40 E 40 W exciter w/manual & test cable, \$1900; McMartin B-910 exciter, \$1000, w/stereo & 57 kHz generators, \$1600. M Benson, KWTY, Box 773, Big Pine CA 93513. 916-893-8737.

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Bauer FB 5000J AM 5000/500 W, gd cond, BO. R Trujillo, RT Comms, 10008 Cordova Glen Ct, Sacramento CA 95827. 916-364-5520.

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FM used, inexpensive, 20 kW harmonic filter. B Lacy, KARX, 3611 Soney, Amarillo TX 79121.

7-10 kW FM, post 1980 mdl. B Christie, Grande Radio Grp, PBO 907, La Grande OR 97850.

Photocopy of schematics and instruction manual for Visual Electronics A1000, 1 kW medium wave TX rig. urgently needed. Contact: Anthony Gallagher, Harmony Heights, Castlebar, Co.Mayo, Ireland. Phone: 094-23576.

AM 10 W for travelers inof svc, 100 mW tunable. A Anello, Anello Tech Svcs, 1915 W Waters Ave #1, Tampa FL 33604. 813-933-6009.

**TRANSMITTERS**

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CCA FM-10DS 10 W FM, meter panel, pwr sply, 4-bay CCA/Comark 1 kW ant, educ band, BO. R Franklin, Franklin Studios, 1004 Dekalb St, Norristown PA 19401.

RCA 7.5B converted to 10B on 105.5 w/spare tubes, new sockets, \$8000. H Hoyler, KIRC, 120 E Main, Shawnee OK 74801. 405-878-1803.

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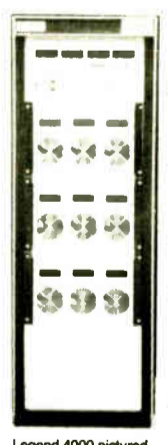
Gates & various old radio ETs, BO. L Houck, Rollin Rcdg, 210 Altgelt, San Antonio TX 78201.

Technics SL 1200-MK2, gd cond, \$160 w/Stanton pre amp, \$200. G Smith, 915-672-5149.

ORK 12C, tan color, \$100. B Spitzer, KKLs, Box 460, Rapid City SD 57701. 605-343-6161.

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Russco Fidelity Pro stereo TT pre-amp, gd cond, BO. H Kneller, WKII, 3151 Cooper St #56, Punta Gorda FL 33950. 813-639-1112.

## Want To Buy

Gray/other 16" tonearms. T Knapp, 1937 Valley Dr, Las Vegas NV 89108.

16 inch Transcription Turntable in good condition. JIM, 304-599-7000.

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RCA TP-66 16mm film proj & TK-27 camera, BO. A Weiner, WHVW, 507 Violet Ave, Hyde Park NY 12538. 914-423-6638.

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Pana AVE-5 SPC EFX mixer with char generator with over 100 effects, \$1600. M Camargosilva, NPS-IMC, 125 E Ave IMC, Norwalk CT 06852.

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NEC FS-18 frame sync/TBC w/new card, manual, \$5000+s/h; Pana 3/4 edit sys, NV9600/NV9240/NVA960, \$2000. D Hurd, Harding Univ, 805 Park St, Searcy AR 72149. 501-279-4017.

Canon VR-HF800 HiFi stereo, VHS VCR/editor, mint, \$500/BO; VC-40A color camera stereo mic, title generator; Quasar VHS HiFi 4-head, 3-speed, mint, little use, \$600. J Diamond, Blue Diamond, Box 102C Chubbic Rd RD1, Canonburg PA 15317. 412-746-3455.

## Want To Buy

JVC R9U/Sony PVM 8220 8/9" color w/rack mounting hardware. J McLean, Stagedoor 1, 9915 MacArthur Blvd, Oakland CA 94605. 510-562-4818.

## VIDEO TAPE RECORDERS

## Want To Sell

Pana NV-9100 (5) color 3/4" U-matic, auto repeat, RF out, \$100 ea; Sony VP-1000, VP-1200, BVE 500 & 500A edit controllers & 1/2" EIAJ R-R recorders, BO. J Krepol, JVK Studios, 7 Dustin Dr, Wilmington DE 19703. 302-798-4076.

JVC CR-6600U (2) 3/4" U-matic VCRs, \$225 ea. C Baker, Sound Rcdrs, 9136 Mormon Bridge Rd, Omaha NE 68152.

JVC HR 2200U indus port VHS w/GZ-53 color camera, deck plays but needs work in recording mode, \$199. D Nuechterlein, Allmake Prod, 6130 S Dehmel Rd, Frankenmuth MI 48734. 517-652-6863.

JVC CR4400 port 3/4" w/power supply & battery, Portabrace case, \$550+s/h. D Hurd, Harding Univ, 805 Park St, Searcy AR 72149. 501-279-4017.

Sony VO 2610 3/4 set with RM 440 controller. M Gatti, Underdog Studios, 771 Farmington Ave, Bristol CT 06010.

## MARKETPLACE

## Best Power's SPS 300

Best Power Technology has added a 300 VA model to its line of Patriot Standby Power Systems (SPS).

Patriot's proprietary detection system transfers to inverter in four milliseconds or less under all conditions.

Other features include a three- to five-year battery life, regulated inverter output, exceptional lightning and surge protection, overvoltage protection, full-time EMI/RFI noise filtering, interface port for LANs and multi-user systems, and status indicator and alarms.

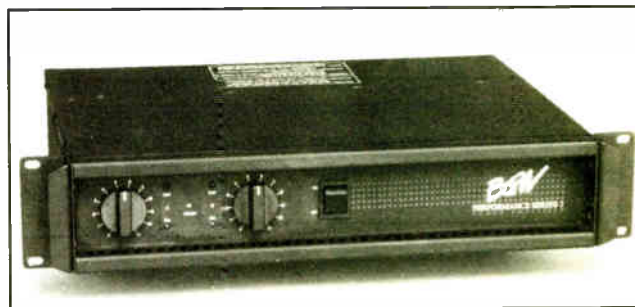
For information, contact Scott Knickelbine or Kenneth Urban in Wisconsin at 800-356-5794; fax: 608-565-2929; or circle Reader Service 51.



## BGW Performance Series 2

The BGW has introduced the first model in its new line of Performance Series Power Amplifiers—the BGW Performance Series 2.

The Performance Series 2 is a two-rack space, 300 W per channel power amplifier designed for the audio professional musician. Features include dual speed forced air cooling, a full complement of LED indicators, detented front panel gain controls, and XLR and 1/4-inch input connectors.



Five-way binding posts are supplied for speaker connections. The unit's price is \$929.

For information, contact Joe DeMeo in California at 310-973-8090; fax: 310-676-6713; or circle Reader Service 157.

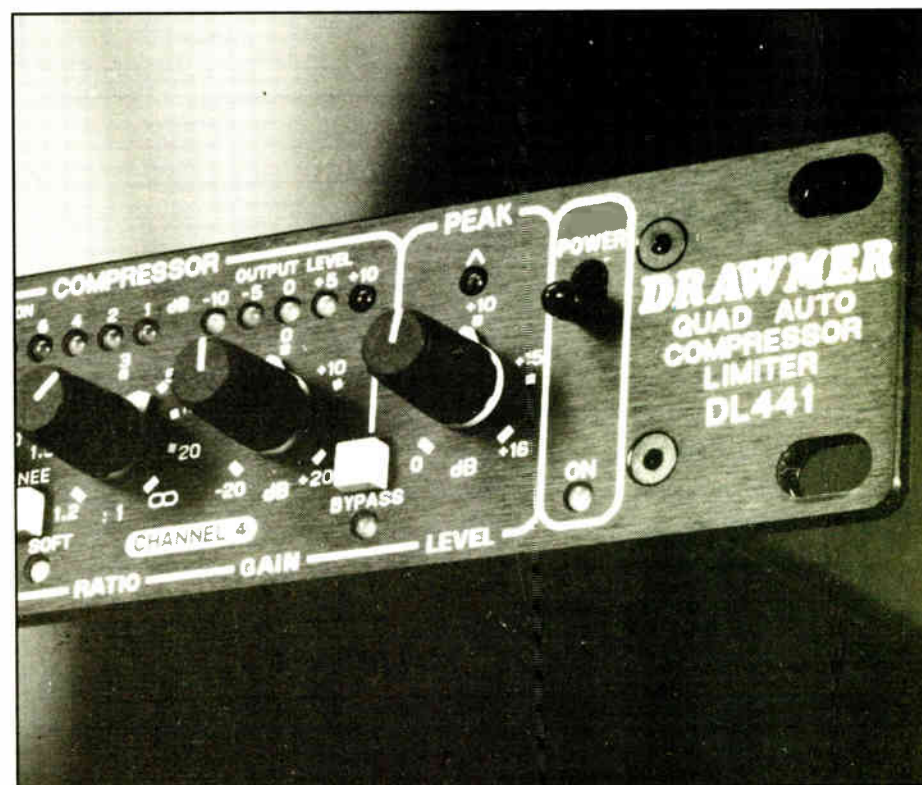
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## Drawmer DL441 Quad Auto Compressor/Limiter

QMI has introduced the new Drawmer DL441 Quad Auto Compressor/Limiter. The DL441 receives four channels of Drawmer's DL241 Auto Compressor and variable peak level section in 1U of rack space.

Features include: switchable hard/soft knee compression with ratio control in both modes; auto attack and release to constantly follow the dynamics of the signal and preserve transients without

allowing excessive peaks to occur; and peak level control, adjustable between 0dB and +16dB.

The unit is switchable for +4dBu or -10dBu operation and uses balanced XLR inputs and outputs. The price is \$1,149.

For information, contact Barry Fox in Massachusetts at 508-650-9444; fax: 508-650-9476; or circle Reader Service 98.

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