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# Radio World



See pp. 35-58 & 120, 121

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Radio's Best Read Newspaper

March 22, 1995

## 'Greatest Broadcast Show' Headlines Vegas

by Thomas Pear

**LAS VEGAS** Broadcasters, manufacturers and others will converge on Las Vegas this April 9-13 for the "world's greatest broadcast show," the 1995 National Association of Broadcasters (NAB) convention. NAB expects a crowd of almost 80,000 to descend on the Las Vegas

Convention Center, with roughly 15,000 registrants expected from overseas.

For those attending, a wide-ranging agenda features 11 conferences with approximately 250 sessions scheduled, as well as more than a thousand exhibitors displaying equipment and programming on this year's combined exhibit floors.

Plans for this year's show began with

the main hall, the radio/audio hall, the Multimedia exhibit at the Hilton Pavilion, and close to 500,000 square feet of floor space. But additional exhibitor demands caused the association to add a 30,000 square foot exhibit hall on Desert Inn Road, just across the street from the convention center.

The new hall will also be the sole site for

all NAB on-site registration. It features more registration stations than last year and is designed to speed up the registration process and shorten registration lines.

A cat-walk will provide links between the two halls, which surpass 10 football fields in size, and the NAB promises taxis and shuttle busses.

The convention will also feature a special 200,000 square foot radio and audio exhibit floor with approximately 200 radio exhibitors, said John Abel, the executive vice president of NAB operations.

The theme of this year's NAB is "Prepare Yourself for Success" and the convention features a vast number of seminars and exhibits designed to help broadcasters do just that.

But a sort of unwritten "Digital Everywhere You Turn" theme will prevail throughout the convention's exhibit floor and its four technical conferences.

There will even be a special tutorial on digital radio broadcast transmissions on Saturday, April 8, the day before the convention officially starts.

### Engineering Conference

FCC Commissioner James Quello is scheduled to deliver a 9 a.m. keynote address to kick-off the digitally-based

continued on page 59 ▶

**WELCOME TO NAB '95**  
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**MusicBoard**

**KWNR-FM in Las Vegas transmitted the special NAB greeting via its RDS billboard on Tropicana Blvd. Our NAB Preview begins on page 59. A full report on RDS begins on page 6.**

## VirteX Expands Operation With Purchase of CCS

### Plans Call for Formation of High-Speed, On-Line System For Broadcasters and Direct-to-Consumer Services

by Alan Carter

**RENO, Nev.** VirteX, a newly-formed enterprise that slipped onto the radio scene this year when former Gannett engineering executive Paul Donahue merged his company, California Digital, with an investor group to form the operation, is expanding its presence with the purchase of Corporate Computer Systems (CCS) and the planned acquisition of the audio division of IDB.

Donahue, chief executive officer and the driving force behind VirteX, said the first goal is to provide the radio industry with a high-speed, on-line system for

program transfer—something akin to an Internet for broadcasting.

"The radio industry has just entered the digital age, and VirteX wants to help facilitate the process," Donahue said.

Larry Hinderks, co-founder and president of CCS, said the industry will see a "new leader emerge in delivery."

### New leader

Hinderks, who remains president of CCS, assumes the role of chief technical officer of VirteX and serves on the board, said, "Don't limit yourself to anything. Our vision is as big as Microsoft and AT&T." Tim Chase, Hinderks' partner in CCS, will be senior software scientist for VirteX.

At press time, VirteX, with executive offices in Reno, Nev., had signed a letter of intent and a draft purchase agreement for the audio division of IDB. IDB was purchased in January by LDDS Communications Inc.

With the purchase of CCS, VirteX acquires a company involved in the com-

continued on page 3 ▶

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# NEWSWATCH

## CBS Radio Renews NFL Contract

**NEW YORK** CBS Radio and the National Football League recently announced the signing of a four-year contract for the network radio rights to regular and post-season games, beginning with the 1995 season. CBS Radio has held the National Football League radio rights since 1978.

The new contract covers the network radio rights to a 53 game package, that includes 41 regular season games: 17 Monday night games, 18 Sunday and Thursday Night games, two Thanks-

giving Day games, four Saturday games and all 12 post season contests.

Spanish-language coverage in the U.S., through the CBS Americas, includes five post-season contests, ending with the Super Bowl.

## Capital Cities/ABC Inc. Adds AM in San Francisco

**SAN FRANCISCO** Capital Cities/ABC recently announced its purchase of KSFO(AM) from First Broadcasting Company. No price was disclosed but industry sources value the station at roughly \$9-10 million.

The purchase makes Capital Cities/ABC the owner of 20 stations, 10 AMs and 10 FM.

## Group W Purchases Chicago's WSCR(AM)-WXRT-FM

**NEW YORK** Groups W Radio earlier this month signed an agreement to purchase Chicago stations WSCR(AM)-WXRT-FM from Diamond Broadcasting, Inc.

The terms of the agreement were not disclosed, and the sale is still subject to FCC approval.

"We are very pleased to bring these great stations into the Group family," Group W President Dan Mason said. "WXRT is truly one of the best-known  
continued on next page ►

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

You will see the difference as soon as you see the Phantom in action. The display provides you with all of the information you need to see in a clean, concise manner, without the crowded look that you'll find in other systems. If you are familiar with the most popular software on the PC, then you may already know how to use the Phantom. The Phantom's pull-down menus guide you through all of the steps involved in setup and daily operation, from creating and scheduling clocks to creating and editing logs.

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The Phantom ends the confusion of automation by keeping everything organized. The Phantom simplifies your daily operations by keeping information such as input changes, voice changes, and clock changes in their own individual schedules rather than in the log. You can leave those liners and other voice drops out of the log because the Phantom will do them for you. The Phantom allows you to date new schedules to begin weeks, months, or even years in advance. When your satellite network informs you that there will be a voice substitution on Thursday, two weeks from today, you can prepare for it *today*.

The Phantom can retime spots to fit them cleanly into a satellite break without inserting silence, overlapping, or running late. The Phantom



can create reports to keep you informed on a number of topics, from a list of expired spots to an analysis of potential mistakes in your log. The Phantom also maintains a history of system activity.

The Phantom has the features that others would want you to believe are theirs exclusively. The Phantom remains *completely* functional during recording, sensing relay closures and starting breaks as easily as it does when it is not recording. The Phantom can fill incomplete breaks with spots from a list you specify without ruining product separation.

While other systems tie your hands and limit your flexibility by only offering 3 or 4 inputs, the Phantom gives you 6 stereo inputs, using its AMX-84 solid state switcher, with the option of increasing the number of inputs to 14 or more. If your station is News/Talk, you know how important this can be.

The Phantom allows you to change the sampling rate, digital format, and stereo/mono settings at will to meet your needs for an individual spot. The Phantom offers a number of digital formats, including the new Dolby AC-2 format, as an option.

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# VirteX Expands Operation With Purchase of CCS

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puter industry and a developer of codec systems for broadcasting. CCS holds the copyright and license for MUSICAM in North America and is known for extensive work in developing the compression algorithm.

## Digital developers

In addition to codecs, CCS most recently moved into developing digital audio editing systems, P.A.C.E. and P.A.C.E. Lite, in cooperation with CBS. CCS also supplied technology, including MUSICAM, for the USA Digital Radio in-band, on-channel digital radio system proposed for the U.S.

Hinderks said broadcasters using CCS equipment should see no change in everyday operations of the company. With headquarters in New Jersey and European operations in Germany, he said CCS soon will expand operations into the Far East.

"VirteX has made a commitment to grow CCS," Hinderks said. "For CCS, it is the greatest thing in the world."

California Digital is extensively involved in providing satellite systems and introduced the DaX transmission system, which is a PC-based platform for storage and transmission.

IDB also is a player in satellite services.

**The main goal is to deliver more services to the networks and group owners for their owned-and-operated stations and their affiliates.**

The CCS MUSICAM algorithm is a common thread among the companies involved. Among the CCS clients are ABC, CBS, the BBC and others in the telecommunications industry including Scientific Atlanta, ComStream, Wegener and IDC.

## Going on-line

One of the first stages for the VirteX operation was to put a DaX headend switching system on line in Minneapolis, according to Donahue.

He also said agreements would be forthcoming with radio groups using the VirteX "digital super information highway."

Donahue said that because the deals were not finalized he could not name the parties.

While various VirteX officials hinted at business interests outside broadcasting, they declined to expand on their plans.

"We do have goals for building software for the consumer market," Donahue said.

Linda Donahue former president of California Digital and now marketing manager for VirteX (and Paul Donahue's wife), explained that the potential for the consumer markets is the application of the DaX system for home delivery. "To go to the consumer, the market is large,

and the company is small," she said. "We are trying to stay very focused on radio at this time."

But she added, "When we say direct to the consumer, it's certainly on the plate."

VirteX, Linda Donahue said, is not trying to recreate technology but standardize and enhance systems in place. "Think of the VirteX system as a big transmission system that's digital from the mind of the producer to the ear of the listener," she said.

The main goal, she continued, is to deliver more services to the networks and group owners for their owned-and-operated stations and their affiliates.

One example Linda Donahue cited, is that an ad agency could supply material via a PC with a DaX card to a network, which in turn could feed it to affiliates.

Paul Donahue also said the system could be used to supply programming in the digital domain to affiliates or stations buying programming. Plans are for the system to operate at a rate of up to 30 megabits per second, he said.

## Finance questions

In addition to the plans for VirteX, questions have been circulating about the financing behind the enterprise, including ties to Christian broadcaster Pat Robertson and his Christian Broadcast Network (CBN).

Donahue said Robertson was not an investor in VirteX.

"I will tell you it involves sports figures and a couple of media holding companies," Donahue said.

Asked if those media companies were associated with Robertson, Donahue said he could not say for sure.

As for the sports figures, Donahue declined to comment on specifics.

But an executive vice president and general counsel for VirteX is Jeff Dankworth, a well-known sports attorney whose clients include or have included John Elway and Dan Marino.

Most of the key people involved in VirteX are business associates and friends of Donahue.

Chuck Wagner, a general executive with VirteX, was director of technical development for Standard News which was owned by Broadcast Equities, a subsidiary of CBN.

And, the executive vice president and chief information officer is Rob Peterson, who comes from Packard Bell and also the Microsoft Advanced Systems Committee. Peterson's wife was Donahue's secretary and colleague at Gannett.

Donahue and Hinderks worked closely in the development of USA Digital Radio.

"We've put together a high-powered team," said Donahue, who also explained that he has a five-year contract with VirteX. As for others involved in the ownership of VirteX in addition to the investors and himself, he said Hinderks was probably the largest individual stockholder.

Lucia Cobo contributed to this report.

# NEWSWATCH

► continued from previous page

and best-loved rockers in the nation."

Mason said he also has high hopes for WSCR because of the growing popularity of sports/talk radio.

"WSCR's talent-driven sports/talk format has seen good recent growth trends, and will present additional opportunities in a market where sports and information are extremely important to us. As it expands its programming, we think it will become a powerful complement to WMAQ(AM), our news and sports station in the market."

Bill Stedding of Star Media Group acted as the exclusive broker in the agreement.

## Repeal of Anti-Foreign Ownership Provisions of 1934 Communications Act

**WASHINGTON** At press time Representative Michael Oxley (R-Ohio), was scheduled to conduct a House Commerce subcommittee's hearing on repealing anti-foreign ownership provisions of the 1934 Communications Act.

If the subcommittee does

recommend repealing anti-foreign ownership laws, the issue would then go before the House Commerce Committee and later to the House floor for a vote.

Oxley's rationalization for allowing foreign ownership of stations is that it would encourage foreign markets to relax restrictions against U.S. telecommunication carriers and U.S. equipment providers.

"The U.S. is poised to lead the world in the telecommunications revolution into the next century if we practice the simple art of free trade," Oxley said in a news release.

## Kinetic Purchases WRCQ for \$2.8 Million

**FAYETTEVILLE, N.C.** Kinetic Communications has closed on its \$2.8 million purchase of Fayetteville station WRCQ-FM from Metropolitan Broadcasting Associates, L.P.

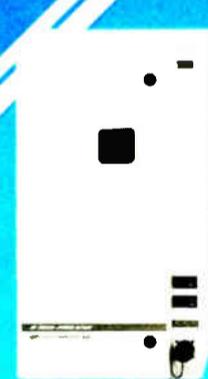
Kinetic his headed by Jon C. Peterson and Howard Johnson. Metropolitan is headed by General Partner Steve Garchik. Michael Bergner of Bergner and Co. was the exclusive broker in the transaction.

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# As the Radio World Turns

**WASHINGTON** You hold in your hands the largest, most jam-packed issue in the history of **RW**. I'm talking 136 pages of NAB Preview and product stories, *Studio Sessions*, *Buyer's Guide*, *Features* and *News!*

On page 1, our beautiful color photo of KWNR's RDS MusicBoard located on Tropicana Boulevard in Las Vegas was provided by Specialized Communications of Seattle, the inventor of the MusicBoard software.



The software, commercially available to RDS stations, allows KWNR's RE RDS encoder to transmit text messages, song title and artist and other information to the billboard, a representation of a Denon RDS car receiver for the station promotions. The MusicBoard can be seen at RE America's display at the NAB convention (Booth 18378, 18478).

Specialized Communications went to a great deal of trouble to shoot that photo for **RW**, and I'd like to thank them in print.

Of course, RDS is but one of a number of interesting technical topics creating a buzz for NAB '95. As reported by **RW** International Editor Alan Carter in our last issue, USA Digital is planning to wow us all with a live demonstration of in-band, on-channel digital audio radio.

As usual, around show time, news of purchases and buyouts starts to swirl around as well. This year, though, the news coming our way is more than just the "X company buys Z company" variety. Intelligence gatherers here at **RW** are uncovering a series of interesting developments which we will relate to

you as they unfold. It seems that our page 1 VirteX story is but the first announcement of the year in what appears to be a coming slew of re-organization and re-alliance stories in the business. Stay tuned to **RW**.

Aside from VirteX, this year, Virginia Beach, Va.-based Broadcast Equities, a subsidiary of the Christian Broadcasting Network (CBN) recently announced the sale of both Standard News and ZapNews to the Chicago-based Major Networks.

Major Networks is a subsidiary of Major Broadcasting Companies, which is also based in Chicago, and transfer of ownership took place March 1.

Standard News, you will recall, came on the scene roughly two years ago, and made some big waves by investing heavily in the California Digital daX technology. Essentially, daX enables a network to provide radio stations with a multimedia system. It's the same technology that Premiere Radio's Gerry House uses to interact seamlessly with his affiliate stations.

As our story indicates, VirteX has big plans for itself and the radio business—it certainly bears watching.

On that subject, VirteX, with its purchase of CCS, is now involved with Project Acorn. If pre-NAB press is right, Project Acorn has sprouted.

As we reported first in the last issue of **RW**, the FM signal will be carried from an existing station in Las Vegas to produce a final signal of 20 kHz stereo. The choice of FM station has been finalized, KUNV-FM on 91.5 MHz. The station is licensed to the University of Nevada and programs a jazz format. The FM setup will use a Harris DAB 2000 transmitter, a unit that is based on the Harris Platinum TV series.

The presentation includes a half-hour

bus tour around Las Vegas to demonstrate the effects of multipath and how USA Digital Radio holds up under mobile conditions.

Listeners will be able to make a two-way comparison on each of the separate (AM and FM) bus tours—among digital AM, analog AM, digital FM and analog FM.

The AM demo will combine live and automated programming from a digital studio organized and set up by Harris Allied in the Radio Hall. The 15 kHz stereo program will be broadcast on the expanded AM band at 1660 kHz during exhibit hours on April 10-13.

The AM/FM receiver is a prototype built by the USA Digital engineers.

Disc jockeys from Gannett, CBS and Group W will rotate air shifts using the

Radio Systems DDS digital audio system in the live-assist mode, with the remaining time operating under automation. Other source material will be from the Audiometrics CD 10E single-play CD player with Orange Book capability.

Everyone is being pretty tight-lipped about the digital radio mixer to be used in the AM setup, but this much we do know, the unit is fully digital with mixing in the digital domain and AES/EBU outputs. Stay tuned to this page for more updates.

If the USA Digital setup sounds vaguely familiar, think back to what the developers of the European Eureka-147 DAB system did at NAB in 1991.

This is USA Digital's first public mobile demo—it held demonstrations by invitation-only on AM in Cleveland, Ohio, and on FM in Chicago, and also has presented video and taped audio programs.



Larry King and Kathleen Sullivan were Elliott Forrest's first guests in Los Angeles when CBS Radio's *The Late Late Radio Show* with Tom Snyder and Elliott Forrest headed to the West Coast for two days. Broadcast from CBS's Television City, the three-hour program, which includes the one-hour simulcast of "The Late Late Show with Tom Snyder," also featured visits from former Monkee Michael Nesmith, Diane Dimond of "Hard Copy," and Shadoe Stevens from CBS-TV's "Dave's World."



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Better than knee-jerk

Dear RW,  
I respectfully disagree with your Feb. 22, editorial wherein you criticize efforts of the new Congress to question the continued funding for CPB, NPR, PBS, et al. As a former employee of a PBS station, as well as a proponent of much of the programming on public broadcasting, I feel that the issue deserves more than a knee-jerk reaction by both sides. While most of the rhetoric has centered around the editorial content of programming, my concerns are related to unfair competition and our country's commitment in general to erase the looming federal deficit.

Much has been written in other industry trades about NPR and PBS affiliates using their tax-free status along with equipment bought outright or subsidized with grants, donations and taxpayer dollars to compete unfairly with commercial stations, post houses, satellite transmission providers, etc., that do not enjoy such advantages. The commercial accounts that public stations are now soliciting to make up their public funding gap come largely at the expense of commercial enterprises. As most of us in the industry have to achieve certain returns on investment in order to survive, it is just not possible to compete effectively when public stations have no true equivalent.

At the same time, it is true that taxpayers' support of public broadcasting is minuscule in comparison with defense spending and entitlement programs. However, if we cannot reasonably examine cutting spending on purely discretionary items (which public broadcasting certainly is), how can our country ever summon the will to address cutting any larger programs that will undoubtedly require greater sacrifice of all citizens? Public broadcasting, like thousands of other taxpayer supported programs, is nice when we can afford it—but we are

broke! We don't need to cut defense programs instead of public broadcasting; we need to do all of it. We should be prepared to start first with what we can live easiest without, and I believe that includes CPB.

Lastly, regarding your statement as to CPB's "loftier goals of education and research," some of us still have faith in the free market system, and will continue to educate our children with or without public funding of CPB. There will also continue to be innovators in our industry as well to do the research and apply it to the commercial marketplace. In fact, RW is full of ads from those very innovators.

David Anderson, VP/O&E  
IDB Broadcast  
Los Angeles

Dear RW,  
Do 'Newt' NPR.

After some 40 years of broadcasting it is time to cease subsidizing National Public Radio. We in the commercial radio sector see it as quite an injustice to have to help subsidize a competitor with our hard-earned tax dollars. We not only are expected to sell advertising against this corporate giant we are also competing for listeners and being taxed to boot. This corporate giant is no more public than ABC, CBS, or NBC—it programs in much the same manner, with much the same trash, the only difference is we are asked to pay with our tax dollars for many shows which I oftentimes find tasteless and politically motivated.

NPR is typically very liberal in its views and hence the support of the Democrats and the socialistic principles portrayed in its programming. We need to cut the strings and let this liberal entity exist on its own merits or we need to establish another NPR which is supportive of conservative views and the free enterprise system. Let's cut government and get it out of our daily lives.

Tony Wortmann  
Norfolk, NE 68701

Smokin' viewpoint

Dear RW,  
Precisely what was your editor smoking when she decided to run your editorial supporting government funded radio ("Don't Newt NPR," February 22)?

Are you people nuts? Has your proximity to the People's Republic of Washington, finally made you forget exactly who the majority of your subscribers are?

Can you really say with a straight face that "Funding for the Corporation for Public Broadcasting is no pork barrel spending"?

OK, let me take it from the top. NPR is directly subsidized to the tune of \$1,000,000 a year. It is indirectly subsidized to a much higher degree because CPB gives away about \$61,000,000 to 550 so-called public radio stations (and I fail to see what makes their radio more public than mine) to buy NPR programming.

NPR has a budget which dwarfs Westwood One's news operation in D.C. It has highly paid executives who are so arrogant that they don't think they have

Energize At NAB

NAB spring conventions are a lot like the Energizer Bunny...they just keep happening and happening and... Picture in your mind, however, the Energizer Bunny on turbo rollerblades, digital headphones strapped to his head and a backpack full of radio goodies. The radio portion of NAB '95 merits such a comparison—it is by far the most super-charged spring show for radio yet.

For openers, Project Acorn has sprouted, and the eternal questions of "Can they do it?" and "Will they pull it off?" verge on being answered in a big way. Acorn plans a live AM broadcast from the show floor and an FM facility broadcasting on the air from an existing FM station in Las Vegas. That's right, in-band, on-channel, on the air. Has Yankee ingenuity and years of dedication from three of radio's premier companies finally come to fruition?

If that does not entice you, how about the legal issues of the complete deregulation of ownership of radio and relaxation of foreign ownership limits of broadcast facilities? Or NPR, CPB and the National Information Infrastructure? (The latter an issue that Vice President Al Gore recently revived at the G7 get-together in Brussels earlier this month.) Think of all those Congressmen and women as well as all five FCC commissioners who will actively participate in this year's curriculum—and all the questions you might pose to them about your regulatory future.

If you'd rather go shopping, the NAB is offering 200,000 square feet of product exhibits directly targeted to radio/audio. The proliferation of affordable, cutting-edge products for radio is evident elsewhere in this issue (see NAB Preview, page 59).

Top that off with an industry riding high on a wave of revenue growth unparalleled in radio since 1985. Forget all the usual good reasons for attending a trade show—this NAB is zooming with energy, technical feats and daring, a packed agenda for managers and engineers and shiny new radio gadgetry as far as the eye can see. What better inducement do you need to attend? And keep on going, and going, and going...

—RW

to answer to the Congress of the United States of America.

Now, I would ask you exactly what RW would do if Congress proposed a subsidy of 14 percent (that seems to be the accepted number) to Radio Ink? Or Broadcasting?

I think you and I both know the answer to that.

That said, why is it necessary to make me pay taxes to subsidize a local station with twice my yearly budget yet one fifth of my local programming? That's right. The NPR station in Tulsa (which, by the way, is a 50,000 watt FM) has a budget of about \$500,000 a year and it provides two hours a day of local programming. We should do \$250,000 this year, we are live and local 10 or more hours a day. We will turn a profit this year (with 1,000 watts on a former AM daytimer).

Why is it necessary for me to subsidize the liberal, politically correct drivel which they call "public" radio with tax dollars?

The answer, of course, is that it is not necessary.

Every time we look at the federal budget, somebody says, "well, that's not a lot of money and it's an important program." To quote the late Senator Everett Dirksen, "a million here, a million there and pretty soon you're talking about real money."

The idea here is that this simply is not something the federal government should be doing.

As far as the ludicrous argument that non-commercial radio cannot support itself, I would observe that the chairman of CPB was enraged when Minnesota Public Radio did such a good job of promoting itself that it raised enough money to buy a commercial station. The subject was brought up during a recent Senate hearing that he complained about how hard it was beg for more money when public radio was making money off of

Mozart t-shirts.

I am not against NPR or non-commercial broadcasting—just the federal funding of it.

If you can get enough listeners to pay for that mind-numbing liberal drivel that NPR pumps out, more power to you.

But absent that, if we cannot cut CPB, than that is a serious indication of the futility of trying to balance the budget. And under those circumstances, RW had better be looking over its shoulder because federal subsidies for politically correct magazines will not be too far behind.

Fred M. Weinberg, President  
KTRT 1270  
Tulsa, OK

Good Ol' Days

Dear RW,

Just finished Ken R.'s "It Was 1969 and I Spun 45s." Great article! Ken put into words what I have thought many times about the state of radio today. (If I heard "another long block..." of anything one more time...) Thanks Ken. I was only eight years old in 1969 but I can relate.

Tom Nichols  
WMC-TV  
Memphis, Tenn.

Thanks

Dear RW,

To all of you at RW (newspaper and magazine), I would like to thank you very much for two of the best publications I've ever received. It is a treat to receive them.

The article on how to treat employees by Sue Jones (RW, Jan. 11) was right on! Too bad more managers don't do this.

Again, thank you very much for two great publications.

Michael "Mike" Payne, VP, Dir. Eng.  
Elk Plain Broadcasting  
Graham, Wash.



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## NEWS ANALYSIS

# Broadcasters Roll out RDS Slowly

by Alan Haber

**WASHINGTON** Just like the train that had a difficult time getting up the mountain in a famous children's story, the Radio Data System (RDS), or SmartRadio, has found it slow going in gaining acceptance in the U.S., despite strong efforts on the part of some parties to help it succeed.

A small number of FM broadcasters support the digital subcarrier technology that can transmit station call letters, transmit scrolling messages, allow stations selection by format, transmit song title and artists while the cut is playing, transmit paperless retail coupons, and switch to alternate transmitters.

At press time, only about 250 of the approximately 5,000 FM stations in this

country were on the air with the technology—some of which are having great success with it (see related story). Though the station growth is very slow, since *RW* began conducting its "Roll-Calls" of RDS stations in late 1993, the number has advanced 25-50 stations every three months.

Yet most FM stations have been unwilling to commit themselves. Receiver manufacturers haven't supported RDS either, even though they have been making receivers in Europe for nearly ten years. The RDS equipment manufacturers and distributors are as sure as they are unsure. And the lords of the manors—the Electronic Industries Association (EIA) and the National Association of Broadcasters (NAB)—continue to agree and disagree about the future of RDS (see related story).

A little more than two years after the release of the RBDS standard (Radio Broadcast Data System) by the National Radio Systems Committee (NRSC), there are many questions that remain.

For example, if radio stations favor auxiliary services, such as paging over the more consumer-oriented benefits, like delivering song titles and artist names, can RDS be considered a success?

Gerry LeBow, president of Sage Alerting Systems in Stamford, Connecticut, believes it can. In fact, he said, "the broadcaster doesn't have to be an active player... As long as the signal is on...it sends the signal to the receiver manufacturers... that it's here."

## Viscious circle

RDS's real plight can be summed up by the three very overused words: chicken and egg. That condition, which implies a vicious circle: radio stations won't put on RDS until receivers are available, but receiver companies will not manufacture the radios until more broadcasters transmit the signal. After

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continued on page 18 ►

## EIA Pledges Money and Support For RDS Promotion in 1995

by Alan Haber

**WASHINGTON** The Electronic Industries Association's (EIA) recent pledge of up to \$500,000 to promote RDS Radio Data Systems (RDS) to the American public is seen by many as potentially a strong boost to the technology. The EIA's effort could net several hundred more stations to RDS' total by the end of the year.

Both the National Association of Broadcasters and the EIA developed the RBDS (Radio Broadcast Data System standard for RDS' use in the U.S.) but the NAB does not seem as much in the forefront of its promotion.

The NAB's Executive Vice President John Abel said the broadcaster association has done its part to promote RDS, but his personal comments reflect more confidence in the high speed subcarrier technology. The RDS data rate is 1,200 bps while high speed systems are proposed to exceed 15,000 bps.

Abel said the NAB is not fighting the current RBDS standard. "We helped set it," he noted. "We want it to develop. But in terms of the big pot of gold at the end of the rainbow in RBDS (RDS), I don't think, in the current RBDS (RDS) standard, it is there for the broadcast industry."

"It has been two years," Abel added, making a reference to only 250 stations being on the air with RDS since the standard was enacted. "Well, there are about 5,000 FM stations in this country, so I wouldn't say that is an overwhelming leap (and) jumping for the technology," he said.

Abel, however, emphasized that NAB has promoted the technology. "I think we have had (RDS) at more conventions than (EIA) has had it at," he said. "We've had bigger displays. We've had more sessions—in fact, they've had very few sessions on this."

## EIA pledge

About EIA's pledge to RDS, Abel said that "EIA has a very selfish interest in this, and that is to sell RBDS...receivers. I think that is pretty transparent. So they want broadcasters to spend the money so they can sell receivers."

## RDS Stations Committed to Technology

by Alan Haber

**WASHINGTON** While the vast majority of FM radio stations in the United States remain uncommitted to RDS (Radio Data Systems) so far, about 250 are committed, and some of them are working hard to make the technology a success.

For example, progressive-classical WBOQ-FM, known as "WBACH," has been sending advertising messages and weather forecasts to RDS radios on Boston's north shore, among other areas, since signing on with the technology about 15 months ago.

Douglas Tanger, WBACH's president and owner, said he believes in RDS. "I think it is about time that other broadcasters stepped up to the plate and participated," he said.

WYPL-FM, a Corporation for Public Broadcasting-funded, non-commercial educational radio station owned by the Memphis, TN public library, targets primarily visually-impaired and illiterate listeners. RDS, said Steve Terry, general manager, helps to promote the station. Messages get sent to RDS radios from a bank of about 98. Terry is a big RDS supporter, and has plans for the technology that could include data paging.

## Success stories

There are more broadcaster success stories: WETA-FM chief engineer Joe Davis said the Washington, D.C. non-commercial, NPR-affiliated station has promoted its RDS activity in WETA-FM's member magazine, which generated "quite a few calls" asking about tuner availability.

WTMI-FM will be one of eight stations in the Miami-Fort Lauderdale area that will participate in CouponRadio's test launch that will likely take place by the end of this year.

CouponRadio is a system that can transmit "paperless" retail coupons via RDS to receivers equipped for such a service.

And KWNR-FM in Las Vegas erected, on the opening day of the 1995 International Winter Consumer Electronics Show, the huge RDS-enabled MusicBoard Billboard, which has netted the station positive response.

Dave Evans, chief engineer at KALW-FM, a National Public Radio station in San Francisco, said that he is the head of the RBDS Users Group, an ad hoc congregation of NPR RDS users, which will meet for the

continued on page 10 ►

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# NAB Names Claudy As Technology Boss

by Thomas Pear

**WASHINGTON** Promising to fight technical complacency in the broadcast industry, Lynn Claudy recently began his new position as the National Association of Broadcasters' science and technology senior vice president.

Claudy, who replaces Michael Rau, has been with NAB since 1988, working his way up through the Science and Technology Department. Rau departed from the NAB to head a new data broadcasting unit for the broadcast radio group EZ Communications.

Claudy's number one concern with regard to radio engineering is technical complacency. He said it is a serious threat to the radio industry in light of rapidly changing digital advances.

"If one believes that radio's place is assured tomorrow—that is a dangerous position to take," Claudy said.

Dangerous because different audio mediums like satellite digital radio audio services (DARS) and cable-based audio services, commonly referred to as cable radio, are quickly becoming viable competitors for listeners' attention and advertising revenue.

Claudy does believe, however, radio's future is secure if radio broadcasters integrate the newest technology into their operations, he said.

So his goal as the new head of the science and technology department is to foster the development of technology that will assist radio broadcasters in competing with other audio mediums.

"I want broadcasters to be equally attractive in quality on a technical basis," he said.

But keeping broadcasters on top of things technically is not an easy task, according to Claudy. Broadcast transmissions are typically prone to interference and problems that other mediums do not have to deal with.

"Broadcasters have a much greater technical challenge," he said.

Cable, for example, has the ability to transmit high quality audio without interference because it does not transmit over the airwaves. And it is difficult to get cable-quality audio through radio, Claudy said.

The task of keeping radio competitive with other mediums, however, is not impossible. Existing technology like digital audio broadcasting is already enhancing the quality of broadcasting tremendously, he noted. "I'm not saying we have to do things that are not done now," he said.

In addition to keeping broadcasting competitive through technology, the new NAB senior vice president will also have his hands full assuring that his department adequately represents the association and broadcasters on industry standard-setting bodies, advises NAB members on technical matters, and organizes broadcast engineering conferences.

Claudy is starting his new position during a busy period for the NAB. Currently, the NAB is busy putting together its annual Las Vegas convention where it expects a crowd of more than 80,000. More than a thousand exhibitors will demonstrate products and services on two convention floors with a combined size of about 530,000 square feet.

The science and technology department is organizing four technical conferences, each filled with their own set of technical seminars.

During his career, Claudy has always been involved with the technical side of audio. Claudy was engineer for Shure Brothers in the late 70's, where he developed phonographic cartridges and engineered other hi-fi products.

"I began my career in an audio technology that was going the way of the model-T Ford," he said.

From 1980 to 1988 Claudy held a technical managerial position with the Hoppman corporation, designing and installing custom large-screen film video, sound and teleconference systems in both corporate and governmental facilities.

It was during that time period that Claudy found a small moonlighting job as a college professor. His Master's Degree in electrical engineering from Illinois Institute of Technology opened a door for him to teach audio technology courses at the American University from 1984 to 1990.

In addition to his educational credentials he has two bachelor degrees, one in electrical engineering from Washington University, and the other, ironically, in music from Oberlin College.

At the NAB, Claudy currently chairs the ATSC T3/S9 Specialist group on RF/Transmission Documentation. He is the project manager and treasurer of the COFDM evaluation project. And he is the co-chairman of the National Data Broadcasting Committee. He is also active in the Broadcasters Caucus.

Claudy believes the outlook for radio is positive. "People like radio, they always will," he said.



Lynn Claudy

# EIA Pledges Support

► continued from previous page

Abel said EIA's RDS promotion is "a pretty self-serving thing. In fact, we've had some broadcasters I know write to EIA complaining about the fact that this is kind of a transparent thing. Their manufacturers clearly stand to benefit—if they sell receivers, he said, adding that how a broadcaster benefits from installing RBDS is unclear.

If there were "a clear path to a revenue stream," Abel said, "it would be obvious that we would be doing it." The path to the revenue stream, he added, "may be there, but it is not clear that it is there now."

Would RDS as it now stands fall by the wayside in the presence of high speed RBDS because RDS is too slow? "I would think so," Abel said. "Most of the applications which are on the current RBDS standard would (be) able to be easily transferred to the new RBDS (high speed) standard. It is a bits issue. Bits are bits are bits."

(In deliberations on a high speed sub-carrier standard, the National Radio Systems Committee (NRSC), which is comprised of the EIA and NAB, members are abiding by a directive to make the high speed subcarrier compatible with RDS.)

EIA, for its part, has promoted RDS since the standard was released in 1993 with booths at its Consumer Electronics Shows, with a public relations program targeting broadcasters, and now with the \$500,000 pledge.

## Consumers want RBDS

Responding to Abel's comments, Gary Shapiro, group vice president of EIA's Consumer Electronics Group, said "We're disappointed in NAB's lack of enthusiasm for RBDS (RDS), but the fact is that all research shows that consumers want it. And those broadcasters who respond to that consumer need for a minimal investment will clearly benefit."

Shapiro noted that, although EIA's RDS promotion is not yet fully defined, it will likely be carried out during the second half of this year. He said "it's an appropriate role for a trade association to step in on behalf of an industry to help resolve the chicken and egg dilemma."

Regarding the NAB's role in supporting RDS, he said that "NAB's emphasis is often more times on AM stereo than it is on RBDS, but they have to set their priorities and we have to set ours. While we would prefer to aggressively work together, I think they've been content to sit on the sidelines in terms of promoting RBDS."

(One unofficial reason that that has been circulated pertaining to NAB's perceived inactivity in promoting is that AM representatives are reluctant to wholly endorse a technology that only benefits FM stations. The NRSC is examining AM RDS technologies, but no one system has yet been considered fully satisfactory.)

## An incentive

The FM radio stations "have an incentive to distinguish themselves in the marketplace they're in," Shapiro said. "Having an RBDS (RDS) encoder, being a leader in technology for a minimal investment of a couple of thousand dollars, does distinguish a radio station. Of course, if no one in the market has RBDS

(RDS) receivers, how is it distinguished? Well, that's going to change." Shapiro said "enough manufacturers have talked to me and indicated they are introducing RBDS product and selling it, that we are less concerned about that."

Shapiro said "the broadcast industry traditionally has been reluctant to embrace new technology and change. Yet every one of those changes has been positive...We always fear the bogeyman that we don't know because it is different. The bogeyman in the closet is scarier than the one we confront every day. And, it just so happens that this bogeyman has a \$2,000 price tag. The critical mass will soon be reached with RBDS."

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# Exhibitors Preview Gear at NRB Show

by Thomas Pear

**NASHVILLE, Tenn.** More than 5,000 attended last month's National Religious Broadcasters (NRB) conven-

were the digital equipment displays. As the digital age moves into the industry, religious broadcasters need to stay on the cutting edge of the technology. NRB President E. Brandt

of different types of digital broadcast equipment. Some of the equipment displayed on the exhibit floor was new. For a lot of manufacturers the NRB show served as a sort of preview as to what they will display at next month's NAB convention.

One of the emerging technologies with religious broadcasters is hard drive based audio sources (see related story).

## Crown's no-network

Crown's no-network network system: the Crown AirForce Wings software package, was shown publicly for the first time on the NRB exhibit floor. It will also be displayed NAB.

"The uniqueness comes from its delivery system which allows delivery of programs to affiliates on a site-by-site basis," Crown Marketing and Sales Manager Mark Potterbaum said.

While containing the features of a typical hard drive-based audio source, the crown system also allows the affiliate station to downlink and store a network feed into its hard drive and play it at a later time, instead of having to run the program at the hour the network broadcasts it.

"It is done with a couple clicks of a mouse," Potterbaum said. The Wings system starts at about \$12,000, but the price varies as the system is structured around broadcaster needs.

## Radio Systems Inc.

Radio Systems, Inc. Engineer Mike Sirkis demonstrated his company's DDS system, a digital PC-based audio storage system.

Because DDS is a system based on UNIX, a type of computer language, it can handle several users using the same audio or different audio at the same time, Sirkis said.

"What's unique about this system is that it's not based on DOS, and it's not based on Windows. It is based on a real-time version of UNIX," he said. "It's a jock-friendly and user-friendly terminal." Although Radio Systems previously displayed DDS at last year's NAB, the company is just now distributing it.

"The first system is going out in March," he said, adding that it will be shipped to WLW in Cincinnati.

Dalet, whose equipment is marketed by RF Specialties, introduced its Surfer 4 stereo track digital editor on the NRB floor, a product it will also display at next month's NAB.

The Surfer 4 has the ability to mix down tracks to give access to virtual unlimited tracks. Instead of using reel to reel that requires tape splicing, broadcasters could simply record onto the hard drive or use a sound file already on the data base, Dalet Vice President Steve Kelley said.

In conjunction with the Surfer 4, Dalet also displayed its existing digital audio work station that has the capability to run the on-air show and production. The system can run the program as cart replacement, switch between satellite feeds or it can run the entire program—including music, spots, news and even radio jingles, Kelley noted.

"Stations are moving more and more towards complete integrated automa-

continued on page 14 ►

# Automation Hot Ticket At NRB

by Thomas Pear

**NASHVILLE, Tenn.** As religious broadcasters enter the digital age they are increasingly flocking to hard drive-based audio sources to run their programming.

Although the technology has been on the market for a number of years, religious broadcasters, who normally have smaller budgets than other types of broadcasters, are just now seriously looking into the technology and its low cost maintenance, said John Scaggs the director of technical services for Morningstar Radio Network.

"The awakening process is just beginning," he said.

While many non-religious stations have already employed hard disk-based mechanical predecessors, religious stations have held back from automation for financial reasons, Scaggs noted. The move to hard disk-based audio sources for religious stations, then, is their first move towards automation.

**The change-over to hard disk-based audio sources for religious stations is their first move toward automation.**

Mechanical-based automation systems, which can run about \$30,000 as compared to \$15,000 for the hard disk system, were just too expensive for religious broadcasters and had too many disadvantages, he said.

Mechanical systems, Scaggs claimed, have a tendency to break down—sometimes as soon as 6 months after purchase—often forcing stations to pay between \$5,000 and \$10,000 a year in maintenance costs. In comparison, he said, a hard drive system can run for 15 years before hard disk failures, dramatically reducing maintenance costs.

Also, fixing a mechanical based system can require two different repair experts: one who understands mechanical parts and one who understands electronic parts, Scaggs explained. Repairing a hard drive system, on the other hand, only requires one expert capable of fixing a hard disk.

And then there are programming concerns stations need to consider when purchasing a system. Broadcasters do not want to find themselves constantly breaking



Mark Potterbaum demonstrates Crown's no-network AirForce system.

tion, setting a new attendance record in the association's 51 year history.

One of the reasons for the considerably larger NRB convention attendance was the notable broadcast technology displays at its approximately 70,000-square foot exhibit floor in the Opryland Hotel.

Catching NRB attendees' attention

Gustavson said at a convention-opening press conference.

"We are in a state of flux," he said. "If we do not stay on top of it technically we are going to be out in the cold."

Manufacturers were happy to accommodate the digital needs of the religious market, displaying a myriad

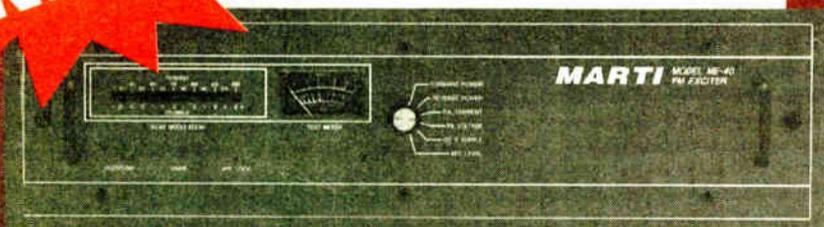
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into programming to fix their system, he said. "If it is breaking down, you have programming problems," Scaggs said.

**Purchasing tips**

Scaggs offered a few tips to broadcasters considering hard drive based audio source purchases. "There are so many tough questions people have to ask," he said.

He said stations need to first evaluate their needs and find a system that will fulfill those needs. "There is no wonder box for all of Christian radio," he noted.

When shopping around for hard drive-based systems ask equipment suppliers for an exhaustive list of users. From the list, a potential buyer can check the manufacturer's service track-record.

"A lot of the time that makes the difference," Scaggs said.

# NRB

Scaggs believes the best service comes from companies that charge for support because if companies charge they have an obligation, he pointed out. "You can make demands on what you pay."

An exhaustive list of customers would also tell how many systems have been sold and whether or not the company is doing well. If a system has been sold to numerous other broadcasters, chances are the manufacturer has worked out the bugs, he said. And chances are if a company is selling numerous products it's financially secure.

"We are due for a shaking out of companies," he said "It would be a real tragedy to own a box that doesn't exist anymore."

Although Scaggs stressed that stations need to find a system that fits their particular needs, one of the systems that did impress Scaggs for use in the religious market was Computer Concepts Digital Commercial System (DCS).

That is because many hard drive-based audio sources are created mainly for three to four minute songs and 30 second commercials. But DCS has an "incredibly capable" advanced switcher, he said, that can handle 30 minute Christian programs. "To me it gets very high marks."

Other hard drive-based audio systems that score high marks with Scaggs are Arrakis' Digilink, Registered Datas System's Phantom, Enco's DAD486x, and Kingdom Technologies' Digital Audio System.

Eventually, Scaggs said, hard drive systems will develop towards a single standard and offer standardized features.

"We are talking a while," he said. "What drives it all is the market force."

# NRB Sessions Tackle Tough Issues

by Thomas Pear

**NASHVILLE, Tenn.** The highlight of last month's National Religious Broadcasters (NRB) convention was the large number of technical and regulatory educational sessions, which gave broadcasters insight as to how and why the latest digital technology must be used.

A Super Information Highway panel session moderated by former NRB President and KMC Media President Dr. David Clark ventured into discussions about the necessity for keeping up with the latest digital gear.

Clark opened his discussion with how Integrated Service Digital Network

(ISDN) is an example of the "unpredictable" direction "that the new avail-

Panelist Jack Johnson, who is the president of the Southern Baptist Radio and Television Commission, said religious broadcasters must keep up with the changing industry by using the newest available technology.

He suggested that stations should even allocate some of their equipment purchasing budgets for new gear that will keep them competitive in years to come.

The rationale, he stressed, is that if stations spend all of their equipment budgets on technology that is almost out-

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**Religious broadcasters must be able to keep up with the changing industry.**

ability of information is moving."

Coincidentally, as Clark started his discussion, popular Christian talk show host Marlin Maddoux was gearing up for his first day of a live ISDN remote from the convention's exhibit floor using the new Comrex DXR.1 digital audio codec.

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**DESIGNS THAT MAKE THE DIFFERENCE**

# RDS Stations Committed

► continued from page 6

time in San Diego in a couple of months (on the agenda is a search for ways in which the stations can be profitable with the technology). Evans said about 50 NPR stations received encoders as part of Denon's RDS promotion; approximately 80 percent of those stations are now on-line.

## Random poll

A random poll of stations, conducted by **RW** for this story, netted a variety of opinions on RDS.

On the plus side, KPWR-FM in Los Angeles plans on engaging RDS within

the next six months; Paul Sanchez, chief engineer of New York's WPLJ-FM, said the station does have plans to go with RDS eventually, and, perhaps uniquely, added that it would be used primarily to provide services for listeners, rather than simply as a money-making venture.

Flip the coin and you'll find such stations as KOHZ-FM in Billings, Montana; duopoly partners KHTZ-FM and KTEG-FM in Albuquerque, New Mexico; KFKF-FM in Kansas City, Missouri; and WOMC-FM in Detroit, Michigan as examples of stations with no plans to get involved with RDS.



Engineer Willie LaFleur programs the RDS software for WYPL.

There is interest on the radio group side, although, once again, without total

commitment. Milford Smith, vice president of radio engineering for Greater Media, said his company "is enthusiastic about RBDS." The technology is being used at three of the company's eight FM stations—two in Boston (WMJX-FM and WBCS-FM) and one in Washington, D.C. (WGAY-FM). Software, developed in-house enables information about songs being played to be displayed on RDS receivers, according to Smith.

Smith said Greater Media is "a little disappointed with the implementation as far as the receiver manufacturers are concerned." The company believes in RDS, however: "We really believe that the ability to display things like call let-

## About 50 NPR stations received encoders as part of Denon's RDS promotion.

ters and other station-related information on a listener's radio is going to be very, very important, especially as the number of receivers increases," he said.

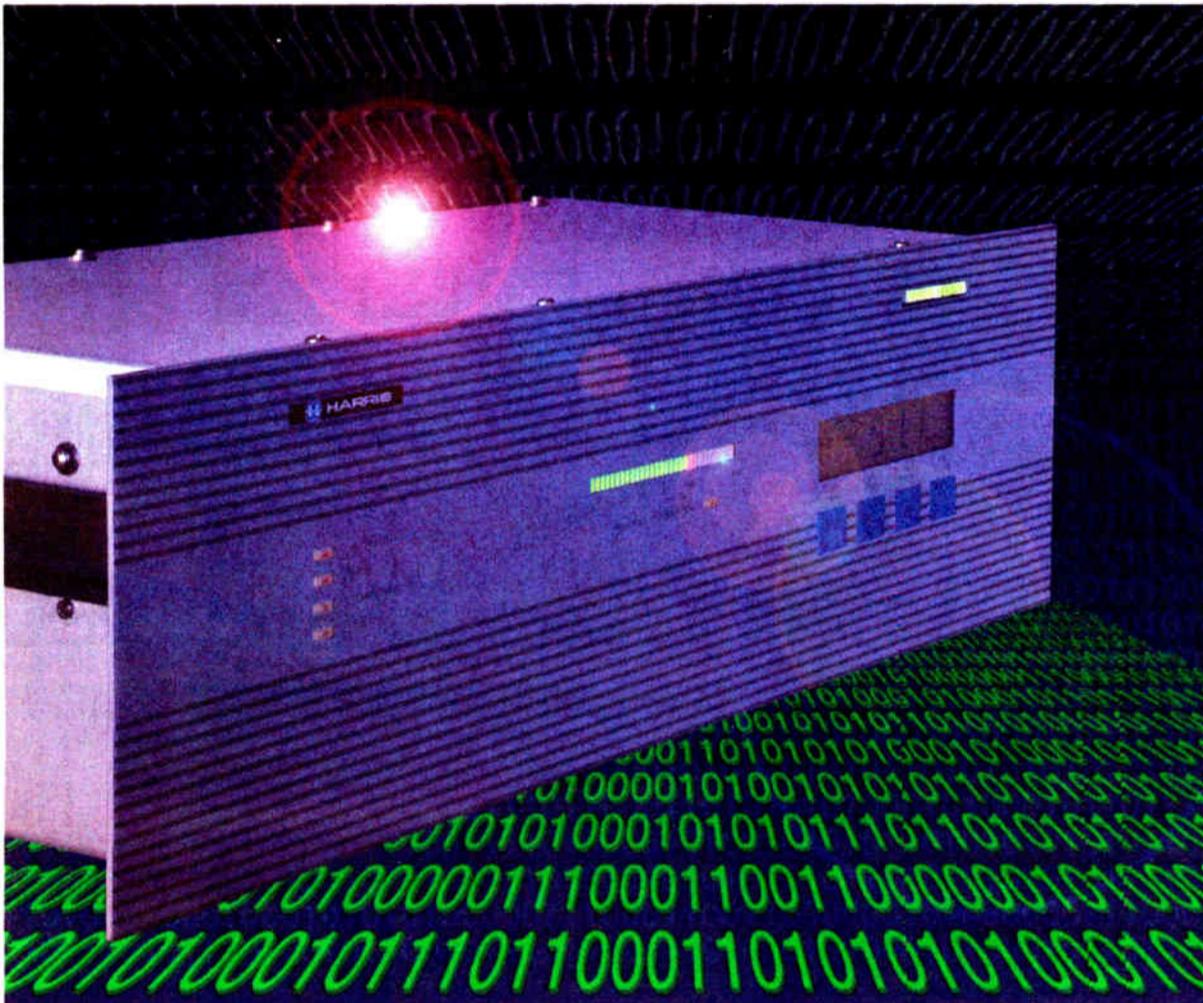
Group W Radio is one broadcasting entity that is not sure what RDS is going to do for radio stations, according to Glynn Walden, the company's director of engineering.

Five of Group W's seven FM stations are involved with Differential Correction's broadcasting of global positioning via RDS (WNEW-FM in New York, WMMR-FM in Philadelphia, WLLZ-FM in Detroit, KTWV-FM in Las Vegas, and KILT-FM in Houston).

But Walden isn't sold on RDS yet. "If I was guaranteed there was some sort of money to be made off this, we'd be actively pursuing it," he said.

## Chicken and egg

And what of the chicken and egg scenario of stations waiting for receiver manufacturers to produce more radios before they go on-air with RDS? Talmage Ball, vice president of engineering for Bonneville International Corporation, which has experimented with RDS at some of its stations, currently operates about 18 stations across the country. Ball said "there's no excuse for a broadcaster to say that he's waiting around for the radios, because it's only a \$2,500 dollar capital investment to install the encoder... I think the broadcasters ought to go out and put (RDS) on and let the (receiver) manufacturers follow."



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# Smart-Radio

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# NRB Grapples with Issues

► continued from page 9

dated, they will "have nothing to go into the future with."

"We must not wait until the price becomes so cheap we can buy it off the bottom shelf," Johnson asserted. "As soon as we see a practical application, we must get the equipment then. That is when it is at the advantage of the broadcaster."

## Duopolies

During a duopoly session, NSN Network Services Engineering Vice President Bill Sepmeier said owners should consider a satellite network when running more than two stations.

Satellite networks allow duopoly owners to run programming for numerous stations from one central location, even when stations are located in different markets, he said.

"You have basically a localization capability via a blend of satellite and PC-based automation systems made by companies like Crown and Computer Concepts that give you the capability to have one announcer run eight, nine or 10 radio stations," he said "And each of these stations would have an individual outro."

The PC systems, he noted, would have the ability to download satellite programming, run it in "real time" or store it for a later broadcast. On top of that, duopolies could download a weekly show to which they do not subscribe to. If they are interested in a particular program, they could purchase it on a "pay-per-play" basis, he said.

## Music licensing fees

Another session dealt with music licensing fees. Presently, broadcasters are fighting to make the royalty fees they pay to the American society of composers, authors and publishers (ASCAP) and Broadcast Music Incorporated (BMI) reflect only the copyrighted material they use.

Both organizations require broadcasters to pay one large blanket fee for all copyrighted music, regardless of how much they use, a scenario that is particularly frustrating to specialty broadcasters like religious broadcasters, noted Edward G. Atsinger III, the chairman of the NRB Music Licensing Committee and president of Salem Communications.

"Religious Broadcasters, who make limited use of copyrighted music, have attempted for over 20 years to negotiate with ASCAP and BMI for a fair and usable per program license with a fee structure that reflects actual music use," Atsinger said

ASCAP, for example, requires stations to pay 1.7 percent of their gross income. "Whether they make money or lose money, that's the license fee," he said

## Resolutions

At the convention, the NRB passed a resolution that supports House bill HR789, which would force ASCAP and BMI to adjust their fee schedule to reflect usage.

"We're seeking a fair per program license. We don't mind paying them, we just want to pay them for what we use," Atsinger said. "If we use a little bit, we want to pay a little bit."

Another music licensing seminar will

include the regulatory conference Wed., April 12, at this years National Association of Broadcasters Convention in Las Vegas.

## Licensing seminar

During a seminar that explained how to get a broadcast license, Engineer Pete Warren of WES Inc. Consulting explained that some non-commercial broadcasters apply for commercial frequencies, even though in most cases it would be easier for them to get non-commercial frequencies.

It makes "no sense" for a non-commercial broadcaster to get a commercial

frequency, he said.

"If you want an educational FM, there are still a lot of available frequencies," Warren said. So educational broadcasters should do a frequency search and then do the engineering to match that particular frequency.

Commercial broadcasters, on the other hand, would be wiser to search for frequencies for which no one else has applied, he said. The FCC allocates commercial frequencies in window periods. Once the window period closes, unapplied-for frequencies go to the first applicant.

The prevalent topic that arose during a licensing seminar was honesty. All other difficulties can be worked around, but once an applicant lies to the FCC, he may never receive a license to broadcast in the United

States again, Warren said.

In another resolution, the NRB supported privatizing the Corporation for Public Broadcasting, which partially funds National Public Radio. NRB contends that privatizing CPB will allow PBS and NPR "to enter the real world of the marketplace."

The NRB also passed resolutions condemning the Fairness Doctrine and spectrum fees. The NRB Fairness Doctrine resolution contends the original Fairness Doctrine "created an environment of repression rather than fairness."

The NRB condemned spectrum fees, a type of airwaves tax, claiming the fees would "severely undermine the ability of broadcasters to fulfill their historic functions, including the dissemination of the Gospel."

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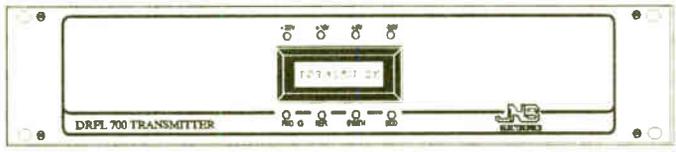


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# Exhibitors Preview Gear at NRB Show

► continued from page 8

tion," he said. "We are offering stations a system that meets their needs in all areas that will grow as they grow."

## Live ISDN remote

Wanting to stay on the cutting edge digital-wise, popular Christian talk show host and USA Radio Network founder Marlin Maddoux broadcasted live an Integrated Service Data Network (ISDN) remote from the convention's exhibit floor using the brand new Comrex DXR.1 Digital Audio Codec. The codec was a loaner from Comrex for promotional purposes.

It was the first time, Maddoux said, that USA ever conducted a live ISDN remote, and it marked the first time the DXR.1 was publicly used. Comrex's Lynn Distler said.

"It was done with studio quality," Maddoux said. On the Nashville end, the ISDN hookup cost USA Radio Network \$58.50 to install. An \$83.50 monthly usage fee was pro-rated to reflect USA Radio Network's usage time at the convention.

The system gave USA Radio Network the option of a 7.5 kHz bi-directional audio that costs about \$15 an hour through MCI, or a 15 kHz bi-directional

audio that costs about \$30 on MCI.

On the Dallas end, the location of USA Radio Network's studio, where the

nity to churches desiring to broadcast their worship services, he said. A translator application to the FCC is less involved than a transmitter application and easier to get approved, he said.

A church wanting to broadcast its services locally can join forces with a large

**For a lot of manufacturers, the NRB show served as a sort of preview as to what they will display at next month's NAB convention.**

remote was transmitted, the network paid a \$475.40 installation cost and a \$57.90 monthly service fee.

The overall cost of an ISDN hookup is about \$360 per month. In comparison, USA Radio Network's satellite hookup costs about \$2000 per month.

Comrex's Lynn Distler said the unit is the first G722 with the ability to deliver 15 kHz. "All G722 codecs until this point have been limited to 7.5 kHz."

"The real breakthrough is the price," she said. The cost of the new Comrex codec is about \$1,500.

religious network and apply to become a translator affiliate. Once permits are granted, the church can add its own worship services to network programming.

## Other equipment displays

Others displaying equipment at the NRB convention were Harris Allied, which displayed its digital FM exciter. Inovonics displayed its 715 stereo generator. Circuit Research Labs displayed its standard line of FM modular systems, and will introduce a new digital FM processor at NAB. Cablewave

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John Clemens (L) and David Reeder (R) were instrumental in assuring the success of USA Radio Network's live ISDN remote from NRB.

Comrex intends to introduce the DXR.1 again at the NAB show next month along with a stereo version of the system, the DX200, an ISO-MPEG Layer II codec.

## Analog presence

Despite the strong presence of digital technology, tried and true analog gear was also prevalent at the convention.

An assortment of transmitters was displayed by companies like CCA and Bext, which ships in Italian-made transmitters specifically built to comply with FCC type-acceptance standards, Bext Sales Manager Michelle DeFazio said.

ATI displayed its line of small market consoles designed to help smaller stations broadcasting at smaller wattage. "This is a good market for this particular market product," ATI Vice President Ed Mullin said.

Shively Labs displayed its 6812 circularly polarized translator antenna. Since the FCC relaxed translator restrictions for non-commercial stations, translators are becoming increasingly popular in the religious market.

"It is a very important product to the religious broadcast market," Shively Labs Marketing Manager Jonathan R. Clark said.

Translators provide a low cost opportu-

Systems displayed RF transmission systems. SADIe displayed its digital audio work station that works on an IBM compatible computer, and Superior Electric displayed a line of power protection products. Broadcast Electronics showed its Airtrack 90, a 6-channel audio console and its solid-state low power AM transmitter.

Altronic displayed its 10 kW air-cooled dummy-load antenna. RDS displayed its Phantom digital automation system, and NPR satellite services distributed information on its Galaxy 4, Transponder 1 and 3. NPR also is a distributor of ComStream satellite equipment.

## Next year

Next year the NRB show is scheduled for Feb. 3-6 in Indianapolis, and many manufacturers are already taking advantage of the opportunity to display their equipment.

"We have already signed up for next year," said Jimmie Joynt of Factory Direct Sales, who displayed a line of FM transmitters from 20 watts to 20,000 watts. "This is one of the best NRB conventions we have been to and we have attended NRB conventions for years."

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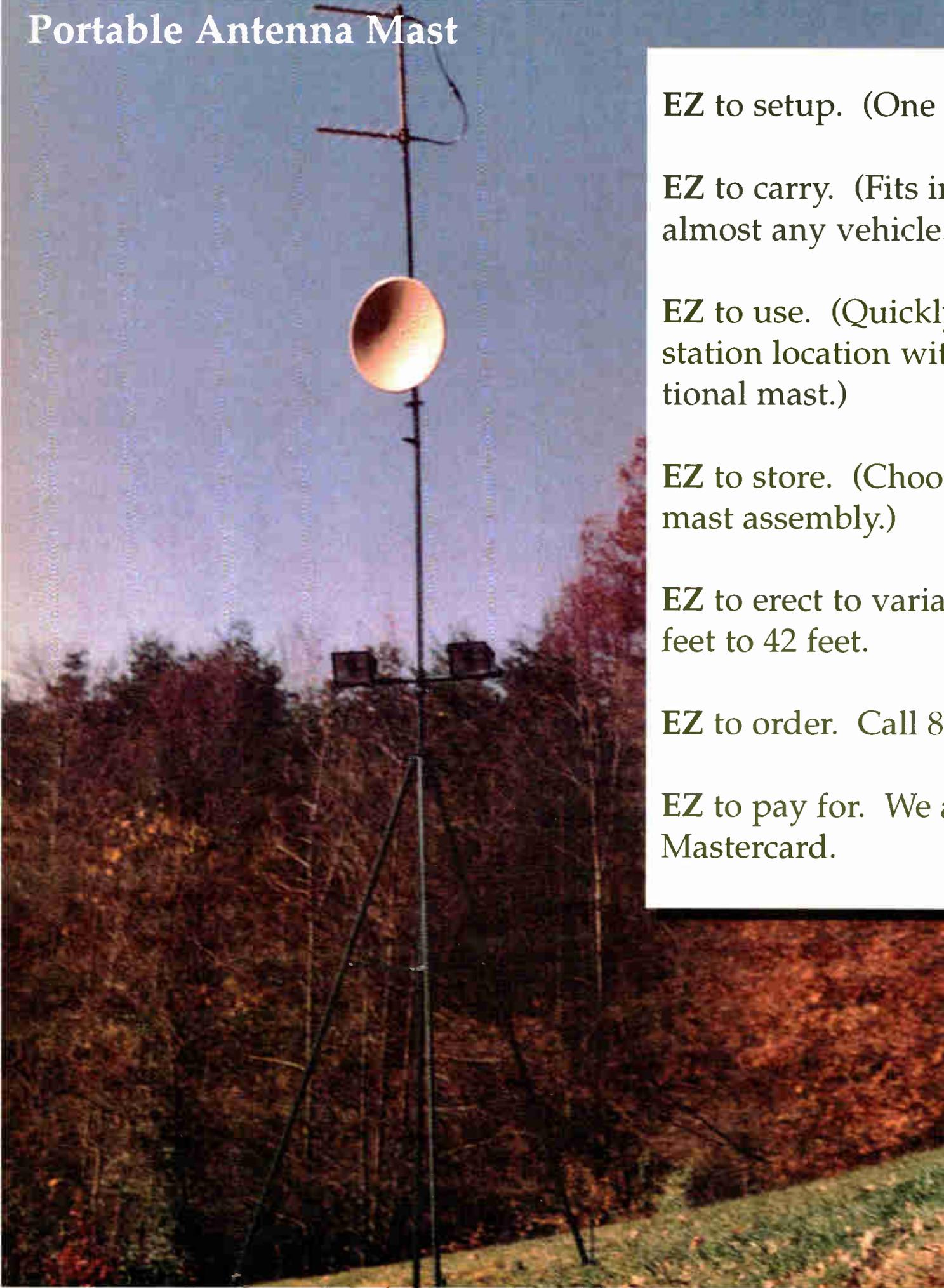
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World Radio History

# WBACH Puts New Spin on Classical Radio

by Alan Haber

**BEVERLY, Mass.** The friendly, subdued voice comes in on the last breath of a determined cymbal clash: "This next announcement may sound (the voice grows unexpectedly animated) a little fishy!" A Strauss polka underscores his words: "Have you haddock with dining at home every night?"

No, this is not your garden variety classical music station. This is WBOQ-FM, or WBACH, as it's more commonly known to discerning listeners along Boston's north shore, which includes Essex county, one of the five metro counties in Paul Revere's home town (the station also reaches the communities that line the south shore of Boston).

WBACH (its studios are in Beverly, Mass., and its tower is in Gloucester) was named Station of the Year by the Massachusetts Broadcasters Association in 1992 and 1993 (it only came in second last year, alas).

## Nothing stuffy here

You won't find any stuffy announcers or super serious deliveries of well-worn biographical sketches of composers here at 104.9 on the dial. You won't find a lot of 20th century classical music, and not much of the vocal variety, either. What you will find are the only daily commuter rail updates in town, marine weather forecasts—in season, of course—and, oh yes—energetic, knowledgeable personalities with a passion for a broad-based selection of familiar Classical Favorites.

WBACH's listeners are as serious about their music as alternative rock fans are about their sounds, according to Douglas Tanger, president and owner of the station.

Tanger said his listeners are as educated about their music (and as serious) "because (the listeners) know all about the artists," he said. "How different is it from someone who knows all about Pearl Jam? The person who is hot about Pearl Jam now could, in ten or twenty years, be hot about classical."

Tanger believes the classical format has broadened its demographic from 35-64 to 25-64.

## A different station

Tanger purchased WBACH in 1988 from local legend and engineer Simon Geller, who had been running the Class A, 3,000 watt station all by himself (he was, in fact, the only on-air voice). The station had originally gone on the air in 1967, emanating direct from Geller's living room for up to 18 hours a day in glorious mono to boost the signal. A conversion was made to stereo when Tanger took over.

WBACH is different from most other classical music stations in variety of ways. For example, the station's sales force talks psycho-graphics rather than demographics when it calls on potential and current advertisers, including upscale clients like local Mercedes Benz dealers and various local jewelry concerns, and national accounts such as Visa, U.S. Healthcare, Nabisco, and Virgin Atlantic airways.

Over the years, certain parameters have been developed within which the broadcast day is navigated, such as when to play commercials, when to run the news, and when to run certain features like

Bach's Lullaby (at midnight, naturally), or the 7:00 a.m. "Sousalarm," which helps listeners greet the morning with a John Philip Sousa, or like, march.

It may surprise you to learn that WBACH's personalities pick the music they play. However, Music Director Karl Alan sets the on-air musical repertoire from over 6,000 classical CDs in the WBACH library.

## The welcome mat

New listeners are greeted with open arms at WBACH, but at the same time, careful attention is paid to veteran listeners.

"Our feeling is that the core listener of the (classical) format is not going to leave the radio station if you choose to

The waltz, he noted is "a component of classical music...We think that (playing a waltz) is a way to get folks who don't normally listen to the format to sample the radio station, and so we like to say we have the welcome mat out."

WBACH is a promotion machine, to use a vernacular more commonly associated with hipper formats than classical—but, hey, classical is hip, especially at WBACH. The company's various promotions exhibit a strong degree of creativity.

For example, for the past four years the station has given away its Super Bowl Snack Pack just prior to the annual pigskin contest. The clever catch? The Snack Pack's stocked with products from

Tanger said, it fits perfectly. "We think that even though our listeners listen to classical music, they watch the Super Bowl like everybody else," he said. And he must be right; the Bachman promotion is one of WBACH's most popular.

Another wacky promotion—for classical stations, that is—involved the creation of the "Handel Bar," something Tanger first did when he worked at WQRS-FM, a classical station in Detroit. Looking very much like a classic type of chocolate bar, the label lists the ingredients as including horns, strings, fireworks, water and hal-lalujahs, and puts the calorie count at a refreshingly non-fattening zero.

Tanger said his staff of 17 full-time people works closely as a team on promotions to make WBACH fun while always concentrating on the bottom line—the music.

## Away from home

The station goes on remotes not normally associated with classical stations; WBACH was the very first classical radio station in the United States to broadcast from Universal Studios in Orlando, Florida (and, not coincidentally, from Walt Disney World in the very same town).

The week-long Disney event turns out to be Tanger's favorite WBACH promotion. Each day, a shopping spree at the Disney store in Boston was given away on the air. And, before you ask, the connection between classical music and Disney is closer than you think—just consider that a lot of classical music has been used in the movies, and in cartoons like the 1950 Bugs Bunny epic, "Rabbit of Seville," which featured the Bugster crooning from *The Barber of Seville*.

Being at Disney, said Tanger, was a chance to "make a statement that classical listeners are not stuffy. It is, in fact, uniquely WBACH. Roll over, Beethoven. And, while you're at it, tell Tchaikovsky the news.



Movie star Roger Rabbit is flanked by WBACH Staff Announcer Heather Kent (left) and Operations Director Steve Murphy during the station's Walt Disney World remote.

invite other folks to listen," Tanger said. To that end, the station features the "Five O'Clock Waltz" each weekday, as local nine-to-fivers scurry home for dinner.

Bachman Snacks.

Although the promotion does not seem as refined as one would imagine for the stereotypical classical music listener,

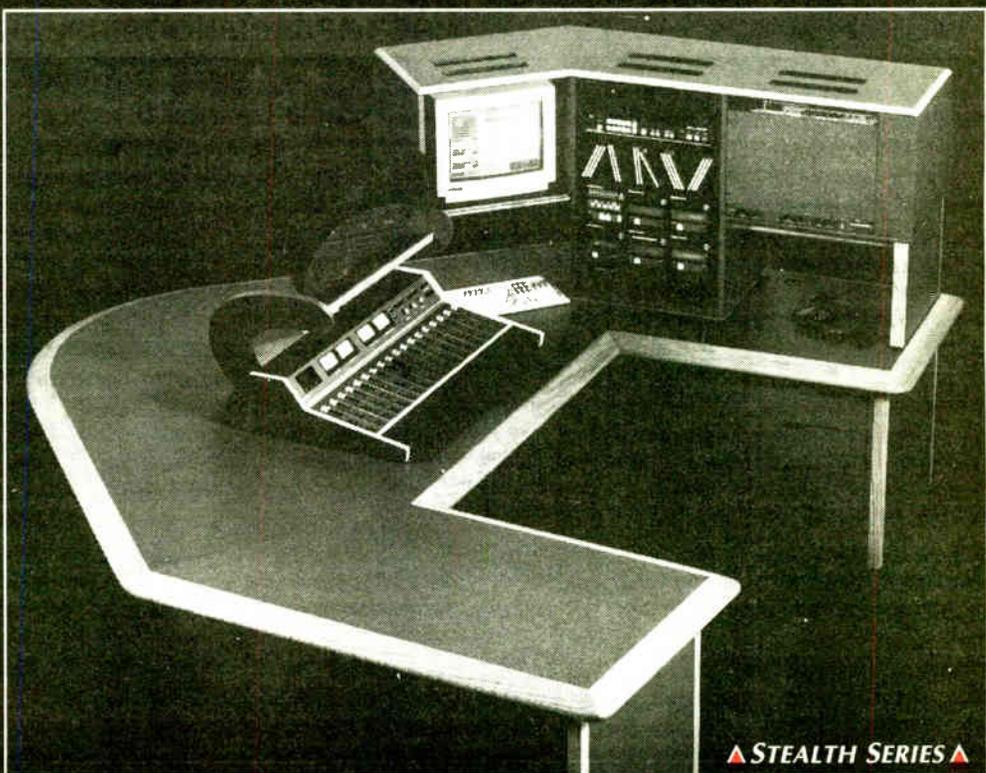
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# Broadcasters Roll out RDS Slowly

► continued from page 6

two years as a standard, it seems that RDS, in order to be the big success that was predicted in 1993, the chicken or egg scenario has to be altered.

David Alwadish, president and CEO of CouponRadio, which uses RDS to store information on music and advertising that can later be retrieved for merchandising purposes, believes that CouponRadio will supply RDS with the impetus it needs to be fully embraced by radio stations. "Broadcasters, quite frankly, won't even have a choice in the matter," he said.

Stronger shots in the arm may come from a variety of sources, such as EIA's pledge of up to \$500,000 in matching dollars to help promote RDS to consumers this year. Although not released officially at press time, the EIA is likely to pursue putting hundreds of stations on the air in many markets throughout the next year or so.

The North American RBDS Forum is a manufacturers' group that will mirror the efforts of its European cousin. The forum will focus on market applications and services, and will launch on April 6th at the EIA-sponsored 1995 National Mobile Electronics Show in Philadelphia (an RDS booth is scheduled, and Denon Electronics will be displaying its RDS radios on the show floor.)

From a manufacturer's stand-point, there is still considerable promotion activity. Several RDS exhibitors will be on the floor of NAB 95 in Las Vegas (April 9-13), including Circuit Research Labs, Denon Electronics, Modulation Sciences, RE America, and SCA Data Systems.

The support doesn't end there. The Radio Rocket, an add-on board that brings RDS into personal computers, is about to be marketed by Advanced Digital Systems. And DCI (Differential Corrections, Inc.) holds claim to one of RDS's biggest success stories. President and CEO Ron Haley said about 150 stations are under contract with the company in the U.S. to broadcast differential global positioning services (GPS) over their RDS subcarriers (some of these stations are also delivering consumer information such as song

titles and artist names). Haley said that he expects this number to increase to between 300 and 400 by the end of this year. "covering basically the entire United States."

## Receiver support

Receiver manufacturer support, however, has been slow—only six have committed to RDS so far. Denon continues to dominate with 15 RDS models available; the company's successful promotional program has placed RDS encoders from Harris Allied and RE America to radio stations in key U.S.

receiver manufacturers, such as Sony, Alpine and JVC, are not yet ready to commit to the U.S. market.

## Wait and see

International Jensen is taking a wait and see attitude. George Pariza, vice president for product development for the company, said. "If anything has confused the picture right now, it's digital audio radio. Are people as an industry looking beyond what RDS can do for them, and looking at the next generation already before they ever put this generation into production?"

## In order for RDS to be a big success in the United States, the chicken or the egg scenario has to be altered.

markets. Grundig, Onkyo, Bang & Olufsen, Blaupunkt (which will be offering an RDS radio in July) and Delco (which announced a toll-free telephone order number for its RDS radios) are also strong supporters. The good news is that, perhaps surprisingly, about 300,000 RDS-enabled radios have been sold in the U.S. Most of them, about 250,000, are Grundig radios since their shortwave portable has been available since 1991.

## Market opportunities

Gary Shapiro, group vice president of EIA's Consumer Electronics Group, believes there are market opportunities for RDS. "Manufacturers jump on market opportunities," he said. "The nimble manufacturers are the ones that get rewarded in the marketplace." Shapiro said that more major manufacturers will commit to the technology as time moves on.

First, however, the chicken and egg standoff must be broken. At present, many FM broadcasters are reluctant to embrace RDS because the base of installed receivers is so small, and many

Pariza admitted that Jensen has RDS radios already designed, "technologically and specification-wise," and could go into production within "six to nine months, once we say yes."

Grundig's Vice President of Operations for North America, Dan Johnson points to broadcasters, saying it's their responsibility "to find a way that this particular bit of technology is going to be useful to them in the generation of income. If they can find that, then we'll be off and running."

Manufacturers of RDS encoders are working hard to make the technology a big success, but there are mixed feelings in this corner of the RDS universe, too. One industry source, who wished to remain anonymous, said, "My gut feeling is telling me that it's sink or swim right about now... It's like coming up for your last breath of air."

The same source also had reservations about the number of encoders being given away by receiver manufacturers such as Denon to "seed" the RDS marketplace among broadcasters. (Denon denies that encoders are being given away, but they are being bartered out in exchange for RDS promotion on those stations that get them.)

"While I applaud Denon's efforts in getting RDS to go, the source said, "they've also made our life difficult because we've been unable to sell the encoders because (they) are giving them away."

On the flip side, Andy Bosworth, vice president of sales and marketing for RE America, an early RDS supporter, said the technology is "going to happen. It's just going to take time." Dave Burns, studio products manager at Harris Allied, said he believes that if the distributors, dealers and manufacturers of RDS encoding and decoding equipment "market, advertise and promote the features and benefits of the technology... RBDS stands a very good chance of success." He noted, however, that he believes RDS "is a technology in search of an application."

## A lot to be done

Modulation Sciences President Eric Small, whose company manufactures an

RDS encoder computer board and RDS monitor, said RDS is going to happen "in one mode or another."

He cited the slow incidence of consumer receivers as an element of the slow progress of the technology, and said that there is a lot to be done. "I lay a lot of the responsibility on the failure of leadership of the NAB, which contrasts with how positive EIA has been," he said. Small pointed to the many non-broadcast RDS applications, which include global positioning and intelligent highways, as revenue-producing benefits being supported by his company.

Tim Schwieger, vice president of marketing for Broadcast Supply Worldwide said he believes RDS is a "wonderful" technology, but sees "little or no interest at all" in RDS among broadcasters at this time. Schwieger said the technology "will be successful the day a radio station is losing revenue or listeners because his competitor has this technology. It will happen eventually, once programming and promotion understand and appreciate the incredible tool they have at their fingertips."

But RDS's potential is held in high regard by Norman Beil, head of New Media at Geffen Records, a prominent record company. "Digital readout of artist, song title and album would be a dream come true for record labels," he said. "Radio sells records, but too often the consumer is left with only a tune to hum to the store clerk. RBDS would solve that problem and increase sales."

## How to succeed

What will it take for RDS to fully succeed? Many think the new Emergency Alert System (EAS) will be one factor. The EIA's Shapiro, for example, said "the EAS decision was a strong message from the FCC that RDS is a viable technology which serves a number of functions. I think it was very supportive of RDS. I don't see how it could be read any other way."

And Harris Allied's Burns said that "RBDS (RDS) could get a good injection if the RBDS (RDS) version of EAS is espoused by broadcasters."

And what of high speed data and DAB? Group W Radio's Director of Engineering Glynn Walden, looks at DAB as "a super subcarrier that really overrides anything that RDS is capable of doing, and really kind of dwarfs it."

Sage Alerting's LeBow countered that high speed RBDS and DAB are not only different from RDS, they're "...very far down the road."

Ultimately, strong broadcaster and receiver manufacturer commitment will likely result in success for RDS, but how many stations is enough?

Denon's Marketing Manager John Casey shifts the RDS focus back to the three overused words when asked if 1,000 stations is the line that indicates RDS strength. "It's enough to break the chicken and egg story, and that's what needs to be done initially," he said.

Denon's Vice President of Sales and Marketing, Stephen Baker said RDS is in a "win, win, win situation."

"The issue is that RDS provides extra value to the listener and it's a potential source of revenue for the radio station and the manufacturer," Baker said. "And I don't think it really matters how the system finally reaches critical mass in the marketplace, because once the system is running, it benefits everybody."

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# ISDN Spreads Winter Solstice Celebration

by David Glasser

**NEW YORK** Paul Winter's "Whole Earth Winter Solstice Christmas Celebration" at New York City's Cathedral of St. John The Divine has been presented for 15 years and has become a tradition both for concert goers in New York as well as listeners on National Public Radio.

NPR's broadcast of this event has been produced by Murray Street Productions for the past eight years, and during this time the broadcast production of the concert has served as a test bed for several new technologies and techniques. This year we decided to try a digital terrestrial backhaul of our feed utilizing ISDN and ISO/MPEG Layer II audio compression.

## High quality backhaul

St. John's is, remarkably, the world's largest Gothic cathedral and Paul Winter literally "plays" the cavernous space for the 3000-member audience by staging musical processions up and down the vast nave and altar areas and hoisting a 7-foot gong 12 stories up into the vaulted ceiling. NPR, Paul Winter, and broadcast producer Steve Rathe all demand a very high quality broadcast production. We try to capture the ambiance of the cathedral and the essence of the stage production by placing mics in various locations around the cathedral in addition to splitting the 30-odd stage mics.

A critical part of our production is the backhaul of the feed to the main NPR uplink site in Washington. After doing all of our hard work at the cathedral, we want to make sure the backhaul is as transparent as possible.

## New technology

NPR's broadcast of this annual event has served as a "test bed" for several technologies and techniques. In 1987, the concert was mixed in Ambisonic surround-sound using a Calrec Soundfield mic, Ambisonic Pan/Rotate processor and Ambisonic encoder and recorded live to tape for delayed broadcast. In 1990, NPR did its first live feed of the event. The signal was encoded via Sony F1 Digital Processor—and backhauled via microwave 150 blocks south to a WNYC(FM) receiver at the World Trade Center. From the World Trade Center the signal was backhauled via satellite to Washington.

In 1989 we began our association with the Record Plant Remote and used a C-band uplink for a direct network live feed. This was also the first year that the concert was recorded for release. The recordings were made on a 32-track digital machine provided by Paul Winter and released as "Solstice Live" on Living Music Records.

In 1993, in order to simplify the live production, we created a recordable CD of the show open, close, and intermission features. Two CD players were available to sequence between tracks if the concert ran off schedule. This technique has become standard procedure for our live broadcast production.

The concert backhaul over the past couple years has been via Ku-band satellite with a digital audio channel operating at 128 kilobits per second (Kbps). It was necessary to switch from C-band to Ku-band

because of physical obstructions with the larger C-band dish on the property. The Ku-band equipment is much more convenient to work with than the C-band equipment, but we have been disappointed in the sound quality from the 128 Kbps transmission. Thus our motivation to try ISDN.

In 1994, Steve Rathe suggested we investigate ISDN service as a higher-quality and lower-cost alternative to the Ku-band satellite backhaul. We agreed that we needed to use a system which would allow us to operate at either a 256 or 384 Kbps data rate. We felt the higher data rate that could be achieved by multiplexing two or three ISDN lines together was essential to achieving the best audio quality and insuring against the possibility of a line failure.

Currently, the most common digital

National (N11) firmware for RE662/663 would not be available. However, RE was still very interested in promoting the high data rate application so they agreed to put together a system utilizing the RE660/661 and an outboard network interface with IMUX capacity.

## Ordering lines

We had several new ISDN lines installed for our backhaul. All of the lines were ordered out of the NPR Systems Technical Center (STC) in Washington. Two new dedicated lines were installed at the STC and three lines were installed at the Cathedral. The NPR staff had been ordering and using ISDN lines for some time and took the following precautions when ordering the new lines for our backhaul. First they checked for National

requirements for the service as being circuit-switched data (not voice or packet-switched data), 64 Kbps clear channel access, and simultaneous access to both B channels. After contacting the local carriers and getting the local phone numbers they then confirmed 64 Kbps conductivity between these numbers through the long distance carrier.

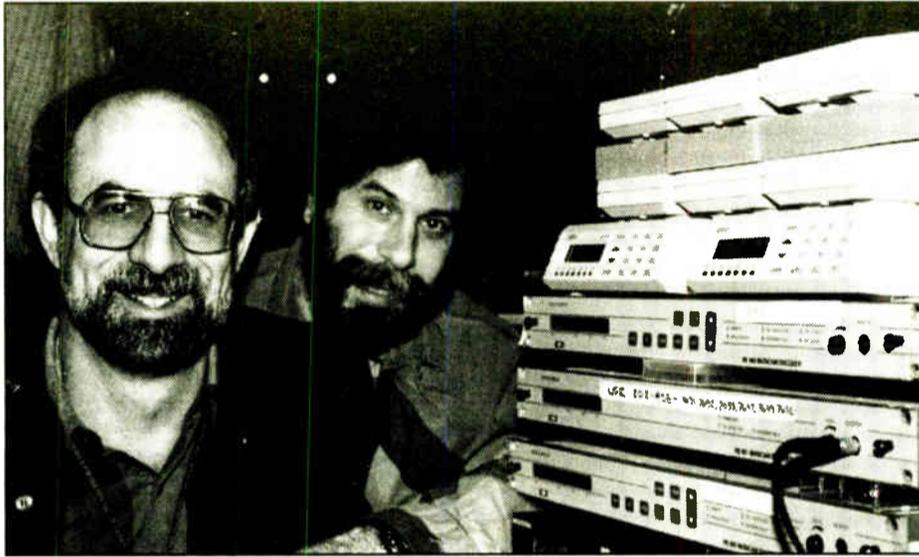
The two new lines ordered through Bell Atlantic were installed and tested without incident a week before the broadcast. The question was now what would be the status of the lines installed at the cathedral. The three lines in New York were ordered and installed through NYNEX a week and a half before the date of the broadcast. Unfortunately, even after taking all precautions, when we arrived in New York we found out that the lines were not provisioned correctly to work with our terminal equipment.

## Sorting things out

Fortunately, RE America, in addition to providing equipment, also sent Steve Watts as its representative to New York to help out with the setup. His expertise was invaluable to the success of the broadcast. As it turned out, Steve had to wade through NYNEX bureaucracy, and then decipher their terminology to get usable information on the line provisioning. After being immersed for two days in the murky world of SPID's translation tables and terminal types, Steve got things sorted out between NYNEX's switch and our terminal equipment (while racking up a whopper of a Cellphone bill!).

One and a half hours before airtime, we finally got the correct provisioning on two of our three lines giving us 256 Kbps service. Listening to the signal looped back from Washington, I was very impressed (and relieved). We decided not to allow NYNEX to perform any further

continued on page 25 ▶



Steve Rathe, producer (l) and David Glasser behind the board at the "Winter Solstice" broadcast

audio transmission applications over ISDN or Switched 56 services are at data rates between 56 Kbps and 128 Kbps. ISO/MPEG Layer II coding gives the user the ability to use data rates all the way up to 384 Kbps. When utilizing three ISDN lines for a stereo transmission, the Layer II algorithm is operating at a compression ratio of approximately 3 to 1. Our plan was to utilize it at a 384 Kbps, data rate for the highest quality audio transmission and for the ability to fall back to 256 Kbps if one ISDN line went down.

We felt that our concert backhaul would be an excellent way to test ISDN functionality and Layer II coding.

## RE 660/661 Codec

Even though the Layer II algorithm allows you to vary compression ratios and data rates from 56 Kbps to 384 Kbps not all Layer II codecs support the higher data rate applications. After discussing the application with RE America at the AES show in November, we learned that RE had two ISO/MPEG Layer II codecs that could perform the high data rate audio coding for our application: the RE660/661, designed for use with external network interfaces such as ISDN Terminal Adapters, SW56 CSUs, or T1 channel banks and the RE662/663, ISDN-specific with three built-in ISDN interfaces and an inverse multiplexer that can operate at data rates up to 384 Kbps.

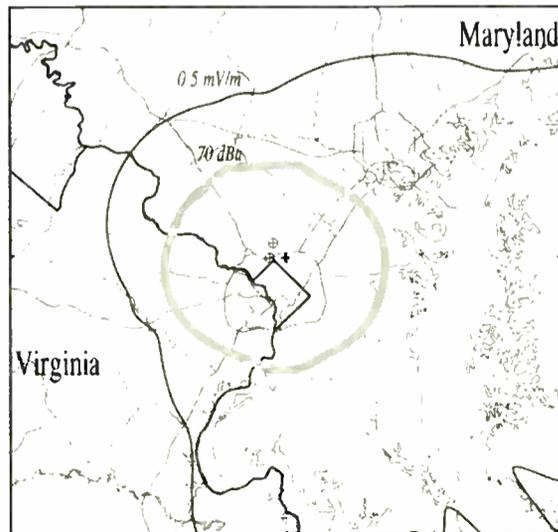
The RE662/663 appeared to be the perfect match for our application, but due to the timing of our broadcast the U.S.

ISDN (N11) availability out of the local carrier's central offices (National ISDN is much preferred over custom versions of ISDN). Once they had confirmed the availability of N11, NPR specified the



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# MARKETPLACE

## Recently Introduced Products for the Radio Broadcast Professional

### Mixing Console

Otari's B-10 series audio mixing console is a compact unit suitable for studio mixing at broadcast stations. The 30 mm-wide modules reduce the total width of the console. Channels can be combined in up to four groups, allowing flexible applications for various types of program and recording systems.

The B-10 provides three talkback outputs, in addition to one studio talkback output. Also, talkback signals can be routed to the program bus when the B-10 is not in on-air mode.

Faders are VCA-controlled with external control function. The fader play output can be used to play and stop external equipment.

For information, contact the company in California at 415-341-5900; fax: 415-341-7200.

### SPDT "Hot" Switch

Narda's 600 WCW hot switch is designed for dynamic switching of failed antennas and power amplifiers operating under full power. Applications include PCS systems, cellular antenna communications, air traffic control, DME and TACAN systems.

Model SEM023DNH is a single-pole, two-throw, type-N connector switch handling 600 WCW to 1 GHz and 300 W to 3 GHz. This switch offers isolation of 80 dB and low return loss. It can also be used with Narda's CellGuard power/VSWR monitor for closed-loop actuation and control at the cell site.

For information, contact the company in New York at 516-231-1700; fax: 516-231-1711.

### Adapters for Cellular Equipment

The RFA-4026 Celludapt adapters from RF Industries Ltd. are designed to fit the antenna outputs of practically every cellular radio and telephone made.

The 22-piece kit includes an inductive coupler for fixed antennas, which consists of 3 feet of cable terminated with unidapt universal connectors.

All Celludapt sections are made of silver-plated machined brass with a gold-plated phosphor bronze center contact anchored in a Teflon dielectric.

The company plans to introduce adapters to fit new cellular radios/telephones as they become available. Expansion slots are provided in the foam-lined case for those new additions.

For information, contact Les Perlman in California at 800-233-1728; fax: 619-549-6345.

### Digital Audio Cables

Gotham Switzerland offers a range of multipair AES/EBU 110-ohms digital audio cables. Four different multipair types are available: GAC-4, -8, -10 and -12 (numbers indicate the number of pairs).

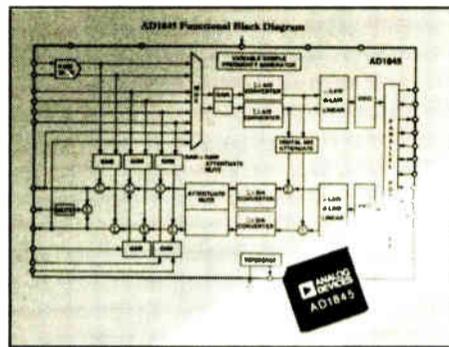
The basis for these cables is the GAC-2/1 AES/EBU cable, which guarantees a constant impedance of 110 ohms over the entire run of the cable.

Gotham's double Reussen shield, featuring two opposing, spiral-wound, bare

copper shields, helps the cable achieve high flexibility with tight electrical performance tolerances.

Constant impedance is achieved by means of two nonconducting strands in the core that maintain the correct geometrical position of the two conductors, even when the cable is bent or kinked.

For information, contact DGS Pro-Audio in Texas at 800-292-2834; fax: 817-473-7712.



### Voltage References

The REF192, REF193, REF194 and REF196 by Analog Devices Inc. are four precision voltage references with guaranteed precision and micropower specifications. These models are ideal for low-power measurement applications and battery-operated instrumentation and provide long-term stability to a variety of calibration circuits. In addition to typical reference applications, they can be used as precision regulators that deliver up to 30 mA of load current.

Line and load regulation are characterized by high accuracy over a wide range of operating conditions. Sleep mode, available on all voltage options, is activated by a standard TTL/CMOS-compatible logic input.

For information, contact the company in Massachusetts at 617-937-1428; fax: 617-821-4273.



### Product and Application Guide

SSAC Inc. has updated its Tower and Obstruction Lighting Controls Application guide. The 16-page applications and product selection guide now includes lamp outage and beacon flasher monitoring relays, as lamp outage and failed monitoring relays are now required to meet new FAA lighting inspection procedures.

A new selection guide cross-references products and applications, making product choice fast and easy. Each data sheet contains complete specifications and typical connection diagrams, making it easy to select the correct part number. Pricing

for each product and a list of sales representatives and stocking distributors are also included.

For information, contact Dave Eastwood in New York at 315-638-1300; fax: 315-638-0333.

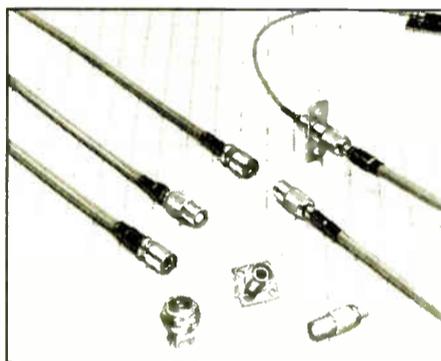
### Real-Time, Two-Channel Processor

The Digital Spatializer from Spatializer Audio Labs Inc. is a real-time, two-channel processor that provides precise control of expanded stereo imaging and realistic stereo synthesis from mono sources. This unit was developed in cooperation with dB Technologies for use in CD mastering facilities and for localization of individual sounds in the stereo sound stage.

Digital Spatializer interfaces with digital consoles, tape machine and converters and is especially useful in stereo enhancement of archival masters for CD re-issues.

Finished products are in Spatialized 3-D sound and are mono compatible. They require no decoding or additional power in broadcast or playback applications.

For information, contact Fred Balch in California at 310-268-2700; fax: 310-444-4970.



### RF Coaxial Connectors

The POD1 series of push-on, locking RF coaxial connectors from Hirose Electric measure about half the diameter of some BNC and TNC locking connectors. The diameter of jacks and plugs, for instance, is as small as 7.6 mm.

The push-on POD1 connectors provide optimum 50 ohm impedance for external wiring of microwave band and high-speed pulse transfer signals in mobile communications equipment. These connectors are currently being utilized in GPS and similar RF applications.

The push-on locking system works by locking the connectors, regardless of which part of the connector is held. The connector will not inadvertently disconnect, even when force is applied to the cable.

For information, contact the company in California at 805-522-7958; fax: 805-522-3217.

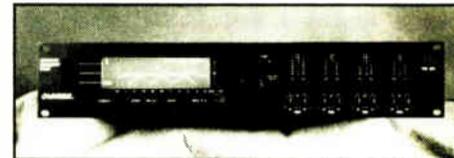
### FM Filter

The LPF-108/176N filter from Communications & Energy Corp. suppresses FM harmonic frequencies up to 1,000 MHz. The filter has a passband of 88 to 108 MHz, with an insertion loss of 0.5 dB and a VSWR of 1.3:1. Stopband rejection is 40 dB from 176 to 1,000 MHz.

Connectors are 50-ohm, type-N

(female) connectors. Power handling is 450 W. The unit measures 1.19 inches by 2 inches by 4 inches and weighs 3 pounds.

For information, contact Steve Shafer in New York state at 315-452-0709; fax: 315-452-0732.



### Loudspeaker Management System

BSS Audio's Omnidrive loudspeaker management system combines two channels of four-way crossover, parametric equalization, phase correction, delay line and limiters in a compact 2U chassis. Its size saves on rack-space usage and weight, with the added advantage of reduced interconnection cabling.

Among the system's features are 60 user-programmable memories for storage of system/venue setups, which may be protected by password to prevent unauthorized access or adjustment on site.

A unique facility is provided for automatic adjustment of delay times as ambient temperature changes, and correction of HF response with humidity variation.

For information, contact Roscoe Anthony in California at 818-894-8850; fax: 818-830-1220.

### A/D Converter

The AD122 stereophonic A/D converter from dB Technologies converts analog signals to a 22-bit digital audio data stream. The AD122 combines high linearity, fast and accurate transient response, small quantization steps and low-noise performance to produce high-resolution digital audio.

This converter features built-in acoustic bit correction redithering to 16- to 20-bit formats and a precision reference meter bridge. The AD122 also offers AES and word clock external synchronization and fully programmable digital test tones for system alignment.

For information, contact the company in California at 213-845-1155; fax: 213-845-1170.

### Stereo Codec

Analog Devices' AD1845 16-bit stereo codec for PC-based audio and multimedia applications integrates all asynchronous audio data conversion and control functions. The AD1845 is also backwards compatible with other Analog Devices codecs and is pin-compatible with other industry-standard codecs.

Other features include full duplex operation, which allows simultaneous record/playback in audio or speak/listen in telephony applications, FIFO registers and power management.

This codec is designed for PC motherboards, PC add-in cards and PCMCIA audio cards. The AD1845 supports Windows Sound System 2.0 software. Drivers for Windows Sound System and a driver applet are available from Analog Devices at no charge.

For information, contact the company in Massachusetts at 617-461-3881.

continued on page 93 ►

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## FROM THE TRENCHES

by Alan Peterson



### Perusing the Winter Bookshelf Can Cause Undue Mental Stress

Dear Luci,

I really must be a little more selective in my choices for winter reading material.

A few weeks back I bought—on impulse—a book called "Why Buildings Fall Down" (Levy & Salvadori, 1992 Norton Publishers). This is a history of architectural and structural disasters, both ancient and current-day. These include some familiar names and events: the Hartford Civic Center, L'Ambience Plaza and Mianus River Bridge, all in Connecticut; the Kemper Arena and Hyatt Regency walkway, both Kansas City, and the C.W. Post Dome and Schoharie Bridge, in New York State. All very disastrous, but at the same time instructive. The book is mildly scientific, and not at all sensationalist.

The result of my snowbound armchair reading? It began by my hearing imaginary creaks and groans coming from my apartment. It progressed into going around the entire place with a stud sensor to find out how much redundancy there was in the walls to hold the joint up. Brushing soap solution over gas fittings and pulling outlets from walls to check for aluminum wiring. Did I freak? Only a lot.

Even a trip to the nearby home center didn't escape scrutiny... just how many skinny little wires were there holding up that heavy-looking trusswork for the lighting display? How much should I worry that a level I bought from them proved their own display racks were out of plumb?

So just how does my paranoia apply to what we try to do at the station level? Well, it certainly gave me an appreciation for worst-case scenarios that can be worked out in reverse to spot problems I wasn't sure about the first time... A sort of "Why Stations Fall Down," as it were.

It's tough for me to forget the day the tower painters came to my Massachusetts station in the mid-1980s to put a fresh coat on a long-neglected tower. Not two hours into the project, they all but parachuted right back down again, quite upset, after their scrapers punched right through the corroded metal of one of the tower legs! Needless to say, it was replaced with a new structure within months.

There was one AM I visited where the studios, shack and all were built on swampy land. Conductivity around the radials must have been exceptional, but the threat of electrocution with perpetually damp indoor carpeting was unacceptable. I give their foundation another five years.

Chapter two, "Why Toilets Fall Down." Stations in older wood-constructed buildings better sneak a peek under the seal on the floor. The modulus of elasticity for rotted wood flooring will guarantee a quick ride to the basement for anyone

weighing in a little too high. A wax seal and a few sheets of plywood are a lot less expensive for the company than workman's comp.

How about "Why Consoles Fall Down"? That wobbly plank toenailed to the wall at one end with the soda-shoppe legs holding up the other? The one supporting the entire control room's complement of gear? The one all the jocks say feels like it's going to fall? It will. One good bump, it will. Conscientious operations managers should take care of it now.

It won't always be structural conditions that require a "sky-might-be-falling" temperament, Luci. Have you ever touched the metal front of a consumer cassette or CD deck and noticed a sensation similar to your finger slipping along wet glass? Take a VOM and measure that front panel against AC ground and you'll find a nice bit of leakage that is lying in wait to zap somebody when conditions are just right. Solution: flip the plug to the device. Better solution: check all the wiring.

Redundancy in instructions and procedures is as important as it is in construction. We lost an expensive dummy load (and almost a whole lot more) overnight one Thanksgiving holiday when a piece of transmission line shorted out and took us off the air. The jocks, not knowing exactly why we were off, did their best to put the station back on by different combinations on the remote control. Their efforts unfortunately resulted in dumping full power into the dummy for half the night. Before long the dummy load became a three-thousand dollar, 50 kW electric hibachi and only a holiday trip up the mountain by our assistant chief engineer saved the day, the station and our jobs. New policy: all jocks must know what every button on the remote does, and how they interact.

The suggestion might be made that, thanks to this book, I am overreacting. Perhaps, but one common thread I found in most of the case histories of the book is the "oh yeah" experience that follows the investigation of any disaster. A flip through this book might make a lot of managers rethink the contractors' suggestion to add on that second story without a good hard look at what's holding up the first.

Did I say I should be more selective in my reading material? Forget it. It may have just built a safer station in the future. Happy first day of spring.

—Al

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Alan Peterson is production director for WNNK-FM, Harrisburg, PA 17110. Next winter he'll limit his reading to Calvin and Hobbes collections.



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## FEEDLINE

# Use Tee-Nets to Fine-Tune Your AM Array

by W.C. Alexander

**DALLAS** Whether designing a simple antenna tuning unit (ATU) or a complete phasing and coupling system in a multi-element directional array, engineers have for years been using conventional tee-network formulas to compute component values, phase shifts and current/voltage values.

These tee-network formulas work. They are tried and true. Why, then, can you not adjust network to the calculated values with a bridge, then plug the network in and have it work? Sometimes you can, but most of the time, field adjustment is required to "fine-tune" the network to the "real world."

## Theory vs. real world

The reasons for the disparity between theoretical and real world in RF network design are numerous and beyond the scope of this discussion. There are, however, design methods now available to engineers to fine-tune network designs on paper that result in component value settings much closer to those required for real-world applications. These new methods, which incorporate moment-method computer modeling, do not take the place of the old tried-and-true; they merely augment them. Many practicing engineers are learning to integrate the new with the old.

Over the past couple of years, I have had to learn to do this. I think it is worth sharing. If you have a project involving network design, redesign or adjustment in your future, you might want to take a look.

The typical approach to designing a phasor is a twofold process: First, a combination of network (phasor and ATU) phase shifts is found through a trial-and-error process that, along with the fixed transmission line lengths and power divider phase shifts, will produce the correct phases at the towers. This process can sometimes take a long time, and there may be many combinations of network phase shifts that result in the desired element phases.

There are computer programs available that can calculate the various combinations and present them to the designer. He can then choose the one that will work the best.

## Traditional formulas

Next, with the design phase shifts and power distribution known, the individual networks are designed using the traditional tee-network formulas. Usually this part of the design process involves making allowances for the unknown. After the nominal component values are calculated, additional calculations are made using the design phase shift  $\pm 20^\circ$  and using 1-1/2 times the design branch power with 125 percent positive modulation.

In ATU networks, a generous allowance is usually made for widely varying load resistance and reactance values. The resulting component values should then allow for plenty of phase-shift adjustment and have adequate voltage and current safety margins. The phasor schematic is then sent to a manufacturer along with a parts list.

The manufacturer computes his cost in manpower and materials to construct the design, adds in his overhead and profit and sends his bid back to the design engineer or client. If the price is acceptable, an order is placed and at some point down the road, a really big truck arrives at the transmitter site with the phasor and ATUs aboard. It is now up to the field engineer to install the system and make it work.

Most manufacturers of phasing and coupling equipment will pre-set all the components to their design values prior to shipment. Even so, after installation when power is applied to the system, the resulting directional antenna parameters, as indicated by the antenna monitor, seldom come close to being what the designer intended.

## Much tuning needed

A great deal of tuning—and not all of it using the phasor front panel controls—is usually needed to get the parameters right. Driving point impedances must then be measured, tee-network values recalculated and network values reset. This sometimes takes days. Moment-method software can give the designer an extremely

valuable tool in network and system design.

Most of us have been hearing about moment-method or numerical electrical code (NEC) software for years. Some may have even used it to model simple antennas. MININEC and its various derivatives that have been around for years are useful in modeling non-directional AM radiators with a high degree of accuracy. A matrix inversion program is needed, however, to make such programs accurately model a typical AM directional array. There are several such programs available.

## Operating parameters on directional arrays can be very different from the theoretical ones.

When modeling a directional array with a moment-method program, the output typically contains the driving point impedances, phases and currents for the array modeled. Remember that the directional antenna pattern phases and ratios are radiated field values. The classic formulas calculate radiated fields based upon currents at the loop (point of maximum current). Seldom will the current loop on a given radiator occur at the driving point.

Those of who have worked for very long on directional arrays know how different the operating parameters can be from the theoretical parameters. This is due in part to sampling system errors, but also to the fact that seldom are sample loops or transformers positioned at the current maximum.

## Z or Y matrix

Another output of a typical moment-method program is the Z or Y matrix at the carrier and sideband frequencies. This data is produced in tabular format that can be later read by other moment-method routines to analyze overall system performance.

There are nodal analysis programs available that can perform a detailed analysis on any network that can be described in terms of a combination of inductors, capacitors, impedances (loads), transmission lines and current sources. An entire phasing and coupling system, from

transmitter output to the individual array elements, can be modeled and analyzed with a high degree of accuracy. Branch voltage, branch current, from node impedance and to node impedance is computed for each circuit element. Node voltage is computed at each node, and VSWR at each transmission line element is also calculated.

Used in combination with the Z or Y matrix output of a moment-method antenna modeling program, a nodal analysis program can show how an entire phasing and coupling system will work at any combination of carrier and sideband frequencies. By repetitively making slight component value changes and re-running the program, a design can be fine-tuned for best bandwidth and overall system performance. Inadvertent high-Q circuits can often be redesigned, and common-point network phase shift can be rotated for best bandwidth and symmetry.

## Near the parameters

Several engineers involved in both the manufacturing and operational ends of phasing and coupling equipment have told me that systems pre-set at the factory to the component values determined using the moment-method and nodal analysis programs almost always come up very near the design parameters when first energized. A few extra hours spent in the design process can thus save days in the field!

Further, several reputable and experienced engineers that have used this method have told me that very little field tuning is required to "make the pattern," a big departure from the usual lengthy and expensive "talk-in" procedures necessary with a conventional DA setup. I assume that this occurs in the absence of significant re-radiation. Still, if you can cut tune-up time from weeks to hours, you have saved a tremendous amount of time and expense.

If a network or whole phasing and coupling system design is looming in your future, it is a worthwhile thing to check out some of the new design methods. They do not in any way replace the tried-and-true, but they do provide us with tools to fine-tune our design, often resulting in a better working, better sounding and more efficient antenna system at a reduced cost.

□ □ □

*Cris Alexander is director of engineering for Crawford Broadcasting in Dallas. He can be reached at P.O. Box 561307, Dallas, TX 75356.*

## Winter Solstice Celebration

► continued from page 19

work on the third ISDN line in fear that we would lose the 256 Kbps service Steve had struggled to obtain. The third line would have given us the 384 Kbps service we planned on.

## Good-bye artifacts

The 256 Kbps transmission seemed to be free of most of the artifacts that I disliked on the 128 Kbps service. The stereo image was almost as stable as the source, but the stereo width was slightly narrowed. The low end was also slightly reduced. For FM broadcasts, though, I was extremely pleased with the results.

In the Record Plant truck, we utilized the digital input feature on the RE600 encoder to feed an AES digital signal from a Wadia A/D converter. At NPR, the network was fed from the RE661 decoder's analog output. NPR also recorded a DAT from the digital output of the RE661 decoder, making it possible to compare the signal recorded on site with the signal recorded in Washington after digital encoding and decoding.

My "day job" is CD mastering, an enterprise where 16 bits is never enough and the mere mention of data compression is taboo. In the real world of remote broadcasts (especially with tight public radio budgets) and the limitations of FM radio, however, ISDN and data compression represent an improvement in sound quality over analog phone circuits and

microwave transmissions and are certainly more convenient than a portable satellite uplink truck (which always seems to be caught in a blizzard or a traffic tie-up just when you're ready to start testing circuits).

## Definite benefits

The down side of ISDN is that, after kissing telcos good-bye and relying on satellite transmission for the past 10 years, ISDN once again put us at the mercy of the telephone companies. And as we learned, ISDN is still not quite a "plug and play" technology. Yes, there are standards, but universal strict compliance with those standards is probably a ways away. The biggest hurdle in the whole process is getting the lines installed and configured properly. Once we got our lines installed, the RE codec worked flawlessly. It would have been nice to have had the opportunity to listen to the material coded at 384 Kbps but we were nonetheless very impressed with the audio quality at 256 Kbps. Yes, ISDN service is not universal, and yes, there are uncertainties, but the benefits are there.

□ □ □

*David Glasser owns Airshow, Inc., a digital editing and CD mastering facility in Springfield, Va. David has been the technical director and mixer of NPR's Paul Winter broadcasts since 1987. He can be reached at 703-642-9035.*

*For information on the RE600/661 Musicam codec contact RE America in Westlake, Ohio at 216-871-7617.*

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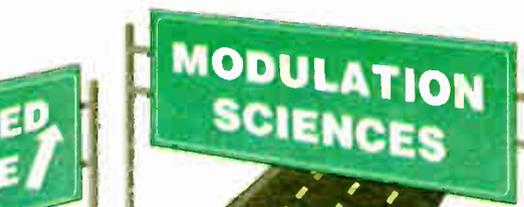
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## STATION SKETCHES

# Fine Points of Turntable Adjustment

by Tom Vernon

**HARRISBURG, Pa.** I wrote about turntable maintenance in last month's column. I made the point that mechanical alignment had to be completed before electronic adjustments were contemplated.

The turntable base must be perfectly level, and massive enough to thwart room vibrations. The cartridge must be accurately aligned in the headshell, and the tone-arm height needs to be properly adjusted.

## Need test records

Electronic alignment of the turntable system is dependent on having test records, and this is a major problem these days. If you are fortunate enough to have a test record in good condition, count your blessings, as they don't make them anymore. There is a partial solution to the test record dilemma, but that comes later.

First on the list is adjusting for proper anti-skating force. For this you'll need a test record with a high-level lateral cut, and an oscilloscope. Connect the scope to the left and right output of the preamp, and set it for an "X-Y" display, as you would for tape azimuth adjustments. When correctly adjusted, you will see a straight line. Asymmetrical mistracking is indicated by a trace that is bent on the ends.

Finally, it is time to do a frequency response run. Be sure to start out with a new stylus and a good test record. Worn test records will give misleading HF information. You should be able to achieve a response of 30 to 20,000 Hz +/- 0.5 dB. If this is your first time through the system, however, you may find no life above 8 kHz. Don't despair. With a new stylus and properly aligned cartridge, the problem will probably boil down to improper loading in the turntable preamp.

## Values specified

Manufacturers specify certain values for resistive and capacitive loading of their cartridges. Turntable preamps may have been designed for other cartridges, or have values that represent a compromise. The ubiquitous Stanton 681 series for example, needs to see 47 kilo-ohms and 270 pF to give a flat response. Other cartridges/manufacturers have different values. You might think that fixing this situation involves matching the specified component values in the preamp, but it is a bit more complicated. The cable that connects the tone-arm to the preamp adds resistance and capacitance. For some types of cable, this can be as much as 100 pF/ft. The trick is to find the right component values that take this into account.

Getting flat response is a tedious trial-and-error procedure. I find it goes a lot faster if you modify the preamp with trimmer resistors and capacitors, rather than soldering an infinite combination of 10 and 5 pF capacitors on tiny solder pads.

Using a DVM and digital capacitance meter plugged into the head shell lets you set up trimmers quickly.

Finally, use the 1 K reference tone to balance channels and set operating level. Play a good direct-to-disc recording with loud passages while observing the preamp's outputs on an oscilloscope. Set gain to allow at least 6 dB of headroom

between the lowest passage and peak clipping. At least one brand of TT pre-amp has sensitivity controls that need to be properly adjusted for headroom as well.

## Routine checks

Turntables in continuous on-air use need to have stylus checked and replaced regularly. Inspection with a microscope won't do. Sound quality deteriorates long before mechanical wear of the diamond takes place. This is usually due to bending of the stylus shank and breakdown of the damping mechanism within the stylus.

Deterioration also takes place just by exposure to air pollution. That is why it

is a good idea to keep your spare styli sealed in a plastic bag till they are needed.

Preventive maintenance of turntable systems is essential to continued sonic quality. Styli on regularly used turntables will need to be changed monthly, if not more often. At the same time, check the tracking force. It should be within one-half gram of your in-house standard.

Quarterly maintenance should include such things as checking cartridge alignment and overhang, verifying response and channel balance with a test record, and checking for proper operation of all turntable controls.

The speed and start/stop buttons in most

modern turntables gradually get packed with dust, and work slowly, then not at all. Microswitches underneath the buttons become noisy and erratic, and that is a separate problem. Both difficulties are easily remedied by careful disassembly and cleaning.

Every six months, remove the platter, vacuum out the interior, and oil the center bearing per manufacturer's instructions.

While the vinyl disc will never surpass CDs, the quality obtainable from a well-maintained turntable system may surprise you.

□□□

Tom Vernon's other writing activities include reviewing computer programs and multimedia CD-ROMs for various magazines. His current radio address is WXPN in Philadelphia. He can be reached at 717-367-5595.

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## INSIGHT-ON-RULES

# Comments Filed on 'Unattended' NPRM

by Harold Hallikainen

**SAN LUIS OBISPO, Calif.** On Dec. 7, 1994, the FCC released a Notice of Proposed Rulemaking that proposes vast changes in the operator requirements for broadcast stations. Approximately 50 sets of comments were filed in response to the NPRM. Copies of the comments and reply comments are available from International Transcription Services at 202-857-3800.

This time out I'll review the comments filed with the commission. It is interesting to note the type of entity that filed the comments and guess at what self-interest they

may have in the proceeding. Broadcast stations are generally interested in reducing expenses. Some engineers are interested in keeping their jobs. Manufacturers are interested in selling equipment. Few commented on interference protection.

## Stations in favor

Several stations wrote short letters expressing support for the idea of unattended operation but offering little guidance as to what form the final rules should take. Several stations stated that with unattended operation they would financially be able to extend their broadcast hours. Some wrote extensive comments carefully

considering the interference possibilities of the various proposals.

Several commenters questioned the "three-minute shutdown" requirement of the proposed rules (that was taken from the existing ATS rules). One commenter said that a dial-up remote control unit can alert station personnel of an out-of-tolerance condition and that person can return the transmitter to proper operation without a shutdown. This appears to me, however, to NOT be unattended operation.

Unattended operation would not rely upon station personnel at all. They could be notified of a pending shutdown, but if the condition is not corrected within some

FCC-determined time, the station should shut down.

Most commenters suggested that more than three minutes of operation in an "interference causing" condition be allowed. The longer period was generally favored to allow station personnel to be notified and to take action before the station was shut down automatically. The AFCCE argues that failure of AM stations to make mode changes does not IMMEDIATELY cause interference, because the day/night propagation changes occur gradually. It suggests a 30-minute period of continued operation while the condition is corrected. Because the propagation "shift" could be considered complete after 30 minutes, a station would then have three minutes to correct the problem or shut down.

## One suggestion

AFCCE suggests that the three-minute limit should be retained when significant interference would be caused. The circumstances they suggest would require a three-minute shutdown would be if the power is more than two times that authorized or if modulation exceeds 150 percent. The "factor of two" concept in power determination is based on the substantial variation in propagation for both AM and FM services. More interference is caused by propagation variations than minor (up to double power) variations in power. I do find the 150 percent modulation limit interesting. It seems that for both AM and FM services, 150 percent modulation could cause significant interference to adjacent channels. The AFCCE suggests a two-hour shutdown should the power exceed authorized limits (105 percent of licensed for radio services) but be less than 200 percent of authorized power.

## Weekend concerns

Retaining transmitter operators would prevent off-air weekends. Another commenter mentioned this possibility of extended downtime and suggested that ATS systems be required to notify station personnel when a shutdown is required.

Another commenter suggested a 30-minute shutdown when the station has an operator and three minutes when no operator is present. The justification for the extended time when an operator is present is that the operator has many other responsibilities during the period he or she is in charge of station operation and that it is not always possible for that operator to drop everything to correct a non-compliant condition within three minutes.

NAB says that a one- to three-hour time limit on operating in an interference-causing condition would allow station personnel to respond and possibly correct the problem without lost air time.

NPR appears to suggest that no shutdown based on transmission parameters be required. Instead, the station would have to take corrective action (possibly shutting down) upon learning of actually causing interference, possibly through a phone call from the FCC or other sources. As an alternative, NPR suggests the three-minute shutdown requirement be extended to several hours to allow the malfunction to be corrected.

## ATS required?

Some commenters said that stations should not be required to have some sort of ATS to run unattended. Some gave little justification for this position. Others cited demonstrated transmission system stability.

continued on page 31 ►

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# Learning to Work with a Tee-Net

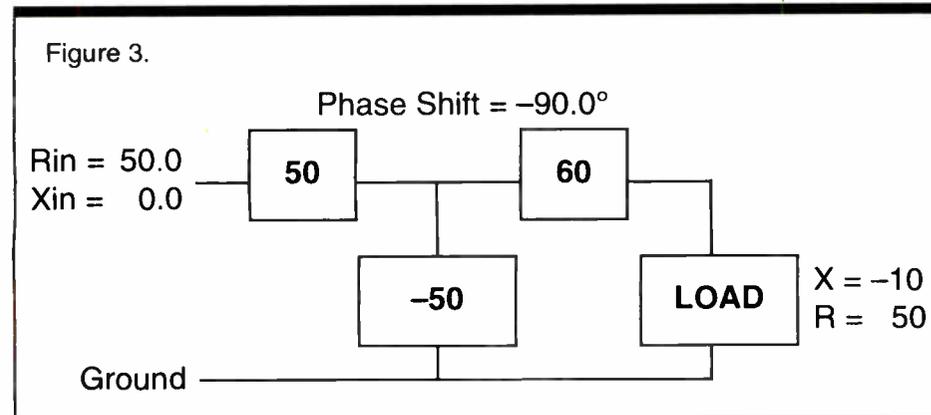
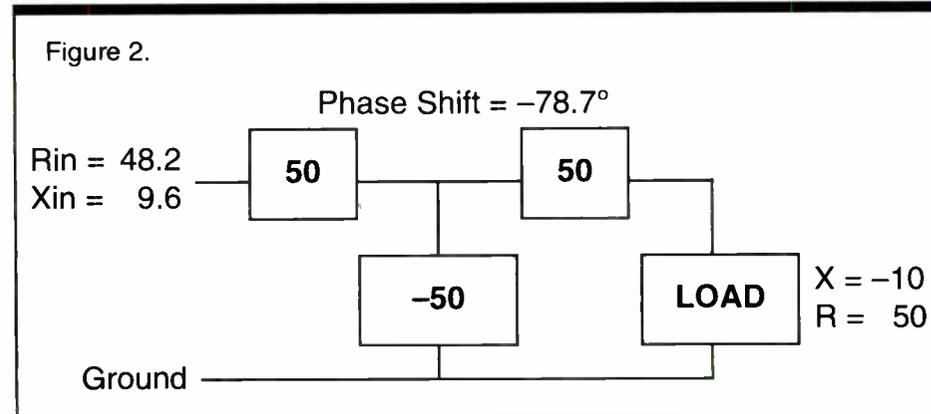
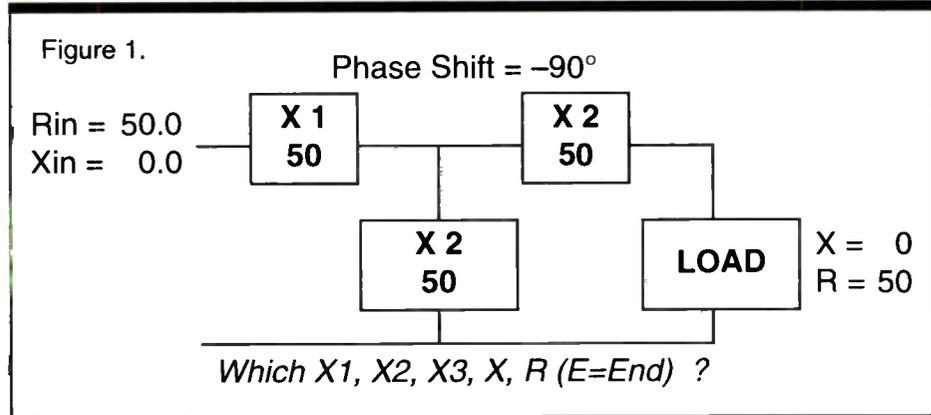
*Make Adjustments on Air with a Simple BASIC Program That Can Familiarize You with AM T-Networks*

by Fred Greaves

Follow the prompts, so that the values appear as in Fig. 1.

**YORK, Pa.** Referring to the end of this article, you will find a source code

Once you have entered all the values,



written in GWBASIC that will allow you to adjust a T-Network without going off the air, without carrying test gear out to the swamp and without fighting mosquitos and snakes in the middle of the night. This program is intended to familiarize the user with the workings of an AM -T-matching network. You will see how both the phase shift across the network changes as well as the input match, when adjustments are made.

The program is based on articles written by Grant Bingeman, published in *RW*. Ref: "Know Phase Shifts in System" on Sept. 1, 1984, and "Find Network Input Impedance" in the Aug. 5, 1985 issues of *RW*. The user is encouraged to study these articles in order to understand more thoroughly the concept and limitations of this program.

Assuming you have loaded this program into your computer, type in RUN "Tsolve". Your screen should look similar to that of Fig. 1. There should be a prompt at the bottom of the screen asking you for the value you want for the input leg (X1) reactance. Let's set-up our first network for a standard -90 degree phase shift into a perfect load.

the prompt should now appear as it does in Fig. 1. The prompt is asking if you want to change any values. This is where the fun begins. Let's add a little reactance to our load and see what happens. Type in <X> and Enter. The prompt will now ask what value you want to assign to X (the reactance of the Load). Type -10 and Enter. Your screen should now look like that of Fig. 2.

Changing the load reactance did not change the input R all that much, however, it did change the input X by close to 10 ohms. Look at the phase shift - it changed by about 11 degrees. If this were in a DA, you would have a lot of adjustment problems at your phaser. So instead, let's adjust the network. The purpose of X2 is to cancel out the reactance of the load - so let's just add some j of the opposite sign to X2. At the prompt, type X2, Enter, type 60, Enter. Your screen should now look like that of Fig. 3.

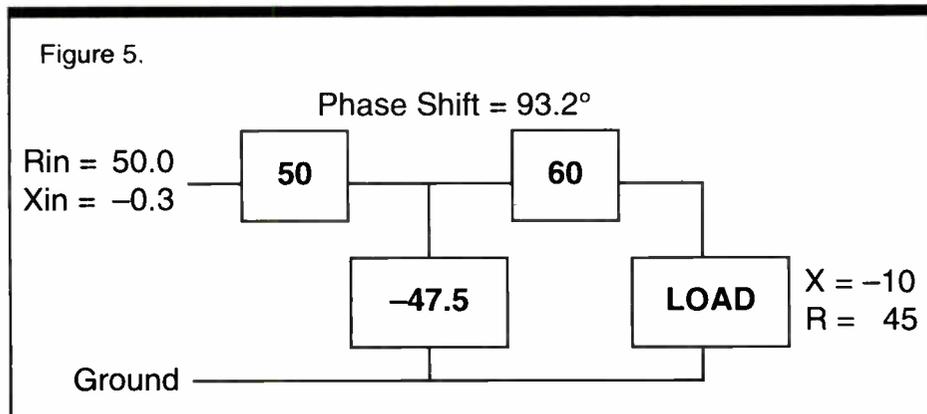
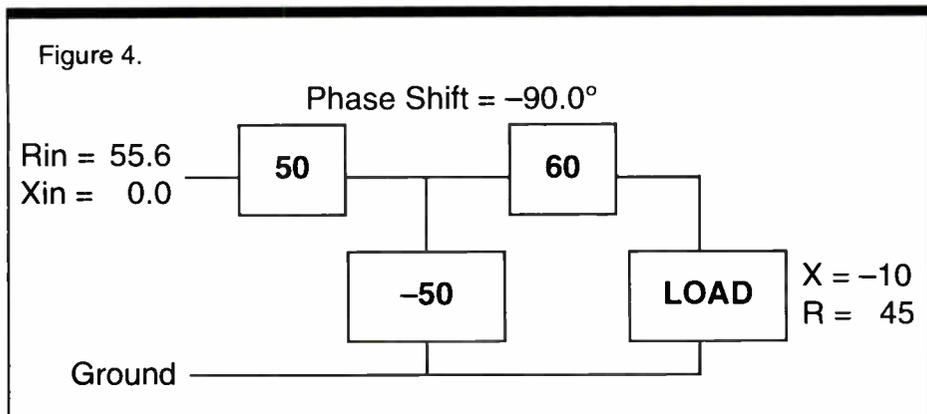
Notice the input Z is back to 50 j0, and the phase shift is back to -90 degrees - nothing to it. Right? Life is seldom that simple. Usually when a tower (load) changes, both the resistance and the reactance will change. So let's now change the resistance and see what happens. Type "R." Enter, type 45, Enter. Your screen should now look like that of Fig. 4.

Notice the phase shift did not change, but the input resistance went up by 5.6 ohms. Let's see what the shunt leg will do for us: Type X3, Enter, -47.5, Enter. See Fig. 5.

Well, we have a pretty good match at the input, but we also created a change in phase shift. Let's go back to the output leg. Type X2, Enter, 57.5, Enter. See Fig. 6.

We now have the phase shift back to -90 degrees, but we introduced a little

continued on page 30 ▶



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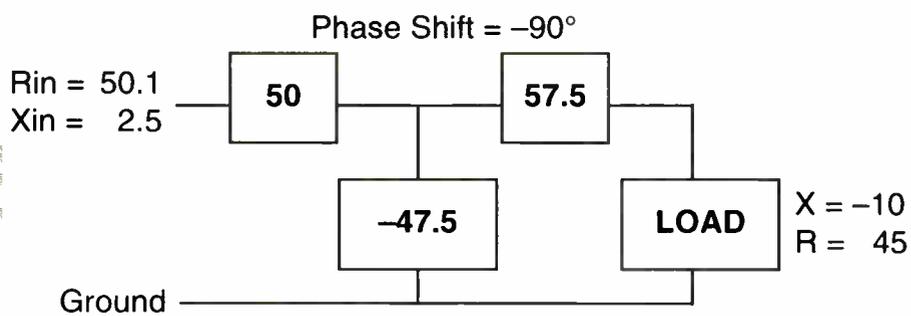
► continued from page 29

solving them with this program, you should get a good feel as to what will happen when you have to go out in the middle of the night, and adjust in the "real world."

□□□

Fred Greaves is assistant director of engineering for Susquehanna Radio Corp., in York, Pa., and a frequent contributor to RW.

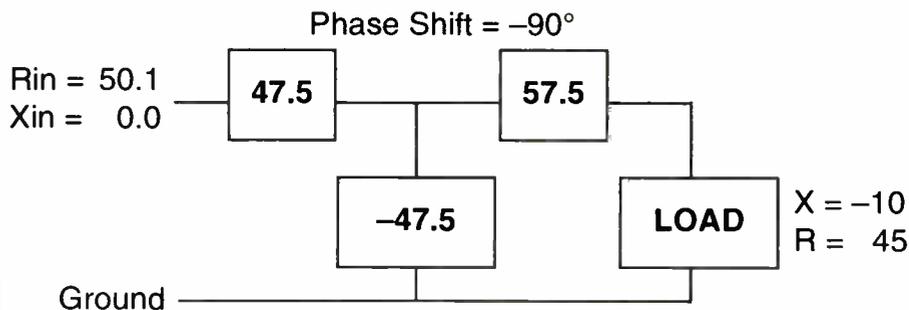
Figure 6.



adjusted to compensate for a change in load of both resistance and reactance. See Figure 7.

By creating your own problems, and

Figure 7.



reactance to the input. That's easily compensated for by adjusting the input leg. Type X1, Enter, 47.5. Enter. See Fig. 7: with the exception of .1 ohms at the input, our T-Network is now properly

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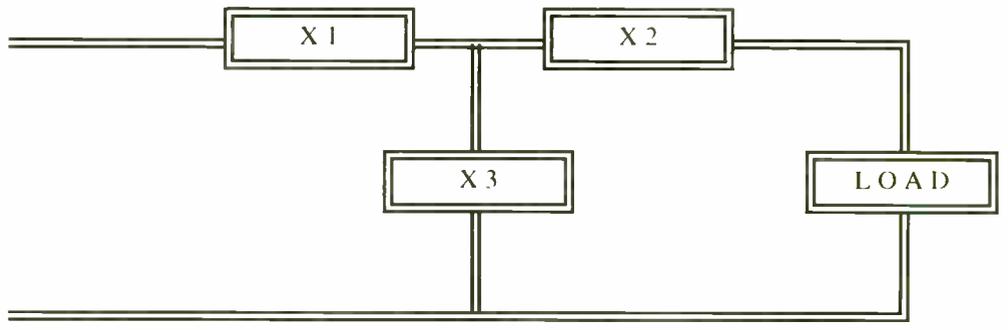
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```

10 PROGRAM TITLE IS -- TSOLVE.BAS --
20 KEY OFF: GOSUB 390
30 LOCATE 6.2: PRINT "Rin=": LOCATE 7.2: PRINT "Xin ="
40 LOCATE 20.25: INPUT "WHAT IS INPUT LEG REACTANCE": X1
50 CLS=SPACES(48): LOCATE 20.25: PRINT CLS
60 LOCATE 6.30: PRINT USING "####.#": X1: IF CORR=1 THEN 310
70 LOCATE 20.25: INPUT "WHAT IS SHUNT LEG REACTANCE": X3
80 LOCATE 20.25: PRINT CLS
90 LOCATE 12.40: PRINT USING "####.#": X3: IF CORR=1 THEN 310
100 LOCATE 20.25: INPUT "WHAT IS OUTPUT LEG REACTANCE": X2
110 LOCATE 20.25: PRINT CLS
120 LOCATE 6.48: PRINT USING "####.#": X2: IF CORR=1 THEN 310
130 LOCATE 20.25: PRINT CLS
140 LOCATE 20.25: INPUT "WHAT IS LOAD REACTANCE": X
150 LOCATE 10.71: PRINT "X=": PRINT R:IF CORR=0 THEN 310
160 LOCATE 20.25: PRINT CLS
170 LOCATE 20.25: INPUT "WHAT IS LOAD REACTANCE": R
180 LOCATE 20.25: PRINT CLS
190 LOCATE 12.71: PRINT "R=": PRINT R:IF CORR=0 THEN 300
200 IF CORR=1 THEN 310
210 LOCATE 20.25: PRINT CLS
220 LOCATE 8:COLOR 7.0:PRINT SPC(15):COLOR 14.1:LOCATE 8.15:PRINT SPC(4)
230 CORR=1: LOCATE 20.25:COLOR 15.8:INPUT "CHANGE X1,X2,X3,X.R. (E=END)":BS:COLOR 14.1
240 IF BS="X1" OR BS="x1" THEN LOCATE 6.30:COLOR 31.1:PRINT USING "####.#": X1: COLOR 14.1:GOTO 40
250 IF BS="X2" OR BS="x2" THEN LOCATE 6.47:COLOR 31.1:PRINT USING "####.#": X2: COLOR 14.1:GOTO 100
260 IF BS="X3" OR BS="x3" THEN LOCATE 12.40:COLOR 31.1:PRINT USING "####.#": X3: COLOR 14.1:GOTO 70
270 IF BS="X" OR BS="x" THEN LOCATE 10.74:COLOR 31.1:PRINT X:COLOR 14.1:GOTO 130
280 IF BS="R" OR BS="r" THEN LOCATE 12.74:COLOR 31.1:PRINT R:COLOR 14.1:GOTO 160
290 IF BS="E" OR BS="e" THEN 520
300 LOCATE 20.25:PRINT CLS
310 RIN=(X3^2*R) / (R^2+(X+X2+X3)^2)
320 LOCATE 6.8:PRINT USING "####.#": RIN
330 XIN=( X3) * (R^2+(X+X2) * (X+X2+X3)) / (R^2) + ((X+X2+X3)^2) ) + X1
340 LOCATE 7.8:PRINT USING "####.#": XIN:P=R / (X+X2+X3)
350 IF P<0 AND X1<0 THEN LOCATE 3.28:PRINT "PHASE SHIFT=":PRINT USING "####.#": (ATN(P)/.01745) +180:PRINT "" :GOTO 220
360 IF P=>0 AND X3<0 THEN LOCATE 3.28:PRINT "PHASE SHIFT=":PRINT USING "####.#": (ATN(P)/.01745) -180:PRINT "" :GOTO 220
370 IF P=>0 AND X3>0 THEN LOCATE 3.28:PRINT "PHASE SHIFT=":PRINT USING "####.#": (ATN(P)/.01745):PRINT "" :GOTO 220
380 IF P<0 THEN LOCATE 3.28:PRINT "PHASE SHIFT=":PRINT USING "####.#": (ATN(P)/.01745):PRINT "" :GOTO 220
390 COLOR 7.0:CLS:COLOR 14.1
400 LOCATE 5.15:PRINT ""
410 LOCATE 6.15:PRINT "" >
420 LOCATE 7.15:PRINT ""
430 LOCATE 8.15:PRINT ""
440 LOCATE 9.15:PRINT ""
450 LOCATE 10.15:PRINT ""
460 LOCATE 11.15:PRINT ""
470 LOCATE 12.15:PRINT ""
480 LOCATE 13.15:PRINT ""
490 LOCATE 14.15:PRINT ""
500 LOCATE 15.15:PRINT ""
510 LOCATE 16.12:PRINT "GROUND":RETURN
520 SYSTEM
    
```



# Comments Filed on 'Unattended' NPRM

► continued from page 28

AFCCE supports permitting unattended operation of broadcast stations if they are ATS-equipped. SBE also takes this position.

NAB suggests the FCC avoid adopting "how to" rules that would require ATS.

A transmitter manufacturer states that "...as presently equipped most radio stations are already suited for unattended operation. Any new rules or regulations requiring additional equipment to qualify for unattended operation are unnecessary and would impose an inappropriate burden on licensees."

"If the commission fails to agree with our conclusions and decides to require an ATS... we would request that the commission restrict its actions to identifying parameters that should be monitored and controlled, avoiding any attempt to specify either the structure of the monitor and control equipment or the operating characteristics for such equipment." This commenter recognizes that directional antenna systems may require the use of a "smart" controller.

One commenter suggests allowing licensees an extended period of time to purchase ATS equipment while still allowing unattended operation based on a demonstration of transmission system stability (submission of station logs showing transmission parameter stability over an extended period of time).

## Approved systems

In my own comments, I suggested that automatic monitoring of an AM directional array without an approved sampling system was not any worse (would not cause additional interference) than manual monitoring of the system. AFCCE argues that the FCC should "adopt policies wherever possible to encourage stations to install approved sampling systems." SBE also takes this view, requiring approved sampling systems for unattended operation.

Several commenters point out that the existing EBS requires manual intervention, making unattended operation impossible (while "off-premises control" is certainly quite possible). They therefore suggest the rules permitting unattended operation become effective when the station has operational EAS equipment.

This may be before the EAS is mandatory. NAB states that the current EBS can be automated, so there is no need to wait for EAS.

## Tower light monitoring

Some commenters suggested that tower lights could be checked manually (through a dial-up control system) daily. Some said this could be automated, though the details of such automation (and failure mode analysis) were generally not included. AFCCE suggested that broadcast stations should bear no greater regulatory burden than other services in this area.

One commenter pointed out that although the FCC has encountered numerous malfunctioning tower light systems, a search of the public record fails to show an instance where a broadcast tower light failure has been the cause of an aeronautical accident. Based on this, the commenter says the FCC might justifiably eliminate the tower light monitoring requirement from the rules.

Most commenters favored getting rid of the Restricted Permit requirement for

stations that choose to retain transmitter operators.

One commenter suggested keeping the RP requirement for station chief operators. He argues that a chief operator with his or her own license at risk would be more responsible than one who has only the station license at risk. He further argues that FCC licensing may preempt state licensing of engineers for broadcast stations.

One commenter suggested keeping the RP because it "encourages a sense of responsibility among operators." Further, "obtaining the RP is considered an important step in the training process. Removing the requirement implies that such training is not really necessary." This commenter also states that the minimal fee paid for the RP suitable for use at

wonder if a set of general guidelines could be established where, for example, operation at twice authorized limits (loop current deviation of 10 percent instead of the permitted 5 percent) would be permitted at 50 percent of authorized power, operation at thrice authorized limits would be permitted at 33 percent of authorized power, etc. Or, would an individual analysis be required for each station?

## FCC enforcement

In the NPRM, the FCC asked whether a relaxation in operator requirements would encourage stations to be lax in compliance with the remaining rules. Moody Bible Institute suggested that fines be double the normal amount if a station violating a rule and causing interference was

## Several stations wrote short letters expressing support for the idea of unattended operation.

commercial stations acts as a simple screening device, removing some people who only wish to "play radio."

Finally, this commenter states that revocation of the RP is the only existing way short of incarceration to prevent recurrent violators from continuing to operate broadcast stations.

SBE said that its certification program did a much better job in assuring operator competency than the Restricted Permit did.

## Monitor points

The FCC had suggested that directional stations rely upon monitor point readings to determine whether an interference condition exists when antenna monitor readings indicate an out-of-tolerance condition (NPRM paragraph 30). AFCCE questions reliance upon monitor point measurements, suggesting reliance on antenna monitor readings. However, the NPRM appears to be assuming at this point (when relying upon MP values) that the antenna monitor does not indicate compliance. Use of MP values, however unreliable, may permit the station to continue operating.

This "reliability of monitor points" question has come up before. Some have proposed that field strength readings are a waste of time. Better analysis of the array performance is available through computer modeling and the measured antenna monitor readings. This may be true, assuming the monitoring system is operating properly.

Another commenter suggests AM stations be given up to 10 days to investigate above-tolerance monitor points as long as the antenna monitor readings are within tolerance, because monitor point fields can be affected by circumstances beyond the licensee's control (local reradiation, etc.).

## Out-of-tolerance DA

In the NPRM, the commission proposed allowing 24 hours of out-of-tolerance operation of directional arrays to allow monitor points to be checked. After that, the station must either terminate operation or reduce power sufficiently to keep monitor points within limits. AFCCE suggests (paragraph D3), it appears, that an ATS might reduce transmitter power on detecting an out-of-tolerance antenna monitor reading. This is an interesting approach. I

Report (a sort of mail-order inspection). Although it appears (in its reply comments) that NAB saw this proposal as a quid pro quo trade (reduced operator requirements traded for increased inspections), I was instead suggesting to the FCC that this would be a better way of getting compliance than relying on the RP.

Another commenter suggested that a question be added to FCC forms 301, 302 and 340 asking whether the applicant will provide sufficient resources to ensure that the station will be operated in compliance with all the commission's technical standards. This commenter also suggests the FCC continue the Self Inspection Report program.

## On call

There seems to be a varied interpretation as to what "unattended" operation means. To me, this would be no operator and no need to respond to alarms. The ATS would make its best attempt at eliminating an interfering condition, possibly making an attempt to notify people. If the interference condition persists, it would shut down the station with no operator action.

Any system that relies upon notification of an operator before an automatic shutdown is not, to me, unattended.

There are, however, circumstances where a station may be fully compliant with the terms of its license, yet interference is being caused. The typical circumstance would be interference due to intermodulation. The intermod may be generated somewhere other than the station, but a quick way to eliminate the interference (which may be causing safety problems)

continued on page 124 ►

# NEURAL WHAT?

5

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Circle (128) On Reader Service Card

## KEYBOARD CONNECTION

# Taking Your First Ride on the 'Net'

by Barry Mishkind

**TUCSON, Ariz.** Probably today's biggest media buzzwords, aside from OJ, relate to computers and the new roles they are taking in our lives. No, not *everyone* is connected yet, but more and more people are seeking out the potential of the Internet and other services. At least one national long distance telephone company is running long-form commercials to generate more interest in the potential value of on-line services to businesses.

The options seem endless. Everything is available—from the well established services like CompuServe and America Online to the worldwide Internet. It seems all you need is a modem and a phone number.

## Some details

Actually, there are just a few more details to consider before you get to "surf the Internet." Unless you're fortunate enough to have a non-charged account, such as at a local university, it's very easy to run up some rather large bills, almost before you know it. For example, even though competition has made several services promote flat fee packages of around \$10 per month, if you move outside the basic areas, or send lots of e-mail, the "extra" charges can mount fast. Some individual users can generate \$50 to \$100 or more in time charges per month. So, it's to the advantage of most users to plan out what they need before logging in.

Each of the online services has a software package they will sell you, often cushioned by a "credit." These packages will allow you to jump more quickly to the areas of interest, and reduce the key strokes necessary to accomplish your mission. Still faster, some third-party packages will let you identify the area of interest, log on, download files, and log off as quickly as possible, to save on time charges.

But of all the places you can go these days, the Internet is perhaps the most

intriguing and mystifying, often both at the same time! Rather than trying to identify a "where," let's just say the Internet is basically a lot of networks tied together, interactively.

Trying to find an appropriate illustration to explain the Internet isn't easy. Imagine a series of wheels somehow linked together, some via the hubs, some on the spokes. In radio terms, picture in your mind a two-way connection to one of the networks in turn connected to all other nets for instant delivery of any program. No matter that you are an ABC affiliate, the CBS financial report appears instantly upon demand. Similarly, through local Internet provider, you are hooked to computers all over the world. With virtually no effort, you can type:

```
ftp ftp.hk.net
```

and a computer in Hong Kong answers, where, in the

```
/shareware/prs
```

subdirectory, you can download a file with all the North American radio stations by location, calls, frequency and format displayed in a simulated HD LOGIC radio receiver.

Or, using the local newsreader, a utility that gathers messages on specific subjects, pop on over to rec.radio.broadcasting and you'll see what an interesting mix of professionals and listeners have to say about the industry.

Need help? E-mail can now be sent to many of the broadcast manufacturers. For example, Hallikainen & Friends, manufacturers of remote control equipment, can be reached at ap621@cleveland.freenet.edu. We'll develop a list of contacts and publish them in an upcoming column. (Manufacturers: please send your email addresses to: barry@coyote.datalog.com)

For those with the spirit of adventure, there are utilities, such as Gopher, Archie and Veronica, that will search computers all over the world for the information or file you desire. Up until now, these have been run via rather arcane and cryptic

commands. Newer interfaces are making this much easier via menus, and in the case of Windows interfaces, point and click. However, like a buffet, it can be easy to "overeat."

## Where to connect?

As mentioned in our COMDEX wrapup, there have been a lot of software packages and services developed to fill the demand for easy access to the Internet. They range from a series of utilities to turn DCA's Crosstalk for Windows(tm) into a front-end for net access to Spry's Internet-In-A-Box(tm). In between were many other products, including Netcom's Netsurfer and Phoenix Technology's Internet Express(tm).

Perhaps among the major differences is the choice of text display or a Windows type graphical display. The graphical interfaces, most based on a program called Mosaic, can deliver startling images, but can take much longer for the average computer to receive. In fact, if you're at 2400 baud, don't even try until you upgrade to a much faster modem.

To give you an idea of what you can get, each package comes with a program and book to lead you through the tasks of loading the files on your computer and connecting to a service provider.

Anyone can use the text based programs, such as the CompuServe Information Manager, and these do provide a certain level of graphical menus to ease the task at hand: from reading news to downloading files to sending email. Stepping up into the Windows world, Phoenix Technologies Internet Express is tied to a deal with Delphi, and guarantees they'll get you up and on the Internet in less than 10 minutes. Internet Express uses icons to speed access to the various areas of interest.

Spry's Internet-In-A-Box truly has everything you need in there, from their AIR Mosaic program to a list of telephone numbers for the different service providers. Yes, there are special deals for free connection and time. A special edition of "The Whole Internet User's Guide" by Ed Krol is included in the box.

One of the largest service providers in the country, Netcom has a Neteruizer package of software and services. A great feature for travelers is a map of the United States with the access points indicated. Click on where you are, and the program makes the connection.

By the way, if you're a viewer of the new PBS program "The Internet Show," the companion book from IDG Books comes with a copy of Internet Chameleon by NetManage and a special trial offer. Perhaps the ultimate in low end is the new book "Get on the Internet in 5 Minutes" (Hayden, 1994). Included in this 80 page, \$10 book, are instructions and a 30 day free look at the Internet. One thing is for sure: this is a rapidly expanding area of information and technology. No longer do you have to spend hours on your computer to become "linked." Carefully evaluate your needs and get a good service provider: it can make your computer time more productive.

□ □ □

Barry Mishkind, a regular contributor to RW, can be reached at 602-296-3797, or via e-mail at "barry@coyote.datalog.com".

# House Axe Begins to Trim CPB

by Thomas Pear

**WASHINGTON** A House Appropriations subcommittee recently proposed a schedule of funding cutbacks for the Corporation for Public Broadcasting, rescinding \$141 million previously allotted to CPB for the 1996 and 1997 fiscal years (FY).

The proposal would allow CPB to keep its allotted \$285.6 million for the current fiscal year.

But the proposal would cut CPB's FY 1996 budget 15 percent—\$47 million—from its current federal allotment of \$312 million to \$258 million.

In FY '97, CPB would realize cuts of \$94 million from its allotted \$315 million budget. The 30 percent budget cut that year would bring CPB's FY '97 budget down to \$221 million.

The proposed \$147 million CPB cut is vehemently opposed by National Public Radio President Delano Lewis. In a written statement the NPR president hypothesized that the subcommittee's vote "puts public broadcasting squarely on the road to zero federal funding."

"Though only the first step in a long process, it was clearly a step in the wrong direction," he said.

Although NPR only gets about one million directly from CPB, about \$63 million goes to NPR's 520-member stations that use the money to purchase NPR programming. Without enough stations purchasing programming, NPR could collapse, according to Lewis.

Lewis promised to fight the CPB budget cuts until the end of the congressional budgetary process. "We will continue to make our case before the full committee, the House of Representatives and the Senate, in an effort to preserve the valuable services public radio provides to the American people."

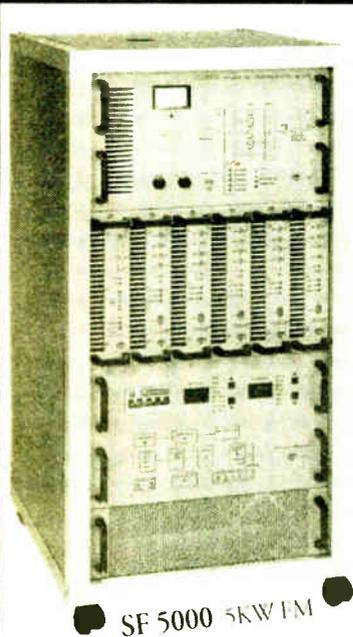
Lewis argues that NPR would be especially hurt from the budget cuts because it does not have the resources of its public television counterpart. NPR does not have Sesame Street or Barney toy retail sales that pull in millions each year, he said.

The subcommittee proposal will go next to the full Appropriations Committee, which was scheduled to examine the proposed budget cuts March 2. At press time the hearing had not yet occurred, but Quin Hillyer, a spokesman for Rep. Bob Livingston (R-La.), said he does not foresee the Appropriations Committee making any changes in the subcommittee's CPB recommendations.

"I've seen no indication those specific recisions will be changed," he told RW.

A full House vote could come as early as March 15, Hillyer said.

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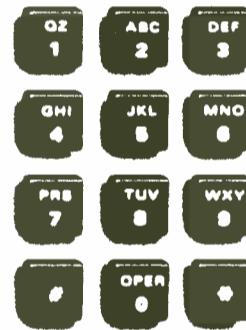
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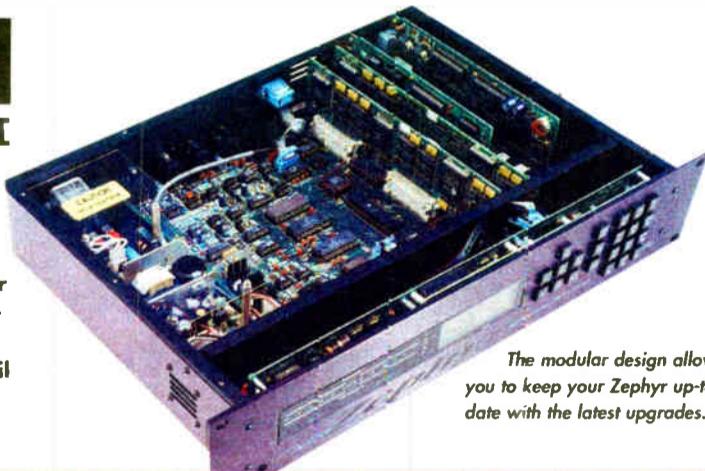
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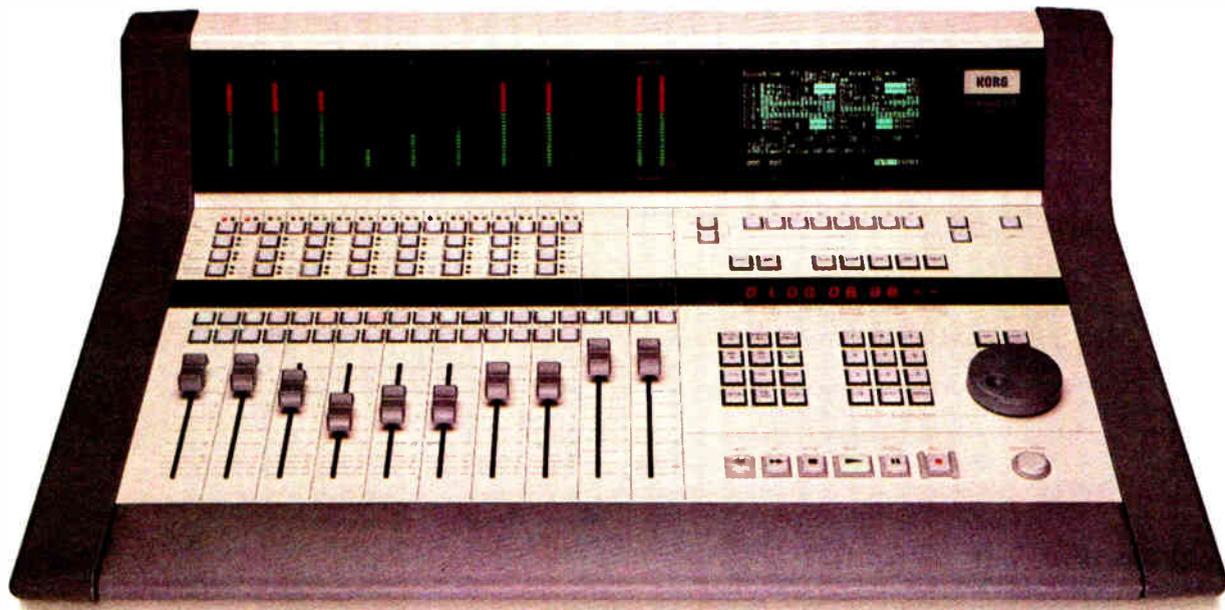


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WLVE-FM/WZTA-FM/WINZ-AM  
Paxson Broadcasting, Miami

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World Radio History

# Studio Sessions

**Comprehensive  
MiniDisc Tests**  
See pp. 36 & 39

Equipment and Applications for Radio Production and Recording

## PRODUCT EVALUATION

# EQ's Virtue is What Can't Be Heard

by Ty Ford

**BALTIMORE** I first saw and heard the Night Technologies Inc. EQ3 several years ago at AES in New York. The concept was simple; an EQ circuit that offered minimal phase shift, the argument being that phase shift is the enemy and that life without it would be better.

I suspect that if a focus group of ten engineers was held, and the question, "Is phase shift good or bad?" was asked, nine out of 10 would say bad. Because all of the analog equalizers I have come to know and love (or hate) work on the

principle of using phase-shifted audio to add to or subtract from the desired frequency, the concept of EQ with minimal phase shift sets the EQ3 apart from other analogue equalizers.

Those of us who have been using analog equalizers for the past 20 years have gotten used to the sound of phase shift, group delay and output distortion. So much so that we usually make the adjustment not based solely on the boost or cut of the frequency, but at the point at which the phase shift and distortion tell our ears to stop. Some of the distortion is caused when in the course of additive EQ, the total output of the equalizer exceeds the headroom of the input of the next device in the audio chain.

In a perfect world, EQ would not be necessary. You would always have the right microphone positioned in exactly the right spot to make the perfect recording. While this is true in theory, problems start to occur when you try to apply the theory to a more

complicated mix. Without the ability to individually EQ a collection of sounds so that they all fit properly within the confines of the stereo and tonal spectra (assuming you're mixing in stereo), making them sound "correct" is virtually impossible. At that point, an equalizer that creates minimal phase shift would come in pretty handy. That's what the EQ3 offers, albeit in a limited fashion.

Those limitations are the result of compromises that must be made to keep the price of the unit reasonable. At a list price of \$3,150 for two channels of EQ, NTI (Night Technologies International) has already priced themselves above the practical comfort range of many studio budgets, although not past the high-priced analog parametric EQs.

In that stratum, the question of whether the price is worth the cure must be asked. The answer to that question can only be made after two others are asked and answered: what do you get for the price?, and what does it sound like?

### The EQ3

The EQ3 is an analog two rack-space box that contains two independent channels of EQ. Each channel has six fixed-frequency bands: 10 Hz, 40 Hz, 160 Hz, 650 Hz, 2.5 kHz and the 10 kHz "AIR" band. The "Q" on the first four bands is about two octaves wide. The curves are bell-shaped. The upper bands are both shelving. Each band has concentric coarse (3 dB) and fine (.25 dB) control knobs. Each knob is step-switched, allowing a controlled calibration of the adjustments.

As the manual states, if your final EQ settings exceed the headroom of the next stage of audio, backing off each coarse and/or fine adjustment an equal number of "clicks" at each frequency will result in a lowered output without changing the EQ slopes.

Each channel also has its own front-panel IN/OUT switch and status light. The IN/OUT buttons on each channel make for easy pre/post EQ comparisons. The back panel has balanced I/O XLR connectors, a spare set

of 1/4-inch unbalanced output jacks and an IEC standard power connector. I heard no problems while using both balanced and unbalanced outputs simultaneously. The manual also notes that care must be taken in adjusting the EQ3 because some of the bands overlap.

out the soundtrack of the recent feature film {"Maverick." The folks at NTI hype the fact these big names plus high-profile recording artists are using the EQ3. Although I'm a Letterman kind of guy, I took the night off and punched up the Leno Show on both Baltimore and DC affiliates.

I received both signals the old-fashioned way, with my antenna. Despite the fact that the Tonight Show was being broadcast over two completely different transmitters, the overall sound was very consistent. But the Letterman show on the CBS affiliate was actually brighter and felt

more "live." This probably had more to do with the satellite feed and the processing at the TV stations than the original program audio.

Therein lies the rub. If all the good work you do with the EQ3 gets lost due to compromises downstream (at least in broadcast applications), is it worth it?

Applications with more end-to-end control, however, offer the opportunity for more successful results. Take, for example, the process of pre-conditioning music before it gets loaded onto your carts, or your hard drive.

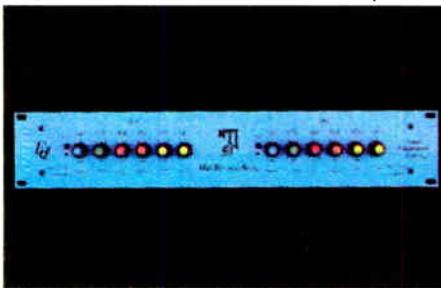
It's no secret that the EQ difference in commercial CDs is very noticeable. This variation makes fine adjustment of the rest of the audio chain virtually impossible. The more "equalized" the music

continued on page 120 ►

### Product Capsule: **NTI Night EQ3 Analog Equalizer**



For more information, circle **Reader Service 151**, or contact NTI at 800-375-9289.



NTI EQ3

## SECOND OPINION

# Pricey EQ Put to Test In Radio

Although expensive for an equalizer, at least for most radio station uses, the NTI EQ3 has shown up in a variety of radio applications (as well as its main markets of music and audio-for-video mastering and theater applications). **RW** even tried it out at Washington's most popular FM station.

KKAT-FM in Salt Lake City uses the EQ3 as its air chain EQ, bypassing the EQ3 settings on its Orban processor. Music Director Jim Mickleson said the virtual nonexistence of phase shift and excellent EQ add some sparkle to the country format station. Mickleson attributes the good sonics to the fact that the country sound is fairly consistent, thus the EQ3 can be set and forgotten.

WCBS-FM in New York has been using the EQ3 for a CD mastering project—cleaning up old hits for later playback. The engineer-in-charge of the project said that as an analog mastering tool, the EQ3 is very effective.

At WPGC-FM and WFLVA-AM in Washington, where **RW** Technical Advisor and Chief Engineer Tom McGinley put the EQ through a trial run. The unit revealed positive, but subtle effect on in-studio processing. McGinley said he is not convinced that the EQ3 would work in the FM station's air chain because of the variety of music the Urban Contemporary hits station broadcasts, making it difficult to set it and forget.

As Ty Ford suggests, try the EQ3 yourself and see if the results justify the price. NTI will be demonstrating the EQ3 at the Harris Allied Booth 16001 at the NAB convention.

—John Gatski

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# MiniDisc Technology

## PRODUCT EVALUATION

# Otari MiniDisc Is Strong Contender

by Ty Ford

**BALTIMORE** Smaller than a breadbox, the Otari MR-10 MiniDisc recorder/player (\$3,350) is positioned to put another nail in the cart machine coffin.

Using the Sony ATRAC (Adaptive Transform Acoustic Coding) data compression algorithm, the MR-10 currently stores up to 74 minutes of digital stereo

on re-recordable optical MiniDiscs. It also ignores SCMS coding.

The MR-10 is designed to sit three-wide on a rack-mounted shelf, or on a table top. If you're using standard Switchcraft XLR connectors, plan on an 18-inch depth to allow for connector space. The back-panel features balanced XLR analog I/Os for the active transformerless inputs, an SPDIF I/O set at 44.1 kHz, an RJ-style phone jack used by the remote control panel, four analog I/O level adjustments, a dip switch, a D-sub 37-pin parallel interface, an IEC standard AC power socket, a main fuse, ground lug and power switch.

### Features

The Dip Switch allows status changes such as: mono/stereo output; timing for EOM (end-of-message) lights; Auto Monitor, which switches to input monitoring in "off" or "input" mode; analog or digital input and to preset single playback and auto-cue modes upon start-up. The three EOM switches cause the "play" light on the MR-10 front panel to blink and can be set to flash at from five to 35 seconds before the end of a cut. The EOM signal is also routed to the multipin parallel connector. An optional RS-422 serial interface via D-sub 9-pin connector can be installed instead of the parallel port.

The front panel consists of the MiniDisc slot, a 1.25-inch x 3.5-inch backlit LCD, standard operation buttons, an LED that indicates the next cut in a series and a headphone jack and level control. The headphone amp is powerful enough to push my inefficient AKG K240 phones to just below the pain threshold.



Otari MR-10

MiniDiscs like to be pulled straight out of the machine, or slightly to the left. Angling them up, down or to the right causes them to catch somewhere in the drive slot. At one point the MR-10 ate one of the discs and refused to spit it out. Rebooting didn't help, and because there is no manual eject, I called the factory. After removing one screw, I looked down to find the machine had spit out the disc.

Afterward, the MR-10 would recognize and play the pre-recorded discs, it would not recognize the re-recordable discs. Otari sent me another, which had no disc problems.

Because each disc contains a TOC

### Product Capsule: Otari MR-10 MD Recorder/Player

Thumbs Up	Thumbs Down
<ul style="list-style-type: none"> <li>✓ good sound with voice/music spots</li> <li>✓ up to 255 cuts per disc</li> <li>✓ three second access</li> <li>✓ programmed spot play</li> <li>✓ analog/digital I/Os</li> </ul>	<ul style="list-style-type: none"> <li>✓ noticeable compression artifacts on voice-only</li> <li>✓ no mechanical disc eject</li> </ul>

For more information, circle **Reader Service 18**, or contact Otari at 415-341-5900.

(Table of Contents), it takes a few moments after a disc is inserted before it can be cued to a certain cut. It took just over 8.5 seconds for the MR-10 to recognize a 60-minute blank disc, over 7 seconds to recognize a 74-minute disk that I had formatted and recorded 12 tracks on, and less than four seconds to recognize a pre-recorded 54-minute Pearl Jam MD. Once the disc is engaged, cueing from cut to cut takes about three seconds.

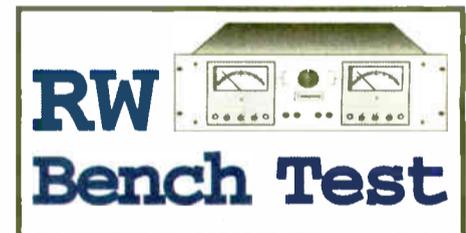
The LCD display is large and easy to  
continued on page 54 ►

## Solid Specs from MR-10

by Edward J. Foster  
Diversified Science Laboratory

**WEST REDDING, Conn.** When I unpacked the MR-10 and popped it on the test bench, my first impression was: "This thing is built like the proverbial brick pagoda. When I turned it on and slipped in a disc, I was equally impressed. Discs load and eject firmly

but gently, and in utter silence. This beast bespeaks solidity as far as one can tell from a few days in the lab.



Performance-wise, the MR-10 is no slouch either. Playback response to the Sony MD test disc was within +0.3 dB, -0.2 dB from 20 Hz to 18 kHz on the left channel, within +0.4 dB, -0.2 dB over that range on the right. At 20 kHz, the left was down 0.75 dB, the right 0.4 dB.

**Although the Otari MR-10 set no new technical records, it beats the average cart machine hands down.**

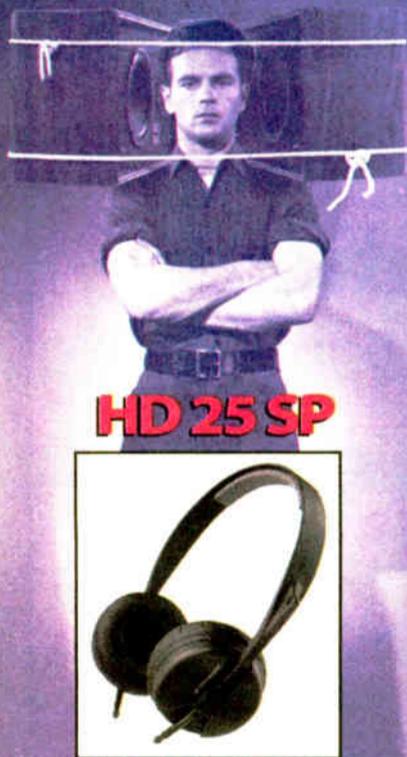
Recording and playing a more continuous sweep elicited similar results: +0.3 dB, -0.4 dB from 20 Hz to beyond 18 kHz on the left (down about 0.8 dB at 19.4 kHz) and +0.5 dB, -0.4 dB on the right to 19.4 kHz. Above 19.4 kHz, response goes off the cliff but who cares? That's the anti-

continued on page 57 ►

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Obviously, once you've chosen MiniDisc, your next decision is which MD to buy. Features like serial and parallel interfaces, digital and analog signal inputs and outputs, external synchronization, and *MD Remote*™ software (see side bar), make Denon MD Cart the obvious choice.



DN-990R MD Cart™ Recorder (shown) and the DN-980R/ DN-955R machines



Denon's MD Remote™ Software, running under Windows™, offers a graphical interface for fast, easy control of all functions and modes on any Denon MD Cart machine, including automatic dubbing of tracks or discs between machines, complete with titles and cue-point information.

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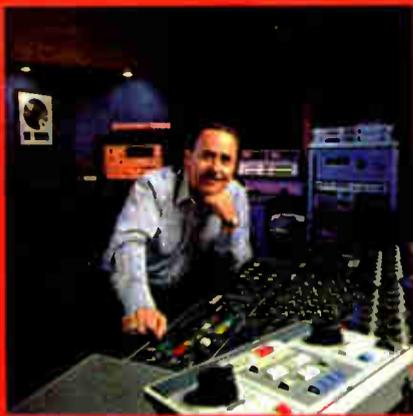
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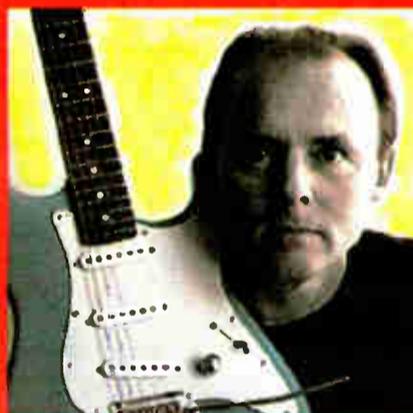
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PRODUCT EVALUATION

# Digital I/Os Added to Sony's Latest MD

by Ken C. Pohlmann  
Hammer Laboratories

**MIAMI** Without question, broadcasting is undergoing a historic transition. Within a decade or two, virtually every aspect of production and transmission will be changed, perhaps unrecognizably so. Clearly, the venerable cart machine will see its empire disintegrate and vanish, to be replaced by more contemporary devices. But which technology will inherit the mantle? Optical disc? Or hard disk?

With the introduction of the MiniDisc, Sony clearly argues for an optical future. Although Sony developed the format and was first in the consumer and pro markets, it was quickly challenged by Denon and Otari models (sporting all-important digital I/Os) in professional applications. Now, with the introduction of the MDS-B3 recorder/player (\$3,400), and the MDS-B4P player (\$2,400), Sony lays its claim to the cart empire.

The MDS-B3 replaces the MDS-B1, and the MDS-B4P replaces the MDS-B2P; in other words we are already into second-generation MiniDisc hardware. Looking at the front panels, you wouldn't know it. By appearance, the new units look identical to the old.

**Features**

Both the recorder and player have Play/Pause, Cue/Stand By (return to position where last pressed Play/Pause), Stop, Next track, and Previous track transport buttons. The buttons are lit, and employ familiar "press and play" cart operation. You'll also find Repeat current track, Repeat all tracks, and Repeat off switch, and Next Track numeric indicator (up to 99 tracks). The recorder adds Edit, Enter, and Record buttons.

The Edit button selects or cancels an editing function, the Enter button executes an editing function, and the Record button records and pauses recording. The fluorescent display features 14 segment peak level meters, a 25 track calendar and a 12 segment display for track title, running time, and remaining time. A Display button lets you sequentially access title and timing information.

A minijack remote connector lets you plug in a RM-DC1 keyboard/remote controller. It can be used to control either the recorder or player, and is used for track editing or text entry with the recorder. It features a QWERTY keyboard, as well as buttons for transport control and basic editing that duplicate many front panel buttons, and add new specialized ones. The RM-DC1 is supplied with the MDS-B3.

**Integration allowed**

Unlike the MDS-B1 and MDS-B2P, the new duo sports digital interfaces that allow integration with production and on-air equipment. The recorder offers unbalanced phono plugs for coaxial input, and output. The player has only a digital output jack. The digital input supports either professional IEC-958 type I or consumer IEC-958 type II format, and the output uses the IEC-958 type II format. The recorder has balanced analog XLR stereo inputs and outputs (+4 dBu, +24 dBu maximum, with adjustable range of -12 dBu to +8 dBu). The player has only stereo outputs.

In addition, both units offer a RS-232C serial port (D-sub 9-pin male) for computer interfacing and transport control, parallel port (D-sub 25-pin female) for remote control, mono/stereo mode switch, minijack headphone output, power switch, power receptacle, and grounding post. There are rear panel screwdriver adjustments for input and output levels on the recorder, and output levels on the player.

The units measure 5-5/8 inches x 5-1/4 inches x 14-7/8 inches, and three units can be placed side-by-side within an EIA rack width.

My hands-on evaluation of the MD duo was very satisfactory, with a zero-time learning curve. Anyone who has ever handled a cart machine, or a Walkman for that matter, will instantly understand the operation. Clearly, the forte of the MD is its near-instant access. Any track can be accessed quickly and cued by punching in its track number. In addition, it is convenient to program track sequences using the remote. The units contain a 4MB RAM, storing 10 seconds of audio data. This provides instant start-up, as well as a

buffer store for shock-resistant playback.

Users will find a number of perks built into these units. With Auto Pause, the player automatically pauses after locating the start of a track. With Auto Cue, the unit enters playback pause when it detects a rise in the audio signal (above -54 dB). This avoids inaudible material at the start of a track. When these functions are not engaged, the player simply starts playback after locating a track.

The end-of-message (EOM) indicator flashes when the end of a track approaches.

continued on page 41 ►

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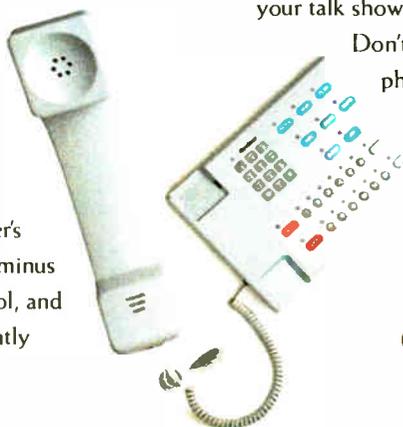
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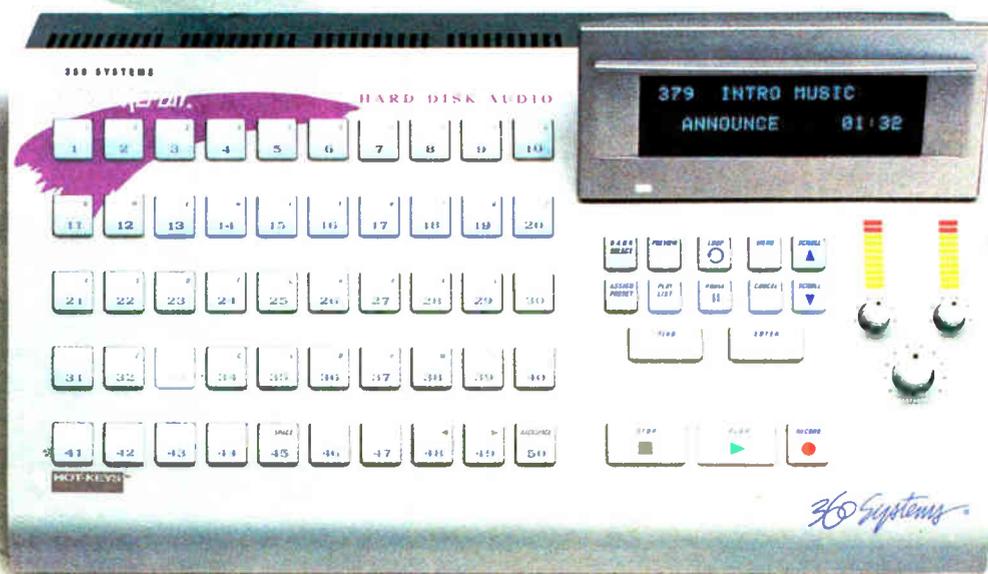


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World Radio History

# Sony Adds Digital I/Os

► continued from page 39

It can be varied from one to 35 seconds. The units can be set up for external timer-activated playback. A timer/play control provides automatic re-cueing, so that a disc will not be ejected if power is cut; playback resumes where it left off. The units also support fader start.

Specific tracks can be quickly accessed by entering the track number on the remote controller. When the unit is in stop or pause, you can hold down the Next or Previous buttons to quickly count up or down tracks. When playing, Next and Previous can be held down to audibly fast-scan through material. If you hold down the Display button for three seconds, the display will automatically alternate between track title and remaining time.

Track sequences can be programmed using the remote controller. During programmed playback, the Repeat All button lets you cycle through the programmed track sequence. An internal hours counter tells you the hours accumulated on the spindle motor. Functions such as reading the hours clock, engaging Auto Cue and Auto Pause, setting the length of the EOM, setting the baud rate of the RS-232C interface, and other utilities are engaged through a front panel button-pushing sequence that provides appropriate menus on the display.

## Welcome ability

The MDS-B3's ability to edit and store text, using the remote, will be a welcome to many users. Titles may contain up to 100 characters per title, with a total of 1,792 characters per disc. Titles longer than 13 characters scroll across the front panel display. When entering a track title, it can be divided with a semicolon, and each part displayed separately. Titles can be added while the unit is stopped, playing, or recording. Titles are initially stored in memory, and are not written to disc until you hit the Stop or Eject button.

One of the great advantages of random-access disc recording is the ease of recording. When adding a new track, the unit automatically finds blank space on the disc and starts recording. You cannot erase over an existing track unless you specifically want to do so.

As with consumer MD recorders, the MDS-B3 provides a number of useful editing functions that are quickly performed by merely rewriting the table of contents (as opposed to altering recorded data itself). The Combine function joins two different tracks into one. The Divide function splits a single track into two. The function allows rehearsal with monitoring in +/- 60 milliseconds steps (over -128 to +127 steps) from a desired starting point. The Move function rearranges the order of track numbers. The Erase function erases a selected track. These editing functions can be performed either with MDS-B3 front panel controls, or the remote. Although not sophisticated, these editing functions are certainly adequate for many applications, and performed flawlessly in the lab.

Track numbers can be added at specified points while recording, and added automatically or manually. As noted in the owner's manual, tracks should not be shorter than four seconds. You may get a dropout at the start of the track. As with other aspects of the unit's operation, I found recording to be intuitive.

However, users should be aware of some of the ground rules in MD editing. For example, if you erase track 5, the 6th track is renumbered to become 5, and all preceding numbers are decreased by one. All MDs contain track mode data, 8 bits of information placed in the table of contents that specify conditions such as copyright status, digital copy restriction, and emphasis. In particular, mode bits d2 and d3 indicate copyright status and the resulting restriction on digital copies.

When the units record an analog or type I (professional) digital signal, the disc is copy-permit enabled, permitting unlimited copying. However, when recording with a type II (consumer) digital input, copy-prohibit may be enabled, depending on the particular status of the input signal.

In any event, no restrictions are placed on digital copying using the MDS-B3 of any MD recordings made on the MDS-B3. However, if you start using consumer MD recorders to make copies, inhibit flags may start appearing.

Although cart machines are not noted for their high fidelity, it is important that any

replacement sound as good as possible. The ATRAC data reduction algorithm employed in the MD format is quite good, and offers sound quality close to that of a compact disc. Generally, if a CD is compared to an MD copy, subtle differences in sound quality can be heard, but only by very astute listeners, listening with a direct A/B comparison.

In other words, ATRAC is not 100 percent transparent, but is still very good. While using the MDS-B3 and MDS-4BP, I was very impressed with sound quality. They incur the faintest touch of ATRAC coloration, but otherwise are excellent.

Sony has also introduced a professional MD disc, the PRMD-74 with 74 minutes of playing time. This disc is said to have a block error rate that is one-tenth that of consumer discs. As with consumer discs, the PRMD-74 accepts up to 255 tracks per disc, with full random access. In addition, as with consumer discs, PRMD-74 cartridges can be write-protected.

Both the MDS-B3 and MDS-B4P performed well on the test bench (see test measurement box). Measurements did not reveal any quantitative weaknesses. In both machines, playback measurements were strikingly similar—suggesting tight quality control at the factory (see graph). Playback frequency response was flat, with good channel separation. Signal-to-noise ratio was excellent, as was THD+N.

Similarly, linearity error and other parameters were all very good. Record/play-

back measurements were also very good, with mainly slight (and expected) decreases in performance relative to playback-only measurements.

There is something very appealing about a MD machine. The media is removable, and it is essentially crash-proof. Anyone who is satisfied with cart machines will find the MD to be instantly likable. Moreover, the MD retains all the positive attributes of the cart machine, adds many positive attributes of its own, and discards virtually every one of the cart's negatives.



Second-generation MD from Sony

Whether the MD will inherit the cart's ubiquity, or merely serve as a brief stand-in while newer systems are perfected, will be fascinating to watch. One thing is certain. Units such as the MDS-B3 and MDS-B4P are light years beyond their analog tape predecessors.

□ □ □

Ken Pohlmann is a professor of Music Engineering at the University of Miami and a contributing writer to RW.

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Ken C. Pohlmann Hammer Laboratories—Test Report	
Equipment: Sony MDS-B3 MiniDisc Recorder/Player	
Record and playback measurements made through the analog inputs. Measurements listed are for the worst of the two channels.	
<b>DIGITAL PLAYBACK (Sony TGYS1 MD test disc)</b>	
Line output (for indicated 0 dB)	12.54
Frequency response (20 to 20,000 Hz)	-0.10 dB, 0.0 dB
Channel separation	
1,000 Hz	86.3 dB
20,000 Hz	61.4 dB
Signal-to-noise ratio	102.4 dB
A-weighted	95.9 dB
Dynamic range	93.2 dB
Distortion (THD+N at 1,000 Hz)	
0 dB	0.034 %
-20 dB	0.046 %
<b>DIGITAL RECORD/PLAYBACK</b>	
Line input (for indicated 0 dB)	12.50 v
Frequency response (20 to 20,000 Hz)	-0.01 dB, 0.04 dB
Channel separation	
1,000 Hz	78.4 dB
20,000 Hz	55.2 dB
Signal-to-Noise ratio	
A-weighted	91.9 dB
unweighted	90.3 dB
Dynamic range	84.9 dB
Distortion (THD+N at 1,000 Hz)	
0 dB	0.053 %
-20 dB	0.079 %

## MD USER REPORT

# Consumer MD Works for KSWP-FM

by **Tim Swanson**  
Production Director  
KSWP-FM

**LUFKIN, Texas** Being a chief engineer and production director at a non-commercial, donor supported, educational radio station can sometimes have its drawbacks. Without a large amount of capital rolling in on a consistent basis, repairing old equipment is difficult (often forcing us to rely on baling wire and bobby pins) and purchasing new equipment is impossible. Our old cart machine was a 20-year old used three-deck unit with one slot out and a bearing constantly grinding and ready to go at any minute, not to mention, monaural (really great sound for a stereo FM, right)?

Nevertheless, the time came to upgrade the old equipment. With an unlimited world of possibilities on the market these days, my decision had to be price-conscious and very user friendly, seeing as 98 percent of our on-air personnel are volunteer and not radio professionals.

## A consumer unit

After studying every conceivable scenario my decision was to go with the Sony MDS 501 home unit MiniDisc player/recorder. These units, while not the professional broadcast type, offer us excellent sound, editing and service.

The MDS 501 is very similar in size and style to a CD player, which all of

our personnel are very familiar with, because, we also use Sony home unit CD players.

**Our personnel love the instant access to all tracks (more than 200) and the instant airing of spots and the tight editing features of the 501.**

With four 501s in use in the studio and another in production, airing of public service announcements, intro's and outro's weather beds, sweepers, jingles—everything we have—is a breeze. The size of the disc themselves are worth it. We have two ordinary data tape boxes holding what a wall of carts once did.

Our personnel love the instant access to all tracks (more than 200) and the instant airing of spots with the tight editing features of the 501. There is also no tape hiss, no grinding bearing and the sound is superb. And the price made the station administrator very happy. We purchased four MDS501s for the price of the original MDS B1 pro Sony MD unit.

From an engineering standpoint, wiring up a home unit for broadcast use presented a few problems. The pause button acts for both pause and play, so a connection was made from the solder points of this to the "on" button of the control board.

We did the same thing to the CD players. All the on-air person has to do is POT up the correct channel on the board

and hit "on." The 501 will "autopause" after the track is finished and cue up to the next track, in either an ascending numerical order, random access or a programmable rotation.

## Small challenges

From a production standpoint, the recording of tracks was a little more challenging, but simplistic. A little thought had to be given to what a disc needed to have on it in order to not cause any confusion among the personnel. Logically, when a certain program "intro" is aired, the outro will automatically "cue and pause" and be waiting at the end of the program. This can also be done with program breaks, sweepers, jingles, and there is the possibility of using

the same system for unattended satellite feeds. Believe it or not, it works.

The timer will count up or down and gives us the advantage of having the exact time of our call in weather forecast, today's latest giveaway winner, or a fast-breaking news story that is called in. This is something our carts did not do and erasing a whole MiniDisc or just one track is so much easier than the old splice-finder/eraser. And I can edit or rearrange the tracks in a different numerical sequence if I choose—either in the production room or the studio.

For on-the-go operations, we purchased the Sony MZR2 portable "walkman" player/recorder for use with on-the-spot interviews and reports. The sound is very good and the auto-track function will make finding the recordings extremely easy when I get back to the production room. And it's not bad for capturing some home-brewed sound effects.

(Editor's Note: Be careful while recording events or actualities on the portable MD recorder while using it in a handheld mode. If the unit is jarred, the recording may error—losing a portion or even all of what you intended to record.)

While I do not want to downplay the quality of the pro MiniDisc equipment, for a station on a "shoestring" budget and the desires to go with digital sound, I don't think you can go wrong with the Sony MDS 501. If nothing else, get one for the home and record your own sound bites.

## SHORT TAKE

# ATUS Vocal Mic For ENG

by **Rich Rarey**

**WASHINGTON** Recently, I was looking for a good ENG microphone—with even response curve, high output, rugged, and reasonably priced.

What I found that comes close to most of these requirements was the Audio-Technica ATM63HE. The mic also had utility in other, non-news situations.

The ATM63HE is a high-output dynamic, low-impedance, hypercardioid pattern, hand-held mic. Its slightly tapering shape gives the mic a solid feel, and the metal ball windscreen complements the solid look.

The first test of the mic was in Africa, coupled to a Sony D-7 DAT. An NPR reporter was looking for a mic with a higher output than his Beyer M58, but with the sound, reliability, and good handling characteristics of the Beyer.

The reporter and his producer reported that the ATM63HE worked well in the heat and dust of the African continent, and was very useful in low-wind/no-wind conditions. However, they said the extra care required to reduce its handling noises made the ATM63HE less useful in situations where its other attributes would have made it a logical choice.

Here, too, the single-ball windscreen alone may not be effective against wind, and those wanting to use the ATM63HE outside should consider foam for shock mount and wind protection.

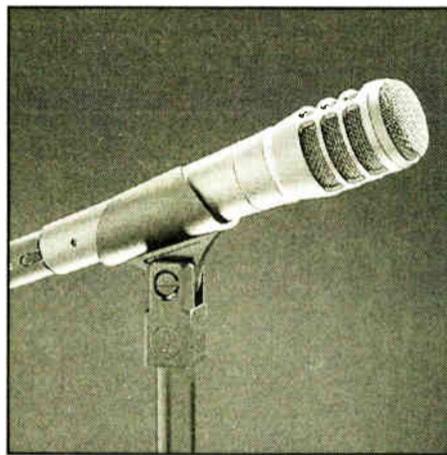
Away from the outside elements, the ATM63HE is a great mic for PA work; it was used at an in-house remembrance service, where one singer performed a sensitive operatic piece, and later in the program a different singer walloped the mic with the full force of a capella gospel.

In both instances, the mic responded beautifully, providing enough gain to capture the classical, and enough resilience to handle the religious. This was plainly the audio niche for the ATM63HE.

As part of a cache of durable mics that could be taken on a remote for the purpose of sound reinforcement, such as dances, sports events, and other public functions, the ATM63HE is a very good choice.

Even handheld, the ATM63HE would be acceptable for most 'non-sensitive' uses, and when coupled to an analog cassette deck—even a 'cheap' one—the signal-to-noise is much improved because of the mic's higher output.

For more information, contact Audio-Technica at 216-686-2600; or circle **Reader Service 38**.



ATM63HE

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# Lectrosonics Takes on Wireless Big Boys

by Rich Rarey

**WASHINGTON** When you acquire a product to test, are you ever surprised at the outcome? I recently was when NPR was given a chance to evaluate Lectrosonics' wireless microphone belt-pack transmitter and receiver.

We took the Lectrosonics UM195 and UCR195 to the U.S. Capitol Building last December to evaluate their effectiveness against a comparably positioned-transmitter and receiver built by a large overseas electronics concern. And by golly, the Lectrosonics simply blew the doors off the competitor!

## Wireless quality

Transmitting from a dining room one floor below the Speaker of the House's (i.e., Rep. Newt Gingrich) podium, we clearly received audio through three floors and some distance away. The other transmitter's audio was receivable from the same floor, not much further than line-of-sight.

I was intrigued: how could one wireless perform so much better than another and offer so many features? Aren't all wirelesses built similarly? And who were these people at Lectrosonics? How did they whip the products of a large overseas electronics company?

The answer came from Lectrosonics President, John Arasim. "We want to design and build the best damn product in the world," he said.

Lectrosonics, Inc., a company that began building portable lecterns and PA systems in 1971, has matured into a leader of portable wireless equipment. The company is located in Rio Rancho, New Mexico. It was Arasim's arrival in 1981 that revived the company from its ill financial health and directed its energies to new products.

## A changed company

Arasim believed that Lectrosonics should build its own products to its own design, work direct to dealer, and develop high-end niche markets where service and quality matter.

The first new product was "The Mouse," a portable guitar amplifier that immediately became popular with New York City's street musicians. Another Lectrosonics product became popular with marching bands and open-air promoters: "The Long Ranger." This product sold thousands of units and was the bread and butter for Lectrosonics during its early lean years.

The "Ranger" packaged two things that the company knew how to do well: a wireless receiver married to a rechargeable-battery-powered 30 watt amplified speaker. Simply set up the "Ranger" anywhere on the field, and a band director could shout all day before the amplifier battery quit.

"We know how to maximize the battery life for our products," Arasim said.

And indeed they do, for the UM195 belt-pack transmitter I tested will work 7.5 hours on one alkaline battery.

Arasim said the evolution of the Lectrosonics designs is the outcome of a corporate philosophy that practices continual improvement. To accomplish that, Arasim said that, up until last year, the company reinvested all profits in materials and tools.

These tools range from sophisticated automated component-insertion devices to complex metal working equipment. To continually improve products and devise new ones, Arasim said that Lectrosonics reinvests 10-12 percent of total sales into research and development.

## Engineering emphasis

Of 90 employees, 10 are engineers, and true to small high-tech firms, the engineers' offices are within 50 feet of the shop floor.

According to Arasim, there is not a formalized quality control program at the plant, but a prevailing corporate culture of "quality consciousness" that values the contributions of all employees. The shop floor personnel confer directly with designers to solve mutual problems. It's amazing to me how these abstract corporate philosophies are distilled into the pager-sized UM195 transmitter. The UM195's controls are simple and effective: Off/On/On-But-Input-Muted switch, Mic adjustment, Low Frequency Roll-Off adjustment, an LED to indicate POWER ON and two LEDs to show modulation level.

Pop in the short-wire antenna into the locking mini connector, slip in an alkaline 9 volt battery, plug in your mic cable, and go!

Lectrosonics also has devised a battery compartment that holds a 9 volt securely and a cleverly designed contact mechanism that auto adjusts to any known alkaline 9 volt battery ("We've tried 108 different ones!" the operating instructions said). The mechanism won't make contact if the battery is mis-insert... and that's extra reassurance if you've ever had to replace a 9 volt quickly.

Audio connection is made to a Switchcraft TA5F 5-pin locking connector, and here's the big plus: the UM195 can accept dynamic mics directly, electret mics (the UM195 provides the "+" or "-" bias), or even live level input,

depending on the input pins used. Ever wanted to use wireless mic transmitters to send a backfeed to your talent? The UM195 makes it easy and reliable.

These operational features enhance the value of the high quality sound of the transmitter. According to Lectrosonics Sales Manager Gordon Moore, the toughest electron-



## PUBLIC DOMAIN

ic module to perfect was the dual compandor—a circuit described in the operating manual as a "dynamic pre-emphasis/de-emphasis function with extremely low distortion."

## Using companding

Lectrosonics developed the dual compandor to process the audio separately above 1 kHz and below 1 kHz, believing that traditional pre- and de-emphasis techniques produce unacceptable distortion.

The 2:1 expander in the companion UCR195 receiver undoes the transmitter companding after the matching transmitter's 32 kHz pilot tone has been detected and filtered out. The receiver's output remains muted until this tone is detected—essentially a "lock" that prevents strong RF on the same channel from interfering (this squelch can be overridden by a switch in the battery compartment).

As wireless equipment must be portable and rugged, Lectrosonics has designed a digital pulse-counting detector to demodulate the FM signal, rather than using a conventional quadrature detector. This scheme gives the receiver excellent thermal stability over a wide temperature range.

The external receiver controls are

simple and straightforward: output level, power source selector (INTERNAL/OFF/EXTERNAL), headphone jack and level control, and a MODulation/RF selector for the 10-LED array.

In reviewing the UCR195, I was struck by a number of small, but important features including stereo headphone jack, LED array labeled in decibels for modulation level and volts for RF level, internal switch for audio output level, audio output mute momentarily on power up, and internal, self-healing poly fuse protecting the receiver, rugged battery compartment door, and solid, metal case construction.

Our intended use at the U.S. Capitol was to give each of two reporters a transmitter plugged to a AT835 shotgun mic, and a receiver to hear director cues and program host questions.

## Working the floor

Two UM195 transmitters in our first-floor remote site room were fed line-level signals from the remote console, and two receivers were mounted on a mic stand in an adjacent hallway. The stand was topped with a machined 1.75-inch rack panel, placed flat, with the UCR195s securely velcroed to the top of it.

During a lull in the broadcast, I borrowed a UCR195 receiver, and heard our back-feed audio clearly and loudly in headphones, around the entire hallway perimeter of the House of Representatives.

It was a pleasure to use such well designed, American-made electronic tools. John Arasim and the employees at Lectrosonics make a great product.

Until next month, I remain, Your ob'n't eng'r.

□ □ □

*Rich Rarey is the technical director for National Public Radio's All Things Considered. You can reach him at rrarey@npr.org.*

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# PRODUCT GUIDE

Companies with new product announcements for Studio Sessions Product Guide should send them to Radio World, c/o Studio Sessions Editor, 5827 Columbia Pike, 3rd floor, Falls Church, Va. 22041

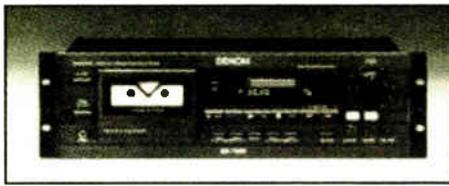


## Fostex D-25 DAT Recorder

The Fostex D-25 is a four-head studio DAT recorder that features chase sync to master timecode, 16-Mbit RAM for instant start, RAM scrub and independent recording.

Other features include 44.1 or 48 kHz sampling rate, 64 times oversampling, an array of analog and digital connectors and external control connectors.

For more information, contact Fostex at 1-800-7-FOSTEX.

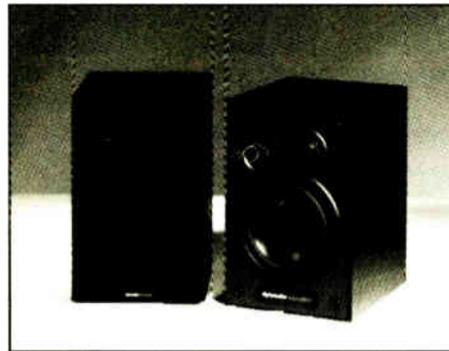


## Denon DN-790R Pro Dolby S Cassette Deck

Denon's DN-790R three-head cassette deck features Dolby B, C and the consumer version of professional Dolby SR noise reduction for up to 24 dB of five-band noise reduction.

Other features include manual/automatic bias control, playback speed adjust, monitor head, headphone jack, rack mount, three-motor operation, Music Search and XLR/RCA jack connectors.

For more information, contact Denon at 201-575-7810.



## Dynaudio Acoustics BMS Nearfield Monitor

Dynaudio has introduced a new, small nearfield monitor, the BM-5, designed for small-space applications including radio stations.

The BM-5 features 170 mm woofer, 75 mm tweeter with a frequency response of 50 Hz to 20 kHz, plus or minus three dB. Each speaker is magnetically shielded, and the cabinet measures 12.2-inches high by 8-inches-wide by 9.9-inches deep.

For more information, contact AXI Marketing at 617-457-8120.

(680MB) recordable CD. This CD-R disc is designed specifically for professional audio, multimedia and CD-ROM applications.

The disc employs a Phthalocyanine organic dye recording layer that is far less susceptible to the effects of UV light and is therefore more stable. According to the company, recent tests conducted to Orange Book standards indicate data security for 100 years under normal archiving conditions.

In addition, the discs are double coated for protection against scratches and fingerprints and the effects of humidity and temperature. According to the company, HHB CD-R discs are compatible with all leading CD writers and are capable of recording at 1-times, 2-times, 3-times and 6-times speeds.

For more information, contact HHB Communications at 207-773-2424.



## Sennheiser HD265 Monitor Headphones

Sennheiser's HD265 incorporates a two-layer "Duofol" diaphragm technology to reduce driver distortion and resonance for cleaner bass, according to the company.

The drivers are housed in sealed circumaural earcups with wrapped leatherette for enhanced comfort. As with other Sennheiser headphones, the HD265 is built with user-replaceable parts.

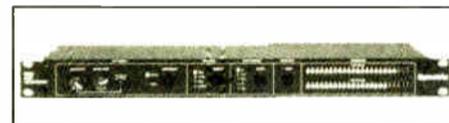
For more information, contact 203-434-91990.



## Garwood PRSII In-Ear Monitoring System

Garwood has introduced a new wireless, in-ear monitoring system. The unit features a transmitter unit, belt-pack receiver with in-ear monitor pieces. The transmitter is rackmountable and the receiver operates on a 9 V battery. The system can work at distances up to 300 feet.

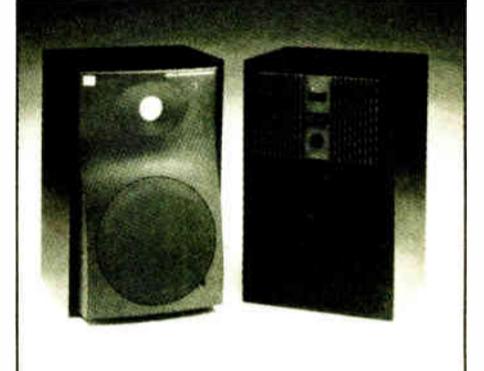
For more information, contact Garwood Communications Inc. 718-383-8004.



## Symetrix 620 20-Bit A/D Converter

Rejuvenation of older DAT recorder sound is just one of the intended uses of Symetrix new 620 20-bit A/D converter. The unit features true 20-bit quantization, selectable output word size, dither, noise shaping and selectable sampling rate: 22.05 kHz to 48 kHz. Cost is under \$1,000.

For more information, contact Symetrix 206-787-3222.



## JBL 6208 Amplified Nearfield Monitor

JBL's new 6208 nearfield monitors each contain a built-in amplifier (no power rating given). The 8-inch woofer, titanium dome tweeter speaker is said to reproduce audio frequencies from 60 Hz to 20 kHz within 2 dB. Other features include time alignment of drivers and under 30 pound cabinet weight. Price is \$499 each.

For more information, contact JBL at 818-893-8411.

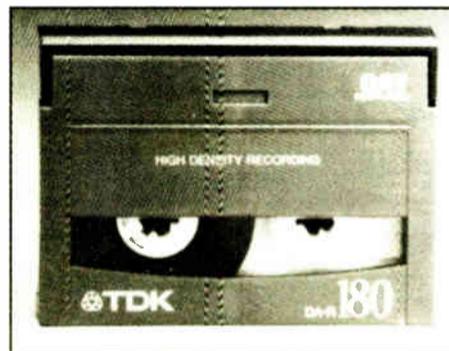


## RSP Tube Saturator

As proof of the continued popularity and resurgence of tube products, RSP Technologies has introduced the dual-channel Saturator to add "analog warmth" to digital recordings.

The Saturator adds the tube effect via two 12AX7s. Suggested applications include DAT mastering and vocals, but the unit could also be put in the production or air chain of a radio station. Features include XLR and quarter-inch connectors, drive/output controls, bypass switch and VU meters. Cost is \$699.

For more information, contact RSP Technologies at 810-853-3055.



## TDK 180-minute DAT

TDK has added an 180-minute blank DAT to its line. The tape uses an Electron Beam Cured binder system for tape strengthening. The tape is housed in a specially developed HPR cassette mechanism that is said to provide outstanding resistance to heat, abrasion and shock.

For more information, contact TDK at 516-625-0100.



## Oktava Microphone

Microphones from the Russian manufacturer Oktava are now available through Harris Allied. The fixed-pattern Oktava MK-219 cardioid microphone features a large diaphragm capsule teamed with low noise, transformerless, discrete preamplifier circuitry.

Magnetic reed switching is provided for both the 10 dB pad and high-pass filter switches. The capsule employs a thin, gold-plated diaphragm and is built to a classic design.

Frequency response is 10 Hz to 16 kHz with a sensitivity of 11 mV/Pa. Phantom power from 12 to 58 V, 48 V nominal, is available. Output impedance is 200 ohms nominal.

For more information, contact Harris Allied Broadcast Division at 317-962-8596.



## Marantz PMD320 CD Player

Marantz's PMD320 is a professional CD player designed for broadcast and commercial installations. Features include fader start, pitch control, rack mount and remote control connectors. The PMD321 offers similar features but with balanced XLR outputs and a cue-to-audio.

For more information, contact Marantz at 708-820-4800.

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## New CD-R Discs from HHB

As part of its expanding Advanced Media Products range, HHB Communications is now offering a 74-minute

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# Move Up from Tapes to Touchscreen Digital Audio

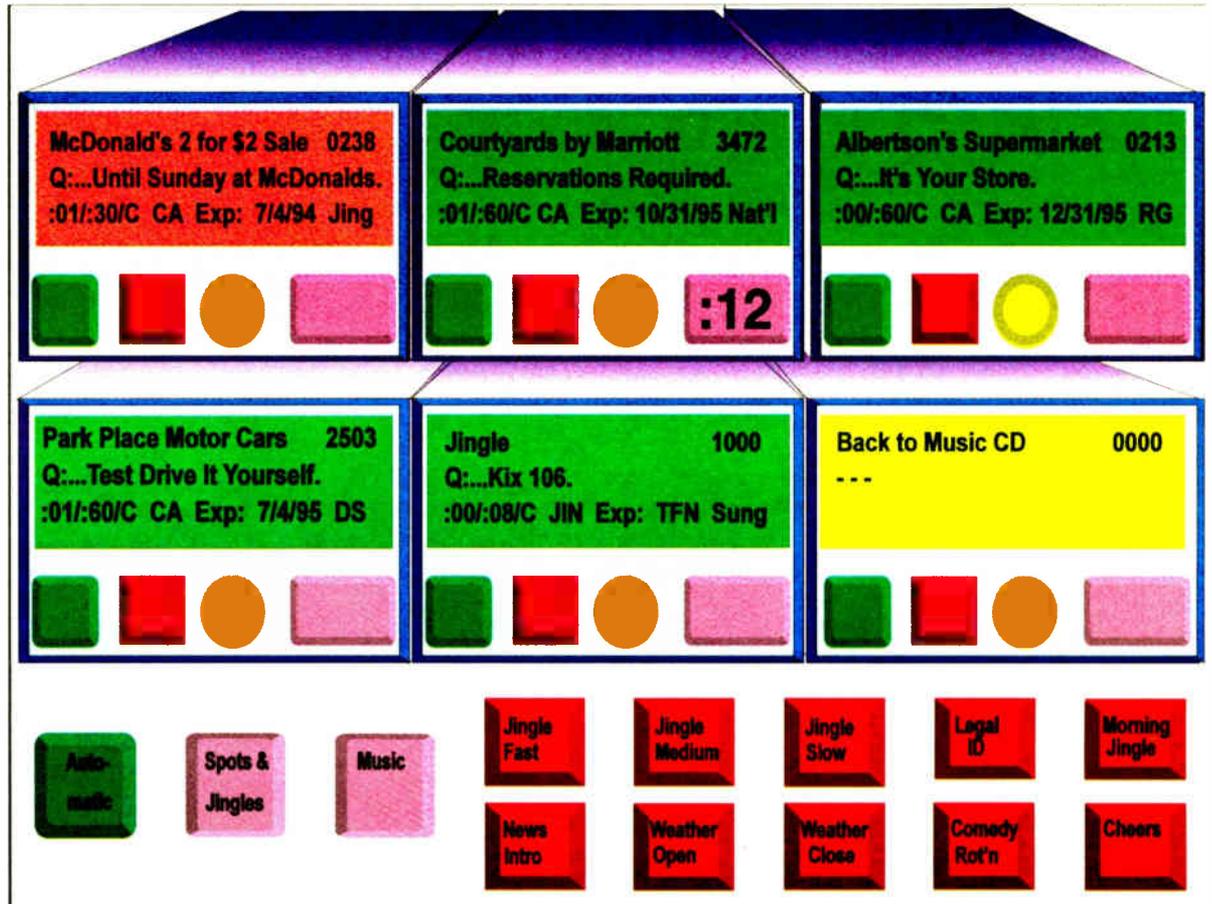
## Play Any Audio at a Touch

Nothing else makes radio as fast or easy as having all your spots, sounders and sweepers start with your fingertip—always on-line and ready to play from hard disk. And nothing else makes your station sound as good or as exciting as touchscreen digital and creative talent with Scott Studios' new *CompuCarts*!

If you've used carts, you already know how it works: Six "cart decks" on the computer touchscreen play what's on your program log. Scheduled spots, promos, PSAs and jingles come in automatically from your Scott Studios' Production Bank and your traffic computer. You see legible labels for everything, showing full names, intro times, lengths, endings, announcer initials, outcues, posts, and years. Your jocks can rearrange anything easily by touching any cart and moving it to any other cart. Spots with one number that rotate several cuts work just like carts, except additions, deletions and changes are much easier. Large digital timers automatically count down event times, and flash end warnings.

At the bottom, 10 "hot keys" start *unscheduled* jingles, sounders, effects, comedy bits or promos *on the spur of the moment*.

You also can select audio from lists of all your recordings.



Your jocks *already know how to use Scott Studios' CompuCarts!* It's the impressive quality of digital audio without the confusion of keyboards. Each button on the touchscreen plays what you want instantly. Logs come in automatically from your traffic computer.



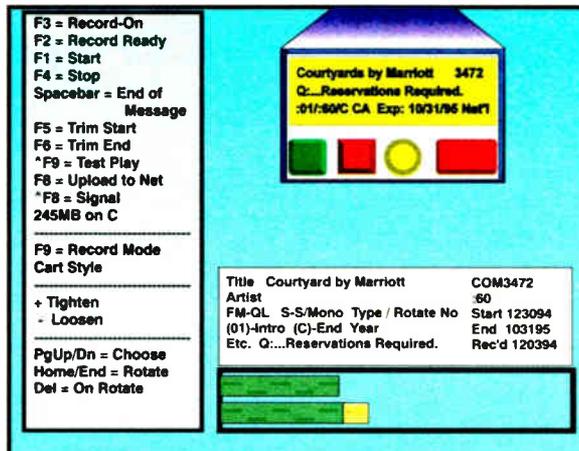
## The World's Fastest Playback!

Touch either of the two buttons at the bottom left of the main screen to see our "Wall of Carts" with all your audio *on-line!* Touch the sound, spot, jingle, promo, PSA or comedy you want and it plays *instantly.* Or, you can put it anywhere you want in the next six "cart" machines. Audio is displayed any five ways you like.

## Instant Music on Hard Drive

Our most popular option is 9 gigabyte disks with 1,000 songs pre-dubbed for *free!* The audio quality of digital music from the Scott CompuCart hard drive meets or beats the best CDs. You even get direct digital inputs so you can dub digitally from your CD players!

And nothing could be faster than song requests from Scott Studios' CompuCarts! You also get five "Wall of Carts" with music that plays at a touch! Songs are displayed by title, artist, year, length, category, or any ways you like.

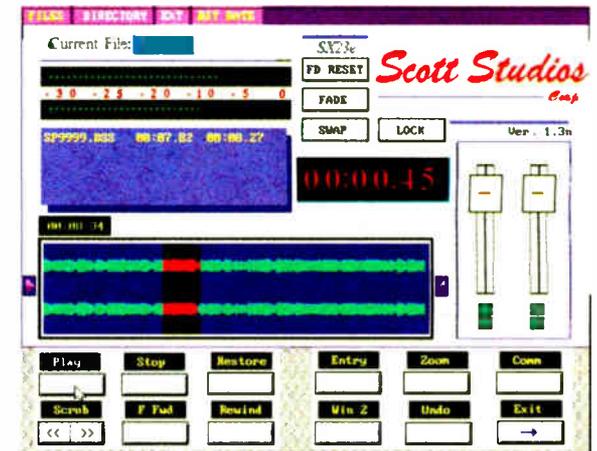


## The Easiest Digital Audio

CompuCarts not only work like a "cart" player in the air studio, CompuCarts work like a "cart" recorder in your production studio. You get all the features your radio station needs, including start- and end-dates, rotations, out-cues and easy-to-read label information. And when spots, promos, PSAs, or any other digital audio events are recorded, they're immediately playable in *all* your Scott System air studios. Nobody wastes time carrying carts down the hall or redubbing spots for additional stations.

## The Best Digital Audio

One question you *don't* have to worry about with the Scott System is "What if it breaks?" The Scott CompuCart System comes complete with *every* spot and jingle stored *redundantly* on *two* hard disks with a *split-second* switch to the "hot standby" outputs! You get touchscreen convenience, digital quality, and redundancy for no more than cart machines.



## Sound Better With Digital Editing

Scott Systems' graphic waveform editors work wonders with phone calls in the air studio and creative spots and promos in production.

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FIELD REPORT

# DATStation Adds Live Quality to Remote

by Chris Crump

**MAITLAND, Fla.** Last July, one of Paxson Communications FM stations, 101.1 WJRR, a rock music station, was asked to participate in the Bud Dry Alternative Summer, a promotion which would culminate in London at the 22nd annual Reading Music Festival.

The event gave me a chance to try out Sony's DATStation editor and our brand new Telos Zephyr.

Some quick programming decisions were made by John Frost, our operations manager. He first decided that Steve Robertson, our music director and host of our alternative music show, should broadcast his 10 p.m. to 1 a.m. show in its entirety for the week from England.

Secondly, we would need to produce two two-minute daily updates to give our listeners a feel for what was happening there. And finally, we would do the show live: no phone cut-ins, but full-spectrum FM broadcast audio.

### Technical challenges

Already this posed some interesting technical challenges. None of us had ever done a transatlantic radio broadcast. How would we go about transmitting our signal? How do we produce quality promos overseas without access to a digital workstation? And what do we do about the very wacky time difference?

Essentially, we were to broadcast from a tent in the middle of a large open field somewhere in the English countryside outside of London. The generators were a given. The media tent was to be outfitted with reel-to-reels, cassette desks and a DAT machine or two but no real multi-track capabilities.

As for transmitting our signal, we had just purchased two Telos Zephyrs for our network broadcasts of Florida Gators college football and basketball. The ISDN was a brand new feature for our local telephone carrier so the broadcast was considered kind of a trial run for all parties involved.

In terms of actually producing the 10 p.m. to 1 a.m. show, I had recalled an article in a past issue of **RW** about a Sony product called a DATStation—a two-deck DAT editor.

A fully portable unit, the PCM E7700 offers the ability to edit DAT tapes through a series of EDLs and the ability to manipulate audio from several source tapes and mix them down to a final master DAT. The unit seemed like the logical choice for my required "field production."

### Enter the DATStation

Through **RW**, Sony was kind enough to loan me its relatively new product for this unique "field test." I received the box about three days prior to leaving, so you could probably imagine my anxiety—I had never used the machine before.

My prayers were answered, however, regarding the learning curve on the machine. After about five hours of manual time, I was able to put together a few minor projects for broadcast before I left. I was able to maintain pure digital integrity by using the AES output from my digital workstation to the AES inputs of the Sony DATStation.

The E7700 is a very interesting box in that it works in a similar manner to a video editor. It's the same basic principle... just no pictures. It is comprised of two decks: a player on the left and a recorder on the right. The player deck is used to determine its points on the source DAT, and the record deck is used to compile the multiple edits from multiple sources if you so choose.

Producing the promos from the remote location was easy. With the pre-produced

promo elements on one source DAT, we were able to collect music artist performances, the festival crowd and local folks using our little Denon DAT DTR-80P, DAT recorder (that is, sadly, no longer made).

It was just a matter of compiling a list of edits on the E7700 using the multiple-source DATs, placing a "clean" DAT in the record deck and then pushing the "auto edit" key. All of the cuts were magically recorded as one seamless piece

of audio. You can specify about 999 different source DATs and at least as many edits. Pretty powerful editing from a box that only weighs 17 pounds and can go just about anywhere AC is available. Speaking of AC, the E7700 had a built-in 110/220 conversation adapter that didn't require an external "step-down" transformer unlike my little Mackie mixer which was rendered useless in the U.K.

As for producing our "live" broadcast, continued on page 48 ►

## RE2000

**The Diaphragm**  
We vacuum-laminate gold—just a few molecules thick—to our ultrathin diaphragm. Its unique diameter provides an extremely uniform, supercardioid pattern, wide dynamic range and exceptional transient response.

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Our custom-designed Jensen® output transformer is low in distortion and a true 150 ohms. It provides the high rejection of electromagnetic noise that only a transformer can.

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Self-noise is 5 to 10 dB lower than "industry standard" microphones. And we keep it that way even in conditions of high humidity with our Constant Environment System™ (CES), which keeps the element at a constant 125 °F.

**The Amenities**  
Shock-mount system, computer-grade power supply, external pop filter, hard-shell case, stand adapter and 20 ft. of premium cable with gold connectors.



## The Awe-Inspiring, Uncompromising Studio Condenser Microphone

Even before its introduction, the RE2000 had earned an amazing reputation and an enthusiastic following. Its exacting performance elicited accolades from professionals who thought they had heard it all.

"The RE2000 has a richness of sound I have experienced only along the lines of a tube mic" — David Esch, Eschicago

"The perfect mic for recording any acoustic string instrument." —

John Beland, Flying Burrito Brothers

"The RE2000 has the warmth of a tube mic—extremely quiet and sensitive, allowing me to pickup low-level material without adding noise." —

Scott Weber, Buena Vista Sound, Walt Disney Studios

"The RE2000 has a crisp, clean and quiet response. I used less EQ to achieve what I look for. What goes in...comes out! It's also extremely versatile...from vocals to acoustic guitars to trumpets and violins." —

Tom Cusic, TM Century, Dallas, TX

"I think it's one of the most versatile I've ever used." — Roy Thomas Baker, Producer

In fact, all of these professionals asked one remarkably familiar question:

**"When can I get one of my own?"**

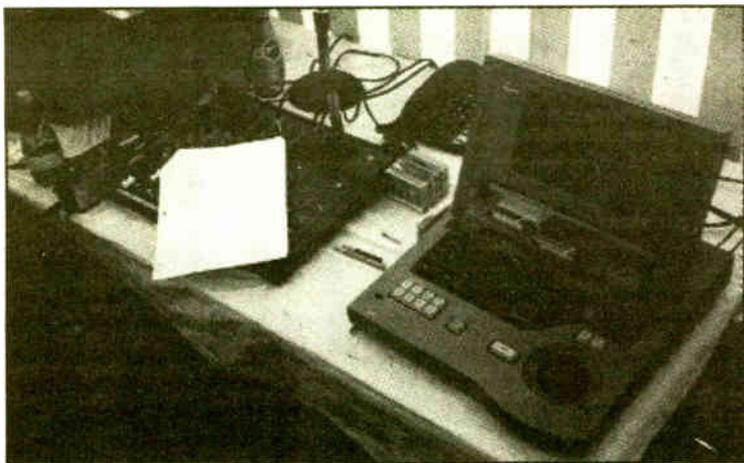
It's available now! And once you've heard it, we expect you'll be inspired to send us an accolade or two as well.



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World Radio History



The Sony DATStation was used extensively during the Music Festival.

# DATStation on Remote

▶ continued from page 47  
neither Steve nor I wanted to broadcast at 4 a.m., so, I sent Steve out into the crowd with the portable DAT recorder and a 60-minute DAT. He spent the day gathering sound, talking to concert goers, doing "breaks," intro'ing songs and so forth. The tape was brought back to me at the media tent.

My goal was to create a "show master" that I would transmit via ISDN back to the station. By

the end of the day, I was editing from seven or eight source tapes. I inserted a definable amount of silence for cueing purposes.

Once I had edited all of the segments for the entire show, I could then "auto edit" them to a single DAT, which would then be transmitted back to the station for later playback.

The ISDN transmission of the promos and canned breaks usually took about 25 minutes total,

which saved a few dollars on connection time.

The clarity and quality of the ISDN transmission using the Telos Zephyr combined with the digital audio was incredible. Most of our listeners actually thought we were "live," and many were amazed by our "live broadcast" from the streets of London.

### Loud and clear

Because the E7700 is a standard EDL-based system, it has very familiar cut, paste and copy editing features. Since my initial run with the early version, Sony has upgraded the software to allow for crossfading of source audio with a range of zero to three seconds.

The one frustrating thing about DAT editing is that it requires time code and if none is present (or if it is non-continuous), the E7700 won't read the tape—it just won't do anything with it for that matter.

But the E7700 does allow you to insert SMPTE/EBU/Film and A-Time time codes to even pre-recorded source DATs. The E7700 also has all of the standard DAT features plus some nifty things like a built-in internal speaker for location monitoring, headphone jack, adjustable sampling frequency, high-speed dubbing, super-fast jog and shuttle transport and an attractive carrying case.

Because of the E7700's ability to do high-speed DAT-to-DAT dubbing and editing, I was a popular guy at the Reading Festival. Not only were many of the recording artists we interviewed impressed with our setup, but many of our radio colleagues from around the country lined up for dubs and to ogle over the speed at which I was able to edit their material.

### A high price, but...

When I first got a hold of the E7700, word was that it was priced at around \$17,000. I've since been told that the price is under \$10,000.

To me, the benefits to producing events in the field were quite obvious. Radio broadcasts of professional sporting events always amazed me when I witnessed producers cueing up low-quality cassettes for use during a half-time show.

With the E7700, the half-time show could basically be produced before even going into the half-time break—all on one tape. The E7700 even allows you to mark cue points in real-time making it easy to shuttle back to a certain highlight or segment you'll want to play back.

Chris Crump is creative services director for Paxson Communications and a contributing writer to RW.

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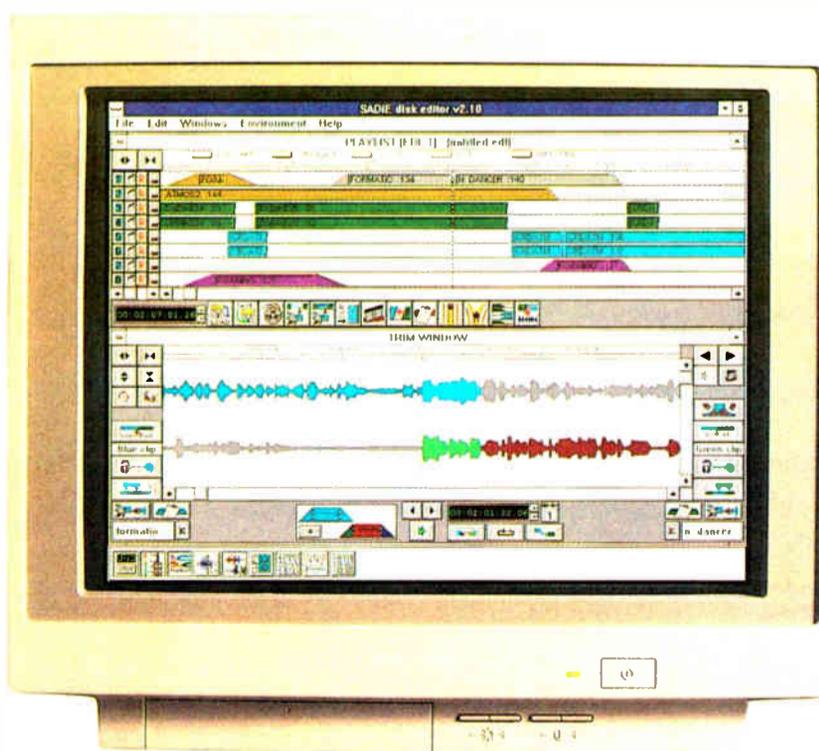
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Circle (4) On Reader Service Card

# AKG Mic Excels with Voice Work

by John Diamantis

**WASHINGTON** Allow me to get philosophical for a moment, please. In the art and science of audio, as in most of our life experiences, if we endeavor to reach a goal, our path is made easier by starting out on the right foot.

Let's relate. If you are still using reel-to-reel tape decks, and you need to record a longform program, if you use a fresh reel of tape, you'll be more or less guaranteed a successful dub. However, if to cut corners you use that ratty old production work tape (you know, the one with ten thousand edits oozing over with splice tape adhesive), you'll be more or less guaranteed hundreds of dropouts.

Or, to get to the point, if you are trying produce a high-quality live recording, no amount of after-the-fact knob twiddlin' is gonna change the sound of a cheap mic and make it sound great. Which brings me to this evaluation of the AKG C 12 VR



Redesigned C12VR

Vacuum Tube Condenser Microphone, the "VR," short for "Vintage Revival."

**Features**

The microphone, priced at \$3,500, came packaged in a professional flight case (snazzy looking!), with a small foam windscreen, elastic suspension mount, and power unit. Also included were the instruction manual, cables for audio and power, schematic, and individually run test strip. Quite an impressive package, considering that the standard studio condenser vocal mic usually comes in a vinyl-clad cardboard box.

The C 12 VR is actually a reintroduction of AKG's original C 12, which made its debut in the mid-1950s. The capsule used is the same as in the original model, now manufactured utilizing state-of-the-art techniques to ensure unit-to-unit consistency (original units are noted for their high quality of sound, but they often vary from one to another).

The design of this one-inch twin diaphragm allows nine different polar patterns, including omni, cardioid, figure-eight, and six intermediate steps, to be remotely adjustable from the power unit. The cable supplied for connection between mic and power supply is a twelve-conductor affair, while connection to the audio world is via an XLR connector on the rear of the power box.

Nominal sensitivity is adjustable internally via switches on the mic's PC board,

and output level can be set to "0," -10 dB, or -20 dB via an external switch.

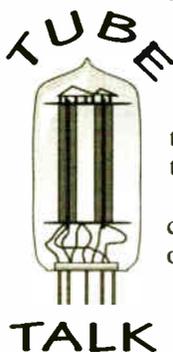
**Tube design**

The vacuum tube used is the same model used on the original, a 6072, which is a low-noise and ruggedized 12AY7 hi-mu dual triode. Replacements are available from AKG, and I would suggest getting them there, as this tube is pricey, and finding a suitable one could take time and lots of tubes.

The circuit is simple. The first triode section is a common cathode amplifier, and receives signal at its grid from the microphone element. The plate is capacitively coupled to one side of

the output transformer primary, while the other side is grounded. If additional sensitivity is required, the second section of the tube is switched into the circuit as a second stage common cathode amplifier, this time utilizing negative feedback from the plate to the grid in order to keep the additional gain at +10 dB.

The plate of the second stage is capacitively coupled to the previously grounded side of the transformer primary, and the previously driven side is grounded, thus preserving absolute phase when switching from one gain setting to the other (each amplifier stage inverts absolute phase at its output, so each time a



stage is added in series, the phase flips and must be corrected).

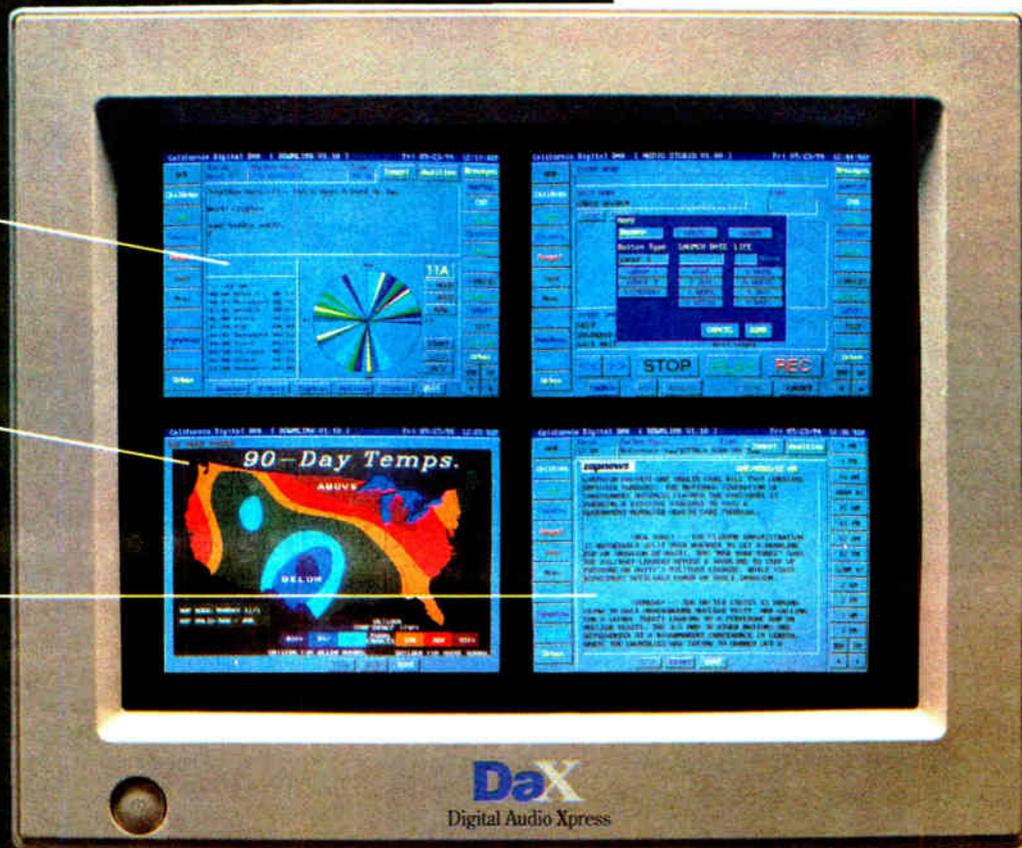
I first tried the C 12 VR in our secret Tube Talk laboratories, utilizing several voices and instruments as sound sources. I compared the AKG to a couple of high-end cardioid dynamic mics, as well as an industry standard vocal condenser mic.

**In use**

The C12 VR made the dynamic mics sound like they were broken. Voices especially showed up the differences. The dynamic mics sounded mechanical and closed in, almost as if a sharp noise gate was being used to cut off the sound below a certain point. Our reference mic suddenly didn't sound as glorious as it usually does. The AKG C 12 VR made a recorded voice sound more like a person was there speaking live.

continued on page 53 ►

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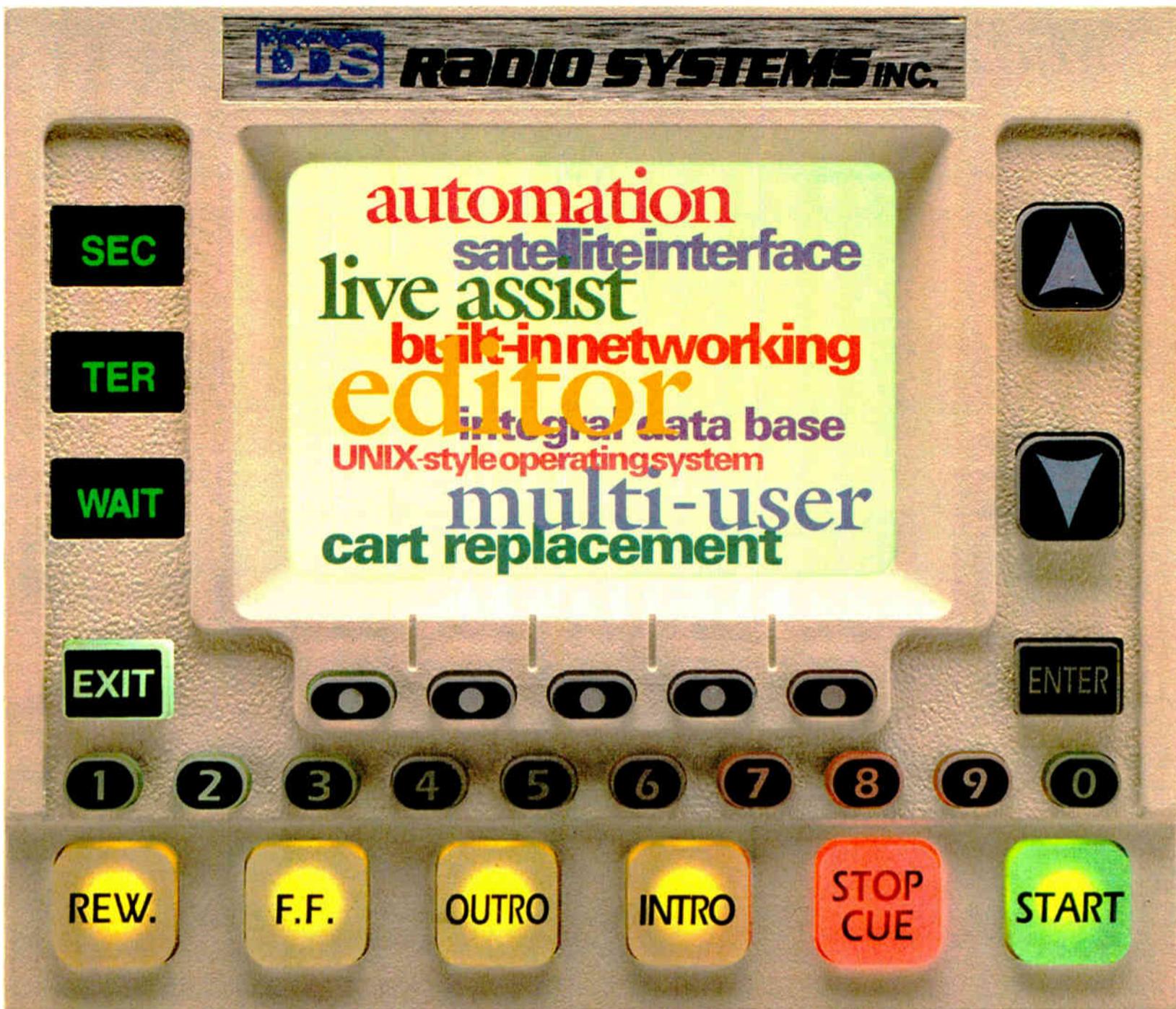
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 **HARRIS  
ALLIED**

# Big Voice From AKG

► continued from page 51

It wasn't a frequency-response kind of thing, as equalization didn't make the two mics equal. The C 12 VR sounded more tangible because it picked up more of the subtle nuances of sound fed to it. It did seem, however, to include a little more room ambience than other mics of its type. Thus, if your room acoustics are not very good, this mic will let you know it.

### In the studio

I installed the C 12 VR in the busy production room of WBIG, our Oldies-formatted station. This room is in use at least 12-15 hours per day, so I knew the mic would get a workout.

I only received one negative review from a user who felt the mic wasn't "bright" enough. This person preferred our studio standard condenser mic. The rest of the comments ranged from positive to enthusiastic, but it did seem to take a little while for people to warm up to it.

My reaction was immediate, and very positive. Bob Karson, our pre-eminent production director, and very patient guinea pig, produced some new promos for the station using the AKG mic, and I couldn't believe how his voice stood out in the mix. It wasn't really louder, nor a matter of equalization. His voice just seem to pop out of the radio more. I noticed similar effects on other recorded spots and promos as well.

I compared the noise generated by this mic with our standard solid state in-house mic and found the C 12 VR about 3-5 dB noisier, the spectrum consisting of a soft hiss. In all uses, this hiss was totally inaudible, and was definitely not noticed in any produced piece.

After a few weeks of trial, I removed the mic from service to return it to AKG. As soon as the mic was shipped away, I discovered the following:

1. Using this microphone is addicting, and removal from a studio will cause withdrawal.
2. Returning to our previous microphones showed how good the AKG really is.
3. Grownups will cry if they don't get their way (yes, I will put in a capital request for \$3,000 to buy you this mic).

### Summary

I encountered no problems while using the AKG C 12 VR. It is priced about the same as other premium mics currently available and if you have that kind of budget for microphones, I highly recommend it for inclusion on your list of "must haves" for the studio.

□ □ □

John Diamantis is director of technical operations for WBIG-FM, WGMS-FM, and WTEM(AM) in Washington, D.C.

### SIGNAL-TO-NOISE

# The Latest on Dylan, NAGRA

by Frank Beacham

**NEW YORK** The year is 1965. The place is Columbia Record's Studio "B" at 41 East 52nd Street in New York City. The three-track tape machine is about to record "Like A Rolling Stone" by a young singer and song writer named Bob Dylan.

Today, that famed studio, once the home of Arthur Godfrey's CBS radio show, has been reduced to a forgotten Manhattan warehouse. But the glory of that legendary recording session has been brought back to "virtual" life in a

remarkable new CD-ROM called "Bob Dylan: Highway 61 Interactive."

Recreated from photos and film footage, Columbia's Studio "B" and its control room become a navigable 3-D space on any PC or Macintosh computer equipped with a CD-ROM player.

When the user enters the studio, some amazing things happen. With the click of a mouse, musician Al Kooper appears to tell of his on-the-spot conversion from guitar to Hammond B-3 organ during the session. Another click brings up record producer Bob Johnston, who describes his work with Dylan.

When you open a tape cabinet in the control room, there are outtakes from "Like a Rolling Stone" and other Dylan songs recorded in the studio.

A click on a tape box reveals the original take list and notes by the recording engineer. By placing a tape icon on a recorder in the control room and hitting "play," the user can listen to each outtake and even hear the original banter between Dylan, his musicians and producer.

As much fun as this is, there's much more on this CD-ROM than the vintage studio. The disk covers Dylan's entire career with hours of music and material, including 3-D environments of the streets of Greenwich Village in the early 1960s, coffeehouses in the 1960s and 1970s and a backstage visit at a major concert.

It takes a full 12 hours to get through this massive collection. This may be the title that convinces recording fanatics to bite the bullet and buy a CD-ROM player.

★ ★ ★

Talk to professional sound recordists who use high-end portable equipment and you hear the same question asked over and over. Is it smart to invest now in expensive portable DAT recording equipment when the technology is in such a state of rapid change?

For a group of audio professionals who

are used to getting 20 years life from a \$15,000 Nagra analog recorder, investing in a new format is a major decision.

tape recorder at NAB '95. Called the Nagra ARES-C, this new 6.4 pound, 16-bit portable has no moving parts.

Aimed specifically at radio news reporters, the first-generation recorder uses G722 digital compression which offers a frequency response of 30 Hz to 7 kHz (-3 dB). However, the on-board compressor electronics (DSP, A/D, D/A and analog audio processing) are designed to accept up to 20 kHz.

This means, Nagra said, the recorder can be upgraded later to ISO/MPEG Layer II or better compression to allow greater bandwidth.

The new Nagra uses credit card-sized PCMCIA flash memory cards as storage media, records in mono or stereo,

includes on-board editing functions and outputs for ISDN, standard phone lines

continued on page 120 ►



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Circle (70) On Reader Service Card

# Otari MiniDisc Is Strong Contender

► continued from page 36

read, but the optimum angle of view is a bit narrow. As you move away from a dead-on view, either horizontally or vertically, the characters become more difficult to read. After I mentioned this, Otari said it would look into providing an adjustment.

The LCD level meters are slow and light up three chunks at a time. This isn't so bad up near Zero, where three chunks equal 3 dB, but three chunks equal 10 dB between -20 dB and -10 dB, etc.

## ATRAC compression

On straight voice recordings I was able to hear subtle artifacts on the first pass.

rhythm made the artifacts increasingly noticeable.

Using the same procedure on a voice-over music radio spot produced dramatically different results. Even after three trips through the ATRAC algorithm, I was unable to hear any artifacts—no difference in frequency response or stereo sound field. I consider that impressive.

## Operational capability

The MR-10's playback, record and edit features clearly make it superior to those of a cart machine. In single playback, the MR-10 pauses at the beginning of the next cut or series of programmed cuts, like a cart machine. Direct play-

"10," you end up back at "1."

This brings me to an aspect of the MR-10 that took some getting used to. While in "Stop" mode, although you can toggle the machine to the appropriate cut number, the cut is not really cued up. What happens next depends on whether the machine is in the "Auto-Cue" mode. If it isn't in "Auto Cue," hitting the "Play" button results in about a two-second delay after which the MR-10 plays the cut.

Hitting the "Pause" button after selecting a cut cues up the cut and although the "Pause" button stays lit, hitting the play button starts the cut. Hitting the "Pause" button previews the cut by playing the first few seconds of the selected cut over and over.

In the "Auto Cue" mode, hitting the "Play" button cues up the selected cut. It can then be played by hitting "Play" again or previewed by hitting "Pause."

The CB-159 Remote Control Unit is a 5-inch x 9-inch tabletop numeric, function and QWERTY keypad that comes with the MR-10. With it, you can operate the unit from a distance, access a cut by number instead of toggling and enter titles of up to 32 alphanumeric characters. The screen, however, only shows 16 characters at a time. The only time the full 32 characters are shown is when the cut is first accessed, or if the "display" buttons on either the remote pad or front panel of the unit are hit. Then, the full title scrolls once across the display.

## Some quirks

The keyboard has some other unconventional quirks. For cueing purposes, entering two-digit cut numbers requires that the greater than 10 button first be pressed. For cuts higher in number than 99, the greater than 10 button must first be pressed twice. The QWERTY board is "CAP LOCKED," requiring that the "shift" button be used to enter lower case letters.

It would be nice if the remote control unit had a small display that showed when the main unit was cued up and the name or number of the cut. Without that information, the operator must still keep an eye on the main display.

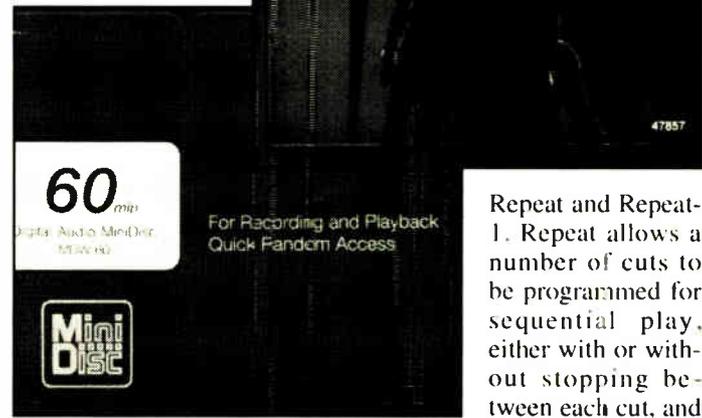
Recording on the MR-10 is a breeze. After inserting a blank or partially recorded MiniDisc one hit of the "record" button puts the machine into record pause. Hit the "Play" button and the machine begins recording almost instantly. Hitting "Pause" while in record stops the recording process, but allows you to continue. When you hit "Play" again, the cut number is incremented by one.

The Auto Marking feature sets a -40 dB threshold for continuous incoming audio. As long as there is a three second silence between cuts, the MR-10 will drop a new cut number at the point at which the

audio exceeds the -40 dB line. This feature is great for streaming an entire collection of material from one source to a disc, and most of the time the -40 dB threshold worked well.

Out of the 47 cuts streamed from CD, only three were upcut. This happened on two soft intros and with one that started smartly. There are two repeat modes:

Prerecorded (right) and rerecordable MDs.



Repeat and Repeat-1. Repeat allows a number of cuts to be programmed for sequential play, either with or without stopping between each cut, and

for the programmed sequence of cuts to be played over and over again.

Repeat-1 limits the selection to one cut on the disc or one cut in a series of programmed cuts.

While in pause or stop within the program mode, the "previous" and "next" buttons can be used to select a specific cut in a programmed sequence.

Program Playback can be used to program an entire spot break from one machine. This requires that very tight start and stop cues be used when recording the cuts, and allows for no crossfades. It doesn't sound like the "tightest board," but if you can tolerate a little space between spots and have less than 74 minutes of spots, they can all be put on one disc and run from one machine.

The production director can keep a backup copy for safety, which also can be updated and swapped with the main copy when needed. Erasing old spots and renumbering new ones are easy processes on the MR-10, as are the "divide," "join" and "erase all" functions.

The 16-page manual is sparse but well written, and includes a parts list, PCB block diagram and exploded view. Also included are notes on limitations such as, each disc is limited to 255 tracks, problems with tracks less than eight seconds, and other problems that result from fragmented disc recording.

## Conclusion

Although I remain concerned about the audible artifacts on the voice-only recordings and have reservations concerning the use of the MR-10 in the archiving of audio or in applications where multiple data compression algorithms may be applied downstream, the MR-10 is still an impressive display of digital technology—even with its quirks. Perhaps the MiniDisc ice is not as thin as reported when the technology first appeared.

□□□

*Ty Ford voices and produces audio tracks for a wide variety of professional purposes. When not in session, he can be reached at 410-889-6201.*

**The MR-10 is still an impressive display of digital technology—even with its quirks. Perhaps the MiniDisc ice is not as thin as reported.**

Although they were subtle and not present during quiet passages between phrases, each spoken phrase had a low-level veil of high-frequency fuzz around it. Two more digital bounce trips through the ATRAC compression algo-

back of a cut is as simple as using the "previous" or "next" buttons of the face of the MR-10 to toggle to the correct number. The cut numbers are stored in a circular system, so if you have 10 cuts and you hit the "next" button while at

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World Radio History

“**M**y bottom line was time. I was spending way too many late hours in the 24-track room just to get one show up on the bird each week. The average teen attention span being what it is, we were juggling hundreds of elements per show to get the impact we wanted, and I had to do something to get it under control.

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**—Todd Busted, Senior Producer  
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# Solid Specs from MR-10

► continued from page 36

aliasing filter keeping the deck out of trouble.

Playing the digital-zero track of the test disc, the MR-10 cranked out 25.6 dBu (unloaded) before any trace of clipping and, with the back-panel level controls you can match channel outputs if you have a deft hand with a screwdriver; I found the controls a bit touchy. Similar adjustments set the analog recording gain. Cranked up all the way, you can get a digital-zero recording with an input as low as -5.6 dBu. At digital-zero, the "OVER" segment just comes on. Source impedance at the balanced line outputs is 55 ohms, 145 ohms at the headphone jack, which can deliver about 70 mW into either 50- or 600-ohm phones, nearly 110 mW into a matched load. That ought to be enough to sizzle the cochlea.

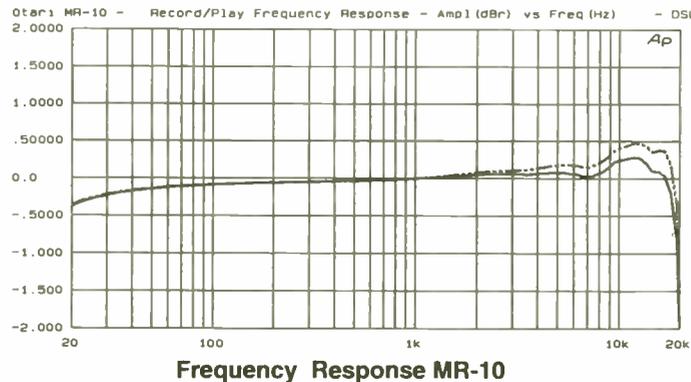
The THD+N at digital-zero was under 0.22 percent from 20 Hz to above 18 kHz when recording and playing from the analog inputs; under 0.13 percent over that range with a digital transfer. Distortion leaps to about 0.7 percent (analog), 0.6 percent (digital) at 20 kHz but, again, who cares? The THD+N as a function of level (using a test frequency of 1 kHz) was under -68.1 dB on either track at digital recording levels from 0 dB to -90 dB, and under -64.3 dB from 0 to -70 dB on the right track when recording from an analog source. Left-track performance with an analog source was somewhat worse: -56.5 dB from 0 to -70 dB.

A-weighted S/N clocked in at a relatively modest 86.8 dB with a digital recording, a substantially worse 81.5 dB when recording from the analog inputs.

Dynamic Range, a test that includes D/A converter noise, was 87.3 dB (A-weighted), 82.9 dB (unweighted) with digital recording, 83.2 dB and 80.5 dB, respectively, with analog recording. Quantization noise was a relatively poor 66.9 dB although converter linearity error was quite low: 0.5 dB or less down to the -76 dB recording level.

Channel separation was better going from right to left, but, worst case, separation remained above 45 dB from 125 Hz to 10 kHz with a pre-recorded MD, better than 35 dB from 100 Hz to 10 kHz when recording and playing from the analog inputs.

Figure 1.



Although the Otari MR-10 set no new technical records nor did it fare quite as well as the finest MD recorders I've tested vis-à-vis noise and specs related

thereto, it did meet its own specs in all important regards and beats the average cart machine hands down. Verdict: solid and competent.

# E D U

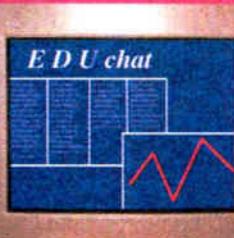
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World Radio History

# 'Greatest Show' Headlines in Vegas

## U.S. and International Attendees Will Have First-Row Seats to USA Digital's IBOC DAB Broadcasts

► continued from page 1

Broadcast Engineering Conference. The conference's schedule includes discussions about advances in digital technology, data broadcasting, satellite and auxiliary systems.

The NAB recently added a "Digital Radio Broadcast" seminar to the conven-

technical regulatory issues pertinent to both radio and television, and the next day, there will be a radio RF workshop designed to help stations maintain their signals.

### Radio Management Conference

A Radio Management Conference will

Broadcasting." The other is titled "Making Satellite Programming Sound Local."

The management conference will also host a session exploring a variety of management and production procedures devised to help stations improve their performance in both areas. One session will show how to manage people who are new to radio industry and another session will feature the industry's best promotions.

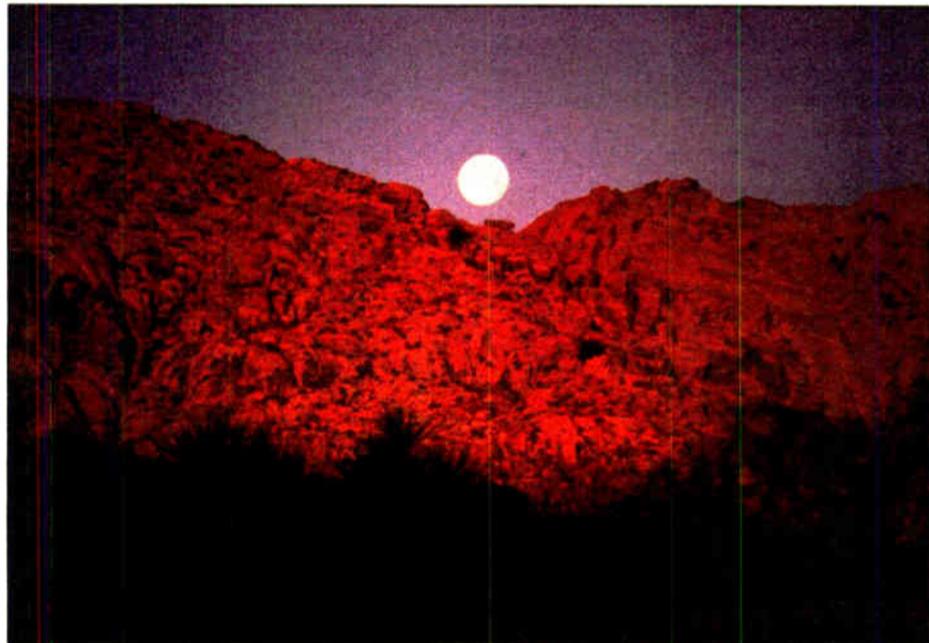
### Regulatory conferences

On Monday, April 10, through Wednesday, April 12, the NAB will hold its "Broadcaster Law and Regulation Conference," which is designed to show broadcasters how to gain greater control

Wednesday, April 12, and a regulatory dialogue session. Both are designed to give FCC officials an opportunity to share facts and opinions about current and upcoming regulations, and to give broadcasters an opportunity to ask regulatory questions.

### Radio Advertising Bureau sales

On Tuesday, April 11, and Wednesday, April 12, the Radio Advertising Bureau will offer a sales and marketing conference designed to improve sales and marketing operations. In conjunction with the NAB, RAB is also sponsoring lunch on April 11 that will induct Gary Owens and Carol Burnett into the Hall of Fame. Owens, the Hall of Fame radio inductee, was a key radio air-personality at numerous radio stations across the country and later became a vice president for Gannett Radio. Carol Burnett is the TV inductee. She is a five-time Emmy



The serenity of Red Rocks will remain undisturbed by the convergence of 80,000 in nearby Las Vegas.

tion, designed to help broadcast engineers understand the fundamentals of digital audio broadcasting.

The engineering conference will also host a "Radio Remote Broadcasting" session that will focus on the latest digital remote technology.

Attendees can then experience digital broadcasting firsthand by visiting the Radio Hall where USA Digital Radio will feature a live digital audio broadcast remote on the AM and FM band in conjunction with Harris Allied (see RW March 8).

The FM remote will be broadcasted through a Las Vegas station that remains unidentified at press time as final contracts are negotiated. The digital signal, though, will be 20 kHz stereo.

The AM remote will be broadcasted on the expanded band at 1660 kHz during exhibit hours on April 10-13. The signal will be broadcasted at 15 kHz stereo. The remote will give listeners an opportunity to make a four-way comparison between digital AM and analog AM and digital FM and analog FM. NAB attendees will be able to hear the remote from the exhibit floor.

In addition, a NAB-contracted Greyhound Bus will provide a half hour tour through Las Vegas. It will tune in to the remote to show listeners how a DAB broadcast would sound from an automobile receiver and how digital broadcasting handles interference that is often encountered during a drive.

On Wednesday, April 12, the engineering conference will offer a seminar on

also highlight some of the latest digital technology, including the latest newsroom technology. On Monday, April 10, the conference will feature two digital related seminars. The first is titled "A Manager's Look at Digital

**The engineering conference will offer a seminar on technical regulatory issues pertinent to both radio and television.**

over their regulatory futures.

On Tuesday, April 11, there will be a special seminar on fulfilling EEO obligations. In addition, two other workshops are scheduled for that day. One seminar will examine employment and workplace laws as they relate to broadcasters and another will deal with content regulations. On Wednesday, April 12, the broadcasting regulation conference will sponsor a music licensing session.

The regulatory conference will also feature its annual "Policymakers Breakfast,"

Award winner who hosted her own variety show for 11 years. The Crystal Radio Awards will also be given at the RAB/NAB lunch.

The RAB conference will also feature a session on buying and selling stations in today's changing regulatory environments in addition to idea-exchange workshops.

An invitation was extended to President Clinton to address the convention. But citing a conflicting schedule, the President declined the invitation.

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# Quello: You Cannot Stop Progress

*Editor's note: The keynote speaker for the Broadcast Engineering Conference at this year's NAB convention is commissioner James Quello.*

A lifelong Democrat, he was first appointed to the FCC by President Richard Nixon in 1974, and was later reappointed by Republican Presidents Reagan and Bush.

Prior to his 1974 appointment, Quello had been a manager and vice president of Capital Cities WJR-AM-FM in Detroit, his hometown. He joined the stations in 1947.

Quello, who was born in the upper Michigan Peninsula—in the town of

Laurium, is also a decorated World War II veteran. He is credited for leading a night patrol in France that once captured 68 German soldiers.

In 1993, President Clinton appointed him interim chairman until Reed Hundt was appointed to the position permanently the same year.

He recently revealed to *RW* that he will not seek reappointment after his term expires in 1996 and would instead most likely accept a chair created in his name at Michigan State University. Federal law prevents him from accepting the chair while a sitting FCC commissioner.

Quello recently agreed to an interview with *RW* where he discussed digital satellite broadcasting, the new Emergency Alert System, the expanded AM band and the changing role of the FCC:

**RW:** Based on your years of experience at the commission and as a broadcaster, what do you think the role of the FCC should be?

**Q:** The role of the commission today actually should be the orderly, compatible implementation of the advanced technology services of

everything—computing, fiber optics, DBS, DAB, HDTV, BCS, cellular—practical implementation of all these services, and it is a complex job. I've always said that the rate and extent of the development will be decided pretty much by consumer acceptance and consumer appointability.

So, that too will be a slow evolutionary process. How many channels do people want? How many people want interactive on the super information highway? As I see the super information highway, eventually, there will be four or five of them. I think there is going to be two wire lines—phone companies, and cable. There will be another one wireless, you'll have cellular, DCS and you'll have AT&T and long distance cellular, and you're going to have digital broadcasting satellite, there's four of them... and these will be competing energies.

**RW:** How will the FCC help terrestrial broadcasters compete on an even field with digital satellite broadcasting?

**Q:** We are doing everything to tell them that they have at least three years to develop terrestrial broadcasting. Remember, pure satellite transmission does not provide for a local service, and radio's biggest value is local news, local emergency alerting, local traffic reports. We are telling radio, if you can, get some kind of terrestrial (digital) service. They have some proposals now.

You cannot roll back advances in technology, and DBS does represent advanced technology. On the other hand,



James Quello

you don't want to regulate something or deregulate it just for the sake of advanced technology. The number one thing we always have to keep in mind is: "What best serves the public?" That is where the public interest lies. So if it appears to me that we can serve the public by delaying it (digital satellite broadcasting) just a little bit, I might even do that.

**RW:** So it is a possibility then that the FCC might hold the digital broadcasters back until the terrestrial broadcasters can go ahead with their systems first?

**Q:** We don't want to do that, but as I said, if it was a real threat, and they (digital satellite broadcasting) were close to having local service, we could make a very compelling argument that public interest should pay for the very valuable service of the public needs and wants over the type of service this would provide—local news, emergencies, traffic, weather reports.

continued on page 62 ►



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# NAB Boasts Varied Technical Agenda

by John Marino

**LAS VEGAS** The NAB Broadcast Engineering Conference is being held in conjunction with NAB '95 April 8 - 13 in Las Vegas. This year's conference was planned with the cooperation of the Society of Broadcast Engineers (SBE) and features sessions targeted to corporate, contract and individual station engineers.

A special seminar on digital radio is being presented by the Institute of Electrical and Electronics Engineers Broadcast Technology Society (IEEE/BTS) on Saturday, April 8. The "Digital Radio Seminar" instructors are Alfred Resnick, P.E., vice president of radio engineering, Capital Cities/ABC; and Robert Culver, P.E., president, Lohnes & Culver. The seminar targets engineers who have worked most of their careers in an analog world and now find it necessary to grasp the fundamentals of digital radio.

## Digital basics

The instructors will begin with the basics of digital communication technology and work through the details of

transmitting and receiving digital signals. The seminar is designed to provide a solid background for engineers interested in digital audio broadcasting.

FCC Commissioner James H. Quello will officially open the NAB Broadcast Engineering Conference with a keynote speech at 9:00 a.m. on Sunday, April 9. Immediately following the opening speech, the radio engineering conference sessions will begin with Part I of the

the commission's enforcement program and what broadcasters should do to insure that their facilities will pass inspection.

Milford Smith moderates a Tuesday morning session, "Digital Audio Encoding: Concepts and Realities." The session addresses the important matter of preserving audio quality throughout the broadcast plant. Presentations will be delivered by representatives of CCS,

216-1847 from the handset of your fax machine and follow the voice prompts.

□□□

John Marino is director of technical conferences. He can be reached at 202-429-539; or by fax, 202-775-4981.

**The latest information from the various DAB proponents will be presented along with a panel discussion of the latest developments from the DAB testing.**

"All-Digital Radio Station: Digital Audio Broadcasting." The session will be moderated by Milford Smith, vice president, engineering for Greater Media, Inc.

The latest information from the various DAB proponents will be presented along with a panel discussion of the latest developments from the DAB testing program. Representatives from USA Digital Radio, AT&T, VOA/JPL and Eureka 147 will be available to answer questions regarding their proposed systems.

Also Sunday afternoon, technical writer Jerry Whitaker, chairman of the NAB/SBE conference planning committee, will moderate "The All-Digital Radio Station II: Digital Audio Production." The session will focus on digital storage and digital audio workstations. Expert presenters will provide information on how to design and implement digital audio storage systems as well as how to choose the right digital audio workstation.

The session is targeted to engineers transitioning their facilities to all-digital. Monday sessions are devoted to radio data broadcasting and computer technology. The morning session is again moderated by Jerry Whitaker and takes a look at how data broadcasting can provide new sources of revenue for stations. This important session is targeted to engineers and managers who need to know more about the methods and opportunities of radio data broadcasting.

## Computer technology

In the afternoon, Bill Ruck, engineering manager for KFOG and KNBR in San Francisco, is moderating "Computer Technology for Broadcast Support." Today, there are probably over 100 stations using the Internet and dedicated bulletin board services. This session will offer an insight on how stations are using these services for promotion. Experts in the area of Local Area Networks will complete the session by addressing the efficiencies gained by installing networks in individual facilities.

Also, Monday afternoon, a special session is targeted toward all broadcasters who have questions on the FCC's inspection and enforcement program. During a station visit, an FCC inspector typically looks for compliance in very specific areas. FCC enforcement personnel from all six FCC districts will candidly discuss

APT, AT&T and Dolby — all developers of distinct audio bit reduction algorithms. Herb Squire, chief engineer of WQXR and WQEW, New York, will lend his expertise in a discussion of the potential problems that broadcasters can face when copying and transporting digitally compressed audio throughout their plants.

"Radio Remote Broadcasting: The Latest Digital Technologies" is the topic for Bill Ruck's Tuesday afternoon session. Radio remotes provide significant revenue opportunities for many stations. However, the quality of remote broadcasts often dissatisfies the client.

## Broadcaster revenue

This session targets the technologies available today that can win broadcasters additional revenue through high-quality, efficient remotes.

A special conference track moderated by Dane Erikson, P.E., of Hammett & Edison is scheduled all day Wednesday. The two-part session on Technical Regulatory Issues will offer broadcasters a chance to interact with panels of experts on FCC/FAA matters, RFR issues, the new Emergency Alert System (EAS) and broadcast auxiliary spectrum. Additional presentations will cover the new FCC tower registration database, OSHA requirements for broadcasters, unattended operations and international treaty requirements for stations near the Canadian and Mexican borders.

Each panel will include an FCC representative, a communications attorney, and various industry experts. The day's session ends with an FCC Roundtable devoted mainly to answering audience questions.

The radio portion of the conference concludes on Thursday morning with the Radio RF Workshop. Presentation topics include AM and FM transmitters and antenna systems—the final link to radio listeners.

New methods of predicting and verifying station coverage will be presented along with new developments in antenna engineering. A special presentation addresses the FCC AM emission limitations—compliance with the NRSC AM transmission standard.

For more detailed, regularly updated, information on NAB '95 and the NAB Broadcast Engineering Conference, call the NAB fax-on-demand service at 301-

## SBE/NAB Build Engineer's Conference

by Alan Haber

**WASHINGTON** This year, for the first time, the NAB '95 Broadcast Engineering Conference is co-organized by the Society of Broadcast Engineers (SBE).

The Conference, which is being held April 8 through April 13, during NAB '95 in Las Vegas, Nev., also will include technical sessions on topics such as digital audio workstations and digital radio, also includes the keynote address on Sunday, April 9 from FCC Commissioner James H. Quello, and the Engineering Awards Luncheon on Wednesday, April 12. Lewis Platt, chairman and CEO of Hewlett Packard, will be the featured speaker at that luncheon.

Building on the successes of the maintenance and operations-oriented sessions held during SBE Days at previous spring NAB Conventions, the 1995 Broadcast Engineering Conference has been organized by a ten-member committee working closely with NAB and SBE staff. The same committee will also be working on future engineering conferences at the NAB conventions and World Media Expos.

Both NAB and SBE said they benefit from the new arrangement. "It is good to get their (SBE) input," the NAB's John Marino said. "We felt that it was a good opportunity to work with them...and try to make sure that we have the best conference we can put together."

Jerry Whitaker, chairman of the joint Engineering Conference Advisory Committee, a writer of technical and scientific books, and editor of *Video Systems* magazine, noted that "the primary benefit for both organizations is the more individuals you get together to attack a particular problem or to organize a particular session, the better the outcome will be."

Be sure to check on-site at the Las Vegas Convention Center, and in the NAB 95 program guide, for locations and last-minute changes regarding all sessions in the Broadcast Engineering Conference.

## No NAB Award Winner Yet

by Alan Haber

**WASHINGTON** At press time, announcement of the 1995 National Association of Broadcasters (NAB) Radio Engineering Achievement Award winner had been delayed by the NAB, due to the larger than normal number of entries received, according to an NAB source, who said the winner was to be chosen in early March.

Over the past four years, the Radio Engineering Award winner was interviewed for *RW's* NAB spring convention preview issue, but the NAB said that it could not have a selection ready by our deadline. The NAB engineering award honors an industry person for his or her engineering achievements in the broadcasting industry from 1959 to 1990. Separate awards for radio and television were instituted in 1991. This year's honoree will be recognized at the NAB '95 Broadcast Engineering Luncheon on Wednesday, April 12.

Past recipients of the NAB Radio Engineering Achievement Award include Charles T. Morgan, Susquehanna Radio Corporation (1994), Robert M. Silliman, Silliman and Silliman (1993); and Edward Edison and Robert L. Hammett, Hammett & Edison (1992).

A profile of this year's winner will appear in a future issue of *Radio World*.

# You Cannot Stop Progress

▶ continued from page 60

**RW:** Do you believe that terrestrial broadcasters will hang on and continue to develop new niches?

**Q:** That's only a guess. My experience is that the digital (satellite) will take away some audience. When you take away audience, you take away ratings. You take away some money. But I don't think it's going to be substantial. I would still bet on local radio being a very viable business. It's just that no one likes to welcome competition, even minor competition.

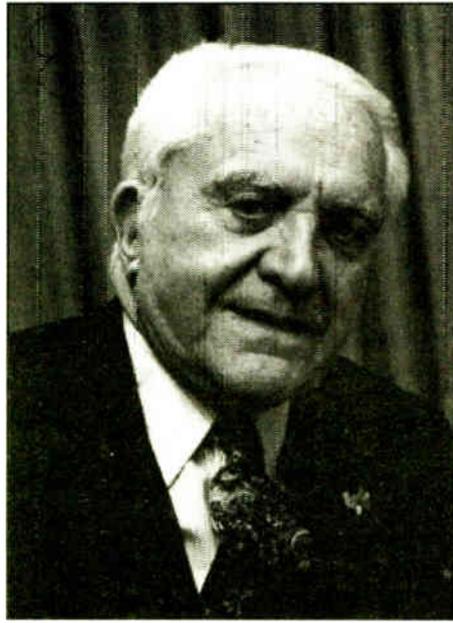
**RW:** In light of the FCC's decision in the early 1980s not to implement an AM stereo standard, and the subsequent confusion, why didn't the FCC mandate one EAS (Emergency Alerting Systems) system?

**Q:** We had an AM stereo standard picked out in the early 1980s, and we should have stuck with our guns. But when it came to the final analysis, where you say "Do you want to let them go on themselves or do you want to just take a look at and pick a standard and then fight in court for 3 1/2 years?" And that's what happened. I don't know if we did the right thing, but it was a loose, loose situation as far as standards were concerned.

**RW:** Was that the rationalization for not selecting a particular

EAS technology, such as RDS, as the EAS standard? Was the commission afraid of litigation?

**Q:** We don't talk about it that openly, but I think that's a factor. But it



James Quello

(developing a digital protocol that various EAS systems can utilize) didn't work out so bad. I don't think. Do you?

**RW:** In light of the Commission's promise of interference reduction on the AM band, through its

sweeping AM improvement docket a few years ago, is the allocation of only 78 AM stations to the expanded band going to significantly reduce interference?

**Q:** We are making the allocation to the stations that, as I understand it, the primary allocation would be how much interference would you eliminate, and we'd give you this frequency. So it is not going to correct everything, but it is going to be a substantial good move with 78 stations causing less interference.

**RW:** AM station stations heading for the expanded band have a five-year grace period to broadcast on the old and new frequencies? Was this allowed to make the transition easier?

**Q:** Yeah, we've done that; we've given them a chance to again, simulcast. Now, the new cars apparently have the expanded band.

**RW:** You refer to Detroit a lot. Do you think the automotive industry is a good measuring stick for what's going to happen in the radio industry?

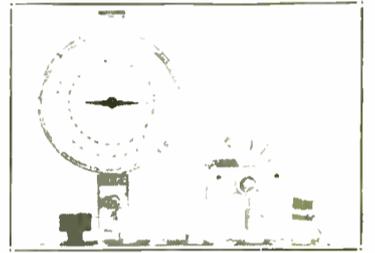
**Q:** I like to see people buy Detroit products. I'm very loyal to Detroit products. I buy nothing but American cars, but the radio business is impartial. Toyotas, Hondas, everything else has radios, but we have more automobile per capita than any country I think. It's a very good radio market and the markets that have the most automobiles are considered the best radio markets. Car markets are very good for the radio business.

I remember at the time when TV came out, we had big meetings on what we were going to do, and we came up with some pretty good campaigns. We had one "Wherever you go, there's radio." The other one was "Radio—you don't have to stop and look—just listen." Everyone found their own niche. And radio today is a very good business. The last year-and-a-half, it has had a tremendous comeback.

## 60 Years Ago

Reprinted from Radio World March 23, 1935. 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.

### Self-Tracking With Calibrated Generator Dial



Dials, Condensers and Coils for Generator

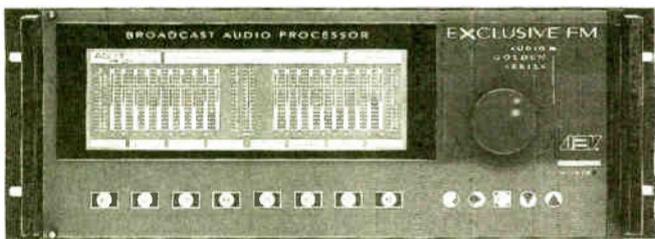
The essential parts for a signal generator are shown in the illustration. There are a frequency calibrated dial, a tuning condenser and a coil system. When these are connected up with practically any tube, the inductances being accurate, the calibration on the scale applies to the frequencies generated. Naturally a switching method is used for convenience. It can be seen that the coils are stacked Indian file on a strip. The lowest frequency coil is at left (goes to 54 kc) and the highest frequency coil at right (goes to 17,000 kc). All frequencies are covered fundamentally.

Despite all that has been printed about the calibration of signal generators and test oscillators (they are the same thing), nothing seems to approach the frequency calibrated or direct reading dial type, especially if the calibration takes care of itself, as it were. That is, when the parts are put together, the generator does what it is supposed to do, including disclosure of its generated frequencies with accuracy.

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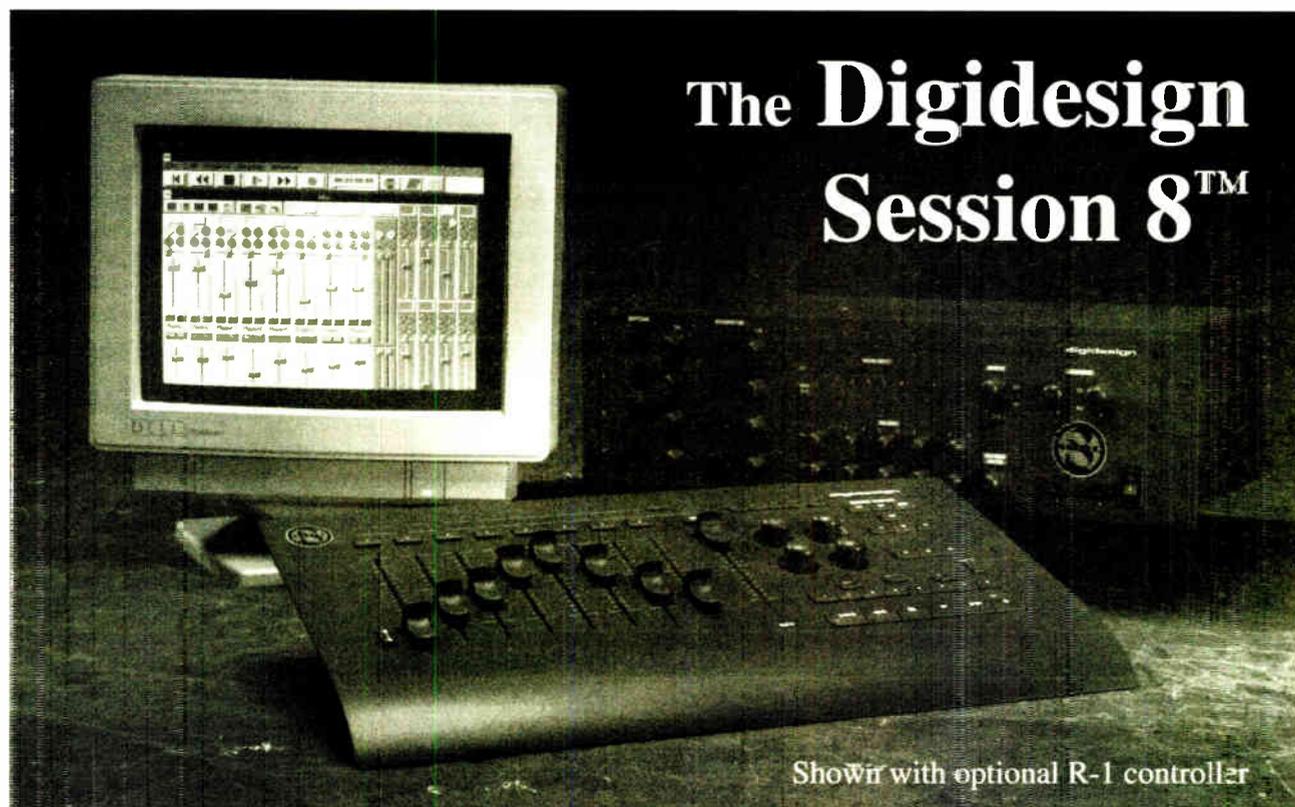
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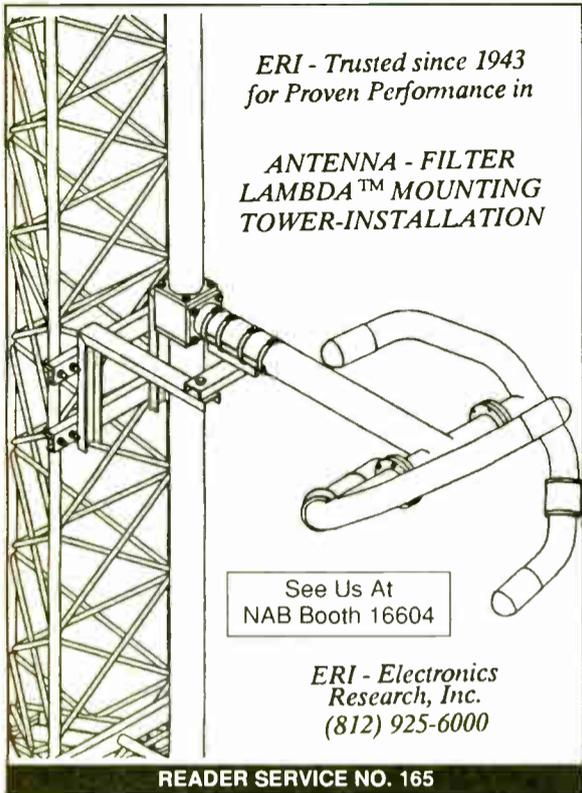
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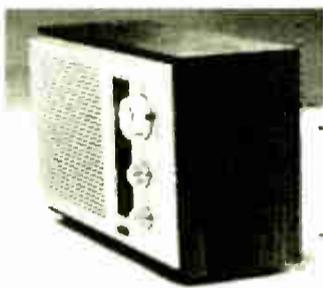
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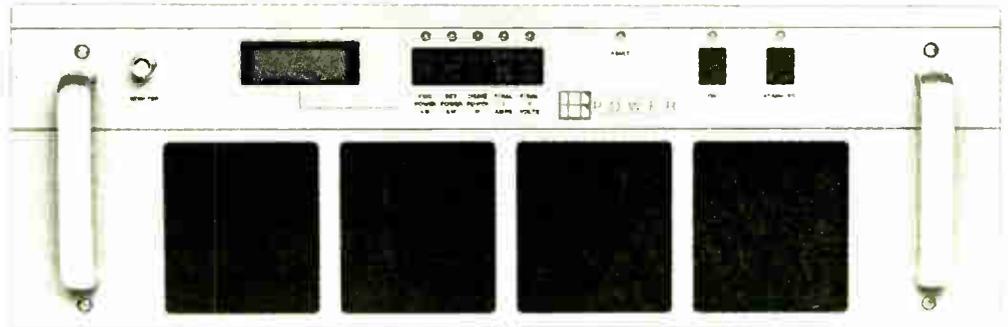
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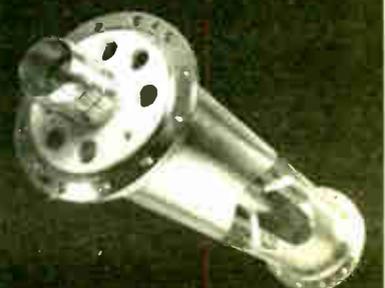


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READER SERVICE NO. 96

## SOURCE GEAR

# Choices in Source Gear Prolific

**LAS VEGAS** When you get to the NAB exhibit floor, make sure you go straight to the source—source equipment, that is. This year, manufacturers promise to show a profusion of studio source gear.

**Denon Electronics** will introduce the DN80R Portable MiniDisc (MD) recorder, built for the rigors of location recording, but containing many of the features found in better DAT and reel-to-reel portable recorders. It uses a RAM buffer with capacity for 40 seconds of stereo audio. The optical pickup incorporates a proprietary vibration-absorbing

suspension. Denon will offer customers who purchased DN990R MD cart recorders and/or DN980F MD cart players before Jan. 1 a free upgrade to cut track access time in half.

The company also will debut the DN790R Professional Tape Recorder with Dolby S Noise Reduction, suitable for cassette mastering applications, and a 200-CD jukebox, the DN1400F, which

Technologies of Vancouver; Otari holds exclusive worldwide marketing and distribution rights. RADAR is available in 8-, 16- and 24-track configurations. The optional remote is fully functional, with 99 cue points, scrub/jog wheel, QWERTY keyboard, keys for track arming and soloing, and dedicated edit function keys. Its time code synchronizer will chase lock to 24, 25, 29.97, 29.97DF, 30



Otari RADAR

quickly accesses any CD by employing two separate transports. A new professional double cassette deck, the DN740R, will be at the booth as well. It is a rack-mount, two-well cassette deck, suited to applications where long playing time, convenient cassette-to-cassette dubbing, pitch control and quality audio are requirements. A wristwatch-style remote provides control over both decks.

In addition, Denon will show a new line of CD-R blank discs, joining its line of DAT and cassette tapes.

**Otari Corp.** plans to show its RADAR multitrack hard disk recorder as well as its MR-10 MiniDisc recorder/player and the CDC-600 dual drive 360 capacity CD changer. RADAR, which stands for Random Access Digital Audio Recorder, is manufactured by Creation

and 30DF rates (offsettable), and will also support 32, 44.1, 44.056, 47.952 and 48 kHz sampling frequencies. The company also plans to bring its MX-50II two-track tape recorder and DTR-90I time code DAT recorder to the show.

**Scott Studios'** booth will display the Scott System '95, a new touchscreen hard disk digital audio system with 9GB hard drives, an on-screen telephone recorder/editor, hot keys to start hundreds of recordings at a touch, and Wall of Carts, which provides audio

The product stories contained in the NAB preview section are as complete as possible samplings of new gear from companies exhibiting at the convention. The stories are not meant to be all-inclusive lists of every product category at the show, but only as a significant sampling based on company-provided information available at press time.

at a touch. In addition, it will show its CompuCarts cart machine replacement and Net Catcher, which records and stores network audio for delayed playback.

Check out **AKAI Digital's** booth, too, where the company will unveil its newest hard disk recorder, the DR8. Other established products on display will include the SR4 hard disk recorder, the DD1500 digital audio workstation and a full line of digital samplers.

**Tascam-TEAC Professional Division** has several new products it will display, including the DA-P1 portable DAT recorder and ES-61 audio edit controller. The DA-P1 is a rugged, portable DAT recorder featuring a two-head design and two direct drive motors. It uses XLR-type mic/line inputs, complete with phantom power. It also offers unbalanced RCA



Tascam DA-P1

connectors for both input and output, and S/PDF digital I/O for direct digital transfers. The ES-61 audio edit controller, suited as the main controller in audio editing (and audio-for-video) situations, can control up to six machines simultaneously. It uses a universal communications protocol, and can connect to the most current generation of audio and video recorders, either directly or via simple interfaces without the need for external synchronizers.

**Bradley Broadcast Sales** will also show Tascam's DA-P1 portable pro DAT machine, in addition to the IQS SAW computer-based audio editing software and 360 Systems' "Instant Replay" Morning Show Sampler.

**Nagra Kudelski** will introduce a new solid state recorder, the ARES-C, with PCMCIA support. This portable machine is mono or stereo, with a single channel recording time of 40 minutes on a 20MB card. The Nagra-D, a four-channel, self-contained digital audio recorder, and Nagra's line of analog audio tape recorders will also take a prominent place at the company's booth.

**Harris Allied** plans to display an operating digital radio station, configured and demonstrated with standard off-the-shelf components, including source equipment. It will demonstrate new digital studio products, digital editors and hard disk systems. The company's CD-10 CD cartridge machine

continued on next page ►



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World Radio History

# Source Gear Abounds

► continued from previous page

now has "orange book" capability and other enhancements. Also on display will be the **Radio Systems Inc. DDS**, an expandable multi-user multichannel digital delivery system that emulates a cart machine. It operates in real time, handles multiple functions simultaneously and plays up to 16 channels simultaneously.

The Harris Allied booth will also be host to **Register Data Systems (RDS) Phantom**, a digital audio system that allows virtually unlimited control of multiple satellite or network input sources. The system can replace carousels and cart machines in live operation as well as tape-based or CD-based automation, and has a recording storage capability from 90 minutes to more than 10 hours. Look, too, for **Enco's DAD-486x Digital Audio Delivery System** at the Harris Allied display. This hard disk storage system uses off-the-shelf hardware and provides unlimited expansion capabilities.

**Alesis Corp.** will bring its **ADAT 8 Track Modular Digital Multitrack Audio Recorder**.

At the **Synclavier** booth, the **EditView 4.0** and **S/Link 2.0** will debut alongside the well-established **PostPro** random-access hard disk-based multitrack recorder/editor.

Among digital editors capable of playing direct-to-air is the **VoxPro** editor from **Audion Labs**, designed to replace reel-to-reel machines in control rooms and newsrooms.

**Radio Computing Services Inc. (RCS)** will be on hand with the new **ProSonix**, a full-featured, digital multitrack audio editor, and **NewsLink**, which the company describes as a "computerized newsroom," with the option for digital audio. RCS also will bring its **Master Control** all-digital, paperless, cartless radio studio.

**Fidelipac Corp.** will debut its **Dynamax DCR 1000 Series** machines with magneto-optical drive systems. Also at the booth will be its **CTR 10 Series** cartridge machine and the **DCR 1000 Series** digital cartridge machine with MO drives.

**Broadcast Electronics'** booth will be stocked with its established source systems, including the **AudioVAULT** digital audio storage system, the **CORE** digital automation system, the **Dura Trak** digital cart machine and the **Dura Trak 90A** cart machine.

**Audi-Cord Corp.** will bring along its **NAB** cartridge machines.

On the recording media front, **Maxell Corp. of America** will offer its tape products, including audio cassettes, R-DAT and reel-to-reel products, and **HBB Communications Ltd.** will debut **Advanced Media Products** blank CD-R discs. HBB will also show the **PortaDAT** professional portable DAT recorders, accessories and tape.

## DIGITAL AUDIO WORKSTATIONS

# Digital Audio Editors Shine at NAB

**LAS VEGAS** Digital Audio Workstations (or DAWs) are becoming as ubiquitous as cart machines. With 11,000 radio stations in their scopes, manufacturers of digital audio workstations are pulling out the stops in Vegas.

**Pacific Recorders & Engineering Corporation** will introduce its **ADX Ensemble**, a Digital Audio Workstation with an onboard, automated mixing surface. It is controlled by a **PowerMac 6100** with a 17-inch reconfigurable color monitor, analog-style control panel interface, trackball and dedicated audio scrub wheel. The Mac-based software offers 32 levels of **UNDO/REDO** for instant recovery from mistakes and added flexibility for experimentation.

Sound processing is handled by a rack mounted unit, equipped with a 66 MHz **DPS**, allowing simultaneous playback of eight tracks from a single hard drive. The **ADX Ensemble** incorporates an eight-channel automated mixing console and is equipped with two stereo sends and returns, 3-band digital parametric equalizer with High and Low Shelf and Midrange "Q" settings.

Another vendor utilizing the latest com-



OSC Deck II

puter technology is **LPB**, which is introducing new **Red Hot SALSA** digital audio systems that feature Pentium processors. **SALSA** systems are available as both **On Air** units for digital automation and **Production** units built around four-track stereo waveform editors. A new feature will be unveiled, an optional built-in **CD-ROM** recorder which will allow users to download their backups to CD, or to dump all of their spots to their own customized CDs.

### Software Solutions

**OSC** will be exhibiting at the booth of video editing giant **Avid Technology** on the main floor of the exhibition. Featured will be the latest version of **Deck II** billed as the first **PowerMac**-native sound recording and editing program. Version 2.2 takes advantage of the **PowerMac's** RISC processor to play back up to 16 tracks of digital audio (on a **Power Macintosh 8100/110**) with no additional audio hardware or AV-enhancement.

**OSC** will also introduce a new **16-Track Tool**—a software enhancement for the **Deck II** hard drive recording program that quadruples the playback track capacity of any four-channel **Digidesign Pro Tools** system. The software combination, when combined with **Digidesign's** hardware allows the simultaneous playback of 16 independent tracks of CD-quality digital audio. Preferred system configuration for **16-Track Tool** usage is a **PowerMac 7100** or **8100**, **Quadra 950** or **Quadra 840 AV** with at least 16MB RAM, a four-channel **Pro Tools** system

and **OSC's Deck II** software (version 2.2 or later). A fast wide **SCSI 2** disk array (such as **FWB's Sledgehammer**) capable of 6MB/sec throughput is recommended to achieve output of 16 tracks playback.

### Portable DAW

**Roland Corporation** will showcase its new **DM-800** digital audio workstation. It is a self-contained, eight-channel hard disk recorder and editor that offers automated 12 channel mixing, non-destructive editing, parametric EQ, video display outputs, MIDI integration and time compression. The **DM-800** employs a 16-bit linear

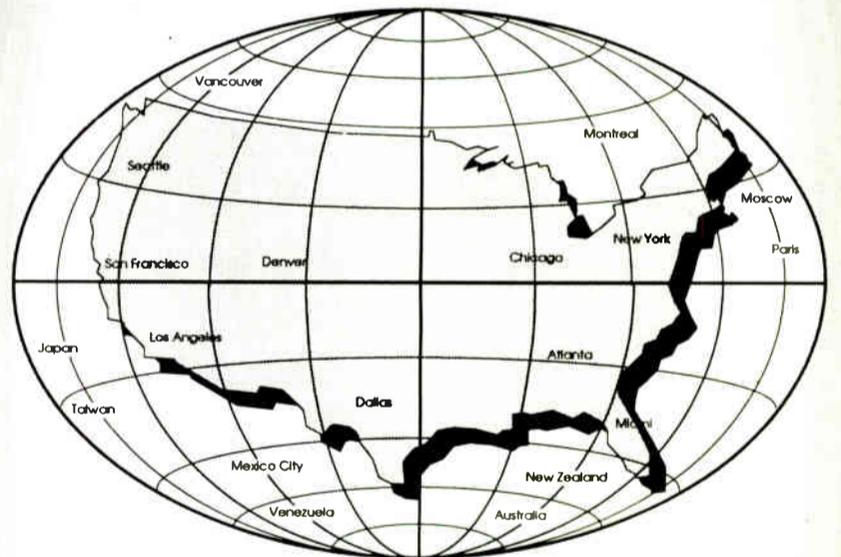
recording data format with selectable sampling rates of 48 kHz, 44.1 kHz and 32 kHz. The unit is integrated into a compact 26" x 11.25" package that weighs just over 12 pounds making it, according to **Roland**, the only fully portable digital audio workstation. Options include an **ADAT** communication bus and an **RS 422** interface.

Various storage methods include two 2.5" 540MB **SCSI** hard drives mounted inside the unit providing 3.5 track hours of recording at 48kHz. Each of two **SCSI** ports on the rear panel accommodate up to 4GB capacity and magnetic-optical drives

continued on page 68 ►

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# Era of Digital Editors

► continued from page 67

such as the Tahiti 300 are fully compatible for removable media recording capabilities. An audio DAT can be used for data backup via the digital output.

Roland will also be showing its DM-80 digital audio workstations in large track expandable configurations of 16, 24 and



PR&E ADX workstation

32 tracks, 100 layers are provided per track for up to 2400 layers. Input/output consists of 24 balanced analog inputs, 30 balanced analog outputs, 12 digital inputs which include sample frequency rate conversion and six assignable digital outs.

**Spectral Inc.** will be showing three new products: the Media Filer, a digital audio file converter; a translator with eight channel digital audio signal format converter; and the Prisma Music music production user interface for the Prisma DAW. Spectral's established Prisma will also be displayed.

The Spectral "engine" is a plug-in card that fits into an ISA slot in your PC. Features include either two or eight inputs (depending on which AD/DA converter you choose), 12 out, two bands of EQ on each channel, automated mix, a playlist, digital signal processing tools (pitch shift,

time compression/ expansion, level normalization, etc.), way file import/exportability and a directory.

**Wegener Communications** will show a new DAW with store and forward along with established products such as digital audio satellite receivers and an addressable network control system.

**Studio Technologies Inc.** new products to be displayed at NAB include the StudioComm Series Model 60 Central Controller, the Model 61 Control Console. The units work together to provide control room monitoring, dubbing, and an integrated headphone cue system.

**Scott Studios Corp.**'s new Touchscreen hard disk digital audio with 9GB hard drive features on-screen telephone recorder/editor, hot keys to start hundreds of recordings at a touch, the "Wall of Carts" to start all audio at a touch and a full day's log editing.

**Prophet Systems** will be displaying its Enhanced Editor. New features include the ability to play a track while recording another, user specification of default location of library tracks, editing of 1/100th of a second for highly accurate cutting and pasting, the ability to record from cursor position and a screen that shows the amount of disc editing space remaining.

The user can also select to use the hard drive or memory for editing, and can select which tracks to mix down.

Switzerland's **Nagra Kudelski** will display the Nagra Lysis Integrated Information System and Broadcast Architecture for Radio. Lysis consists of hardware and software for sound editing, scheduling, broadcasting, administrative tasks, statistical analysis and news editing.

Lysis, an open system based on distributed computing, client/server architecture and high speed networks, also includes an object oriented information system that manages all multimedia documents and enables the creation, processing,

planning, sharing and archiving of such documents.

**Studio Audio and Video** will display its established SADIE digital editor and the new SADIE PC-based Digital Audio Editor Version 2.2. The new version adds SCSI CD-R, DDP 8mm CD mastering format, back-up to Exabyte, 16, 20 and 24-bit editing and a hardware controller interface.

**AKAI Digital** will show the new DR8 hard disk recorder and the established DR4 hard disk recorder, DD1500 digital audio workstation and S2800/3000/S3200/CD3000 digital samplers.

**Arrakis Systems Inc.** will display the Gemini live radio, triple play and record digital workstations, control surfaces and mixing consoles. Also on display from Arrakis will be the TRAK\*STAR 8, a digital multitrack workstation that can back up On-Air.

**Broadcast Supply Worldwide** will have the Roland DM 800 digital workstation on hand, along with the VoxPro and a DigiLink.

**Computer Concepts Corp.** will be demonstrating its new range of digital audio products including newsroom editing, multi-track production, "live assist" control and the Cartrack cart selection system.

**Corporate Computer Systems Audio Products** will display the new PACE Lite, a desktop version of the established PACE digital newsroom editor, which will also be on display. PACE is a full-function standalone news editing system with network and audio routing switcher control capabilities.

**Dalet** will be displaying its established multitrack editor.

**ENCO Systems** will show its established DAD486x digital audio delivery system, which features DOS-based software coupled with industry standard computer hardware. Capabilities include digital audio recording, editing, library management, program scheduling and multiple output reproduction capabilities.

**Radio Computing Services (RCS)** will display the new ProSonix full-featured digital multi-track audio editor.

## You'll Be Like A Kid In An ISO/MPEG Layer II Candy Store.

Are you excited by the future of CD-quality audio transmission over telephone networks? Then don't miss MPR Teltech's display at Booth 4410 at the N.A.B. Convention. This is a chance to see all of the most interesting new developments. From a world leader in audio coding and telecommunications.

Here are some of the products we'll be featuring:

### L II Blue

This is a full-featured, reference-quality digital audio encoder/decoder with superb implementation of ISO/MPEG Layer II and the telecommunications expertise of Philips Sound & Vision and MPR Teltech.

### Capella

A PC-compatible ISO/MPEG Layer II/G.722 audio

codec offering exceptional audio quality for direct-to-disk recording, sampling and reproduction. With the addition of a communications adaptor, the Capella will enable real-time audio transmission.

### Polaris

A reporter's notebook which will record, edit, and transmit remote audio broadcasts in real time, over digital networks. Studio quality reporting from the field.

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## MICS & MONITORS

# Microphones, Monitors and Headphones

**LAS VEGAS** The next generation of microphones, monitors and headphones is expected to debut at NAB with a host of companies parading their latest wares.

**Harris Allied** is introducing its Russian-heritage Oktava microphones, an exclusive in the western hemisphere.

**Neotek Corp.** will be unveiling two four-channel microphone pre-amplifiers: the MPX 4A, and the MPX-4D. The MPX-4D is digitally controlled and includes a micro-processor controlled gain system, front panel digital gain readouts and PA422 serial control inputs for remote control over standard serial lines. Also new this year is the EQ4X-M1 microphone and four-band parametric equalizer.

**Developing Technologies** will preview the Sanken COS 11 omnidirectional miniature electret lavalier microphone, and the Sanken CSS-5 shotgun stereo microphone.

**Crown International** will debut its CM311-HS microphone, used in conjunction with Sony's headset. Its line of amplifiers, microphones and IQ computer control will also be on display.

**Beyerdynamic** will introduce the SPL EQ Magix microphone pre-amplifier, featuring variable gain, 48v phantom power, phase reverse, and a defeatable insert point and 30 dB pad for line use.

**Audio-Technica U.S.** is highlighting several microphones: the AT-MX341a SmartMixer automatic microphone mixer with digital switching; the ATH-M40 and ATH-D40 Precision Studiophones, professional studio monitor phones with application-specific use; the ATM75 headworn cardioid condenser microphone for hands-free studio performance; and the AT815b and AT835b cardioid shotgun microphones that operate on battery or phantom power.

The company will also display its AT4050/CM5 multi-pattern, diaphragm capacitor microphone for studio applications.

**Vega** is introducing its T-678 Pro Plus synthesized, miniature UHF bodypack wireless microphone transmitter. Established products include the R-662 series four-frequency UHF wireless microphone receivers; the Pro Plus VHF and UHF hand held wireless microphone transmitters; the VX-20 Audio for Video wireless microphone system; and the Q600 wireless belt-pack intercom system.

**Shure Brothers** will debut its M367 six-input portable microphone mixer for professional applications in electronic news gathering, electronic field production and general audio mixing. The M367

continued on next page ►

► continued from previous page handles up to six microphones or line-level signals and can be used with any balanced, low-impedance dynamic or condenser microphone.

Also displayed by Shure Brothers is its VP3 portable receiver, powered by a single 9V battery, featuring a single, pivoting



Audio-Technica M-40 and D-40 headphones

"rubber duck" antenna for horizontal or vertical positioning.

Sennheiser Electronic Corp. will feature its MD42111 cardioid dynamic microphone that handles high sound pressure levels; the EM2004 tuneable UHF diversity receiver; the ME67 long shotgun back-electret microphone capsule offering high directionality; and the BF1053 body pack trans-



JBL EON

mitter system with lavalier microphone.

Established products from Sennheiser include the EK4015 miniature UHF true diversity receiver providing interference free signal transmission; the SK250 16-channel UHF high power pocket transmitter; and the K6/ME64 cardioid back-electret microphone capsule with powering module featuring a smooth frequency response.

Micron Audio Products is introducing its TX-505 wireless microphone system, SDR portable diversity receivers, and the SQN-IIIa location stereo audio mixers.

The line of Micron wireless microphone systems, SQN portable audio mixers, and Tram lavalier microphones will also be on exhibit this year.

Electro-Voice is highlighting its RE2000 studio condenser microphone this year, and will display its established line of microphones including the RE50, RE50 N/D, 635 N/D, RE20, RE27, RE 38, RE45, RE15, RE16, ELX1-A, S-60A, and S-80A.

Comtek will preview the BST-25 frequency synthesized base station transmitter, offering front panel tuning; and the PR-50 wireless cuing system.

Three existing wireless microphones will be shown by Comtek: the MRC-82 C Camera Companion; the studio/professional grade M-182 wireless handheld microphone; and the MR-182 wireless microphone receiver. The RC-72 portable wireless cuing system will also be on display.

Wohler Technologies will debut a serial digital embedded audio extractor to AES/EBU to analog DA option for its line of rackmount powered speakers; the Broadcast line of 1U and 2U powered rackmount monitor speakers; and the AES/EBU digital level meters for both powered monitor speakers and up

to 10 stand alone units in a one-rack space.

JBL Professional will feature its EON portable performance system, which includes one EON MusicMix 10 channel mixer; two EON Power15 biamplified speaker/monitors, that offer controlled directivity HF horn with 1-3/4" compression driver; two JBL E50S dynamic microphones; and necessary cables. The system also includes left & right RCA auxiliary inputs with phone jacks; L to R balance control; a subwoofer male XLR output and monitor XLR male output; an XLR female microphone connector and 1/4" TRS phone line input connector; and an IEC AC input power input connector.

PRODUCT SERVICES

# Music, Products and Services for Radio

**LAS VEGAS** Without the plethora of varied services available to radio stations, it would be awfully tough to get through the broadcast day. Thankfully, NAB '95 exhibitors will be on hand to guide station personnel through the jungle of useful offerings.

**NPR Satellite Services** will be offering its full-time satellite channels that use C-band, SCPC transmission. (Satellite space is on Galaxy IV, Transponder one and three, and can accommodate digital and analog audio transmission.)

**TM Century** will be on the show floor with its new product, Playback, a CD-ROM catalog offering fast music selection (the company says Playback cuts production time by 60 percent). Also on display will be the Gold Disc full-format CD libraries, and the company's selection of station IDs used by KHS, WPLJ, WUSN, and other stations.

New from **NSN Network Services** will be the InSAT Internet Satellite Access Terminal, which the company says is "the world's first interactive VSAT Internet system," and provides stations with Internet access to and from any location.

**Crown Broadcast** will be showing its Crown AirForce(tm) Wings system, which allows network-fed stations to sound local, while at the same time maintaining the benefits of the network feed.

**Digital Generation Systems**, a provider of multimedia transaction networking services to the broadcast advertising industry, will be on the show floor with its standard and premium services. Both provide advantages akin to digital networks.

**ComStream** will be demonstrating NPR's new Public Radio Satellite System. ComStream's new ABR700 digital audio receiver will be shown, and will be receiving a live, NPR satellite feed. The ABR700 offers many of the same features that were custom-designed by ComStream for the digital upgrade of the Public Radio System.

The news will be hot off the press at the **Associated Press** booth, where the new AP All News Radio product will be unveiled. It's a live, 24-hour network that delivers turnkey news and information programming.

New from **International Datacasting** at NAB '95 will be the **Microsoft** Windows-based Media Manager software package for implementing a multimedia data broadcasting system that uses the company's FlexRoute, MPEG PRO or DataNet digital satellite receivers.

Statistics will be the name of the game at **Dataworld's** booth, where new detailed ethnic and demographic reporting by way of tabular and graphical (map) formats will be on offer, as will new ethnic/demographic shading overlays for any base map.

NAB '95 attendees with an ear for production music and sound effects libraries will find many booths to peruse on their show floor travels. In fact, "lovers" of

continued on page 73 ►

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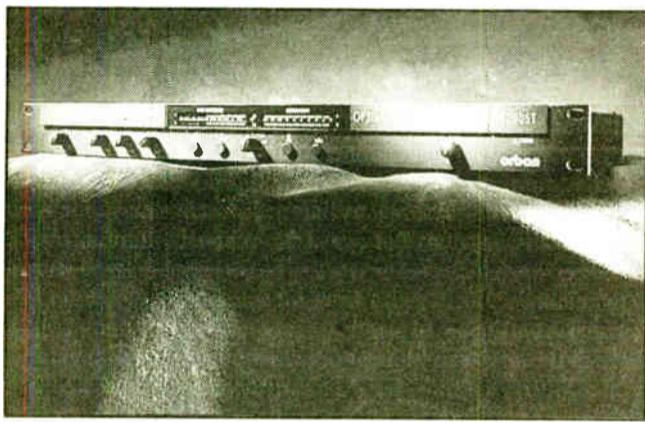
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**AUDIO PROCESSING GEAR**

# Processing Gear Is Both Analog and Digital

**LAS VEGAS** A host of new and upgraded audio processing products are scheduled to be displayed at this year's National Association of Broadcasters Convention. So if your station relies on you to develop its sound, you may want to shop the NAB exhibit floor for the latest gear and most recent audio processing upgrades.

**Benchmark Media Systems** will introduce the Audioworld Interface, which combines a two-way recorder interface with switch selectable operation as a line amplifier or mono-mix amplifier. Benchmark is also introducing the JR Audio Director Plus, a stereo mode controller with four switch selectable inputs per channel. Benchmark is bringing back the System 1,000 that offers more than 14 different carts and four power supplies, the Microframe Series and numerous general line products.



Orban 8200 ST

**Cooper Sound Systems** will acquaint NAB attendees with the Cooper ENG - style four-channel audio mixer. It features analog meters (Peak/VU), Jensen coupled inputs and outputs, insert points and channel outs, PFL and an ergonomic design that allows for ease of operation. Cooper will bring back its CS 106+1 audio mixer and its CS 108+1 audio mixer.

**Cutting Edge Technologies** will introduce its latest Unity software version that provides a wide range of processing settings appropriate for every format. Cutting Edge will also demonstrate its Unity 2000i FM and its Unity AM processors. In addition, Cutting Edge is also showing the Dividend composite filter, which provides full spectral protection, including RBDS and other SCA signals. The Dividend can boost main channel modulation and reduce multipath distortion.

**Dan Dugan Sound Design** will show its Model D automatic mixing controller, a live mixing assistant.

**Euphonix** will present its CS2000 B-Broadcast System, a digitally controlled audio mixing system suitable for on-air and post production. The system includes 12 mix minus feeds and optional multi-format mixing buses that can be configured for surround sound mixing. The company will also return its CS2000 audio mixing system to the exhibit floor. It features digitally controlled analog audio mixing.

**Orban** will introduce its 8208 stereo encoder, a compact stand-alone unit with all-digital processing. The encoder is designed for large network applications, especially operations using digital

program distribution. Updates on other Orban audio processing equipment includes PC software for the OPTIMOD-FM 8200 and demos of the digital OPTIMOD-TV 8282.

**Solid Electronics Laboratories** will introduce its FM composite processor Model DCP-1. The unit performs the functions of instantaneous limiting and composite low-pass filtering in a single structure.

**Symetrix Inc.** will show a new model of its 528 voice processor, which features EQ and dynamic processing for radio and TV announcers. The company will also show its 601 digital voice processor, a programmable digital processor for radio and TV announcers.

**Alesis** will introduce its Matica 500 and 900 audio amplifiers, which feature high-speed bandwidth dual-channel power amplifiers designed for production monitoring application.

**Alesis** will also introduce its Q2, which features dual-channel octal processing master effects with digital I/O. It allow the user to use up to eight audio effects simultaneously in any order using a unique digital patch visible on the display.

**ATI-Audio Technologies** will show its new quad and dual 1x3 audio DA with XLR type input and output connectors. The company will also display its Vanguard Series consoles, small mixers and headphone amplifiers and distribution amplifiers.

**Auditronics, Inc.** will show its 1900 Mix Minus system, a unique modular rack-mounted mix-minus/IFB audio system. It features unlimited input, output and IFB configurations.

**Circuit Research Labs** will introduce a new digital FM audio processor, the DP-100. The processor is based on a 32-bit floating point DSP processor. CRL will also include its Amigo FM and AM processors along with its Audio Signature, a digitally controlled processing system.

**Developing Technologies** will showcase its dB Technologies model AD 122 stereophonic analog-to-digital converter. It converts analog signals to a 22-bit audio data stream. Some of the converter's features include -122 dB noise floor, 0.00009 percent total harmonic distortion plus noise, optional SDIF interface and multiconverter synchronization. Developing Technologies will also showcase its dB Technologies model 3,000 digital optimizer, a multi-function digital audio processor for sample rate/data format conversion, monitoring and measurement.

**Apogee Electronics** will feature its DA-1000E-20, a reference standard D/A converter.

**Gentner** will showcase its established line of audio processing distribution products.

**Inovonics, Inc.** will introduce its new David-II FM stereo processor/generator, model 716. The company will also display its NRSC AM audio processor,

Model 222, and its Models 250, 255 and 260 FM processors.

**The Neotek Corporation** will display its EQ4X-M1 microphone and four-band parametric equalizer. The product combines one section of of the MPX-4A, a four-channel microphone preamplifier, with a four-band parametric equalizer in



Cutting Edge Unity 2000

one rack unit.

**The Mark IV Audio Group** will introduce the new Klark Teknik DN 3600, a stereo programmable graphic equalizer that is digitally controlled and has 66 memories. Mark IV will also introduce the Klark Teknik DN 3600 computer control, a computer control of up to 66 stereo DN 3600 programable graphic equalizers via Windows-based software. In addition to the new products, Mark IV

will also feature the following lines of Klark Teknik products. The 300 series of graphic and parametric equalizers, 400 series of para-metric equalizers, 500 series of compressors and gates, 700 series of digital delays and 800 series of cross-overs.

**Radio Design Labs** will display its connectorized rack-up line, including its RU-UDA4 unbalanced audio DA, its RU-MP2 adjustable stereo line amp, its RU-BIA2 adjustable stereo line amp, its RU-BDA3 balanced audio DA and its RU-MDA3 microphone DA.

**Ward-Beck Systems Ltd.** will introduce its new M8207 audio compressor and its M8208 remote level distribution amplifier. In addition, Ward-Beck will introduce its D8212 distribution assembly and card family.

**Harris Allied** will display the NTI EQ3 High Definition Sound Enhancement system, which uses patented high definition circuitry to achieve sound that is virtually free of hiss, noise, distortion and phase shift.

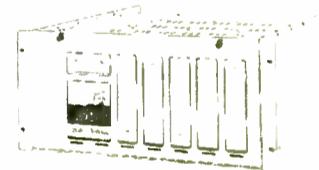
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## RF GEAR

# The Latest Designs in RF Equipment

**LAS VEGAS** As the demands on radio stations to transmit clearer and cleaner signals increase, the necessity for keeping up with the latest transmitters and related RF equipment becomes more important. A wide variety of new and established products will be on the show floor at NAB '95.

**Harris Allied's** new product offerings include the DX series 200 kW water-cooled EPAC for high power digital solid state medium wave transmitters. Established products include the Platinum Series(r) PT 5FM FM transmitter, and the HT25FM and HT 10FM transmitters, all with the Digit(tm) Digital FM Exciter, and the Quest 1 FM transmitter.

**TFT's** new EAS 911 Emergency Alert System and accessories will be on display. A variety of current model AM and FM monitors, analog and digital STLs, and an FM reciter and synchronous booster system will also be shown.

The 5kW solid state FM-5C FM transmitter, 250 watt FM-250C solid state transmitter, and AM-500 500 watt solid state AM transmitter are the new products on display from **Broadcast Electronics**. Established products from the company at the show include the FM-30B 30kW FM transmitter, and the AM-5 5kW solid state AM transmitter.

**Crown Broadcast's** new products at NAB '95 include the FM-XA-1K and

FM-XA-2K 1,000 and 2,000 watt solid state FM transmitters. Expandability capacity on both models give broadcasters the ability to increase power output in a modular way. The company's current FM30, FM100 and FM200 integrated transmitter/exciter packages will also be on display.

**Inovonics's** new product offerings include the model 540 AM Modulation Monitor, the model 716 DAVID-II FM Stereo Processor/Generator, and an RBDS Encoder/Decoder Computer Interface. Among the company's already-introduced products on display will be the model 222 NRSC AM Audio Processor; and the models 250, 255 and 260 FM Audio Processors.

A 100 watt solid state FM exciter/transmitter, and RPU transmitters and receivers comprise the new product offerings at **Energy-Onix's** booth. The company's Eco series of grounded grid, triode tube FM transmitters, from 1kW to 11kW, will also be shown.

**Svetlana Electron Devices's** new products include two replacement tetrodes—the YC130 for 35 kW, and 4CX3500A for 5kW FM transmitters, as well as the new 3CX3000A7 replacement High Mu Triode for FM transmitters and the 3CX2500F3 replacement triode for AM transmitters. NAB '95 attendees should also be on the lookout for the company's large selection of current model triodes

and tetrodes for the radio broadcast market.

The new **STABILINE(r)** SL series of uninterruptible power supplies, and SP series of standby power supplies, will be unveiled at **Superior Electric's** booth. The company will also be displaying its STABILINE WHR series of automatic voltage regulators and WHC series of power conditioners, among other current products.

**CCA Electronics's** new and "updated" FM transmitters and exciters will be on offer, along with the company's current model AM, FM, MW and shortwave transmitters (up to 65 kW).

**RF Technology's** new product offerings at NAB '95 include 1.5-15 GHz high performance Heterodyne fixed links, and "ultra portable" 1.5-15 GHz UPL series transmitters. The established D series of 1.5-15 GHz portable transmitters/receivers will also be on display.

New high voltage RF switches and new isolation units will be featured at the **Phasetek** booth, along with a variety of current product offerings, including RF components, inductors, and contactors.

"Flexible" composite audio/video cables and "extra-durable" multipair field cables will be new at **Nemal Electronics International's** booth. The company's line of electronic cables, connectors, jack-fields and accessories for RF applications will also be on display.

**Nautel Maine** is unveiling a number of new products, including the NB series of

modular AM transmitters with power ranges of 6 kW to 60 kW (they're available with AM stereo). The NB series features dual exciters and on-air serviceability. The company's established lineup of products includes the NA series of high power frequency agile medium wave AM transmitters, and the NE50 digital 50 watt FM exciter, which uses direct digital synthesis to generate the modulated FM carrier.

A variety of new "test quality" reducer/adaptor devices for EIA rigid line to type N female and 7/16 will be on view at **MYAT's** booth, as will the company's current line of Rigid Coaxial Transmission lines, components and accessories.

Over at **LDL Communications's** booth, the company's current line of 30 watt to 25 KWS FM transmitters will be on display. Six solid state models offer power levels up to 8 kW.

**LARCAN-TTC** will be showing its new FMS-500 500 watt solid state FM transmitter, and its current model FMS-4000 4 kW solid state FM transmitter.

New high power RF contactors for 0.5-1 megawatt applications, and a variety of established products, including a variety of RF components, will be shown at **Kintronic Labs's** booth.

**ITELCO S.P.A.** will be displaying its new solid state 1 kW and 5 kW FM transmitters.

The new SF series of up to 1 kW solid state transmitters with "improved" protection characteristics are among the products that will be shown by **ELENOS S.L.P.**

**EEV's** current line of broadcast tetrodes

continued on next page ▶

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World Radio History

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# Radio Music and Services

► continued from page 69

production music and sound effects libraries should stop by **Valentino's** booth, where the new ROM Reference Disc audio catalog on CD-ROM, for the PC and Mac formats, will be on display.

A wide selection of new releases for **Promusic's** music and sound effects libraries will be shown at the company's booth, as will its established music and sound effects libraries.

**Network Music's** NAB '95 production music offerings will include the company's current line of more than 135 volumes of music on CD (a new release becomes available every month); 66 volumes of sound effects, comprising over 4,000 effects; and the new Network Classical Library—15 CDs "featuring the greatest composers of all time," according to the company.

**Manhattan Production Music** will have its new Apple Trax music library on hand at the show, reflecting today's hottest radio music, from hip-hop and hot country to alternative rock and more. The company's current 50 CD production music library will be among the established products on display.

## RF Gear Abounds

► continued from previous page

for AM and FM transmitters will be shown at the company's booth.

A line of rebuilt power tubes for radio transmitters will be introduced by **Econco**.

**Dielectric Communications'** NAB '95 offerings from the company's current product lineup will include a variety of FM broadcast components and associated RF components.

Radio broadcast transmitters and other RF equipment will be on display at the **Continental Electronics** booth.

**Altronic Research's** new model 3500 digital calorimetry for air-cooled dummy loads, and the current model 67150 150 kW MW air-cooled dummy load will be shown.

**QEI Corporation's** Quantum 10 kW solid-state FM transmitter and QEI Solid State 1kW FM Transmitter will be among the company's new products on display. QEI's standing FMQ Series Transmitters will also be on offer.

A new FM stereo transmitter for limited area broadcasting applications will be introduced by **LPB**. According to the company, the transmitter "will be operating from a case the size of a paperback book."

**DB Elettronica's** 300 watt FM transmitter with a built-in digital stereo coder, and a variety of FM exciters and transmitters, will be among the company's new products on the show floor. Established products on display will include FM solid state amplifiers with modular construction, and FM exciters and transmitters.

**Dataworld** will be showing its line of allocation map books, coverage analysis, terrain digitizing, and interference studies. And **Belden Wire and Cable's** established products at NAB '95 will include AES/EBU digital audio cables.

New from **Killer Tracks** will be the Tunebuilder self-editing music software; the company's current **Killer Tracks** production music library—75 CDs strong—and the 30 CD BMG scoring library will also be shown.

At **Firstcom Music's** booth, the new MusiQuick keyword search software will be on display.

**The Aircraft Production Music Libraries** will be unveiling the new Jazzvertising two-CD package of jazz-based rhythm tracks, and will be showing the 64-plus CD Aircraft Music Library, among other current products.

**Halland Broadcast Services's** new update discs for adult contemporary and

country music CD libraries will be on display, as will the following, standing CD libraries: "Rock 'N' Roll Graffiti" (Oldies), "The Seventies" (AC-Gold), "The Eighties Plus" (AC), and "Halland's Country Hits."

**Broadcast Programming** will be showing its current line of digital radio programming formats, such as the new 90's Alternative (Radio X) and Heart of the Seventies—70's Greatest Hits. The company's weekly Chartbreakers Hit compact discs, and a variety of additional offerings.

Over at **E-Z UP International's** booth, NAB attendees will be able to see examples of shelter-type products. The self-contained E-Z UP Instant Shelter Eclipse and Encore models, which are targeted for indoor and outdoor instant displays,

will be the company's new products at the show. E-Z UP's current product, Instant Shelter, for keeping cool while at remote locations and, at the same time, creating visibility with silk-screened call letters, will also be on view.

Studio quality sound with **Accu-Weather's** Exclusive Accu-Weather Forecast, is available through ISDN, Switched 56 and Comrex. The product, which will be shown at the company's booth, features local weather forecasts and exclusive use of the "highly promotable" Accu-Weather trademark in markets.

**ATCI's** new inclined orbit satellite tracking systems will be on display. And, over at **Wolf Coach's** booth, the new Power Truck "new generation" satellite uplink truck will be shown.

# Call the Pioneers!



Courtesy, Colorado Historical Society F20.275

**B**ack in 1988 when NSN introduced VSAT satellite technology to the broadcast industry, there were fewer than 1,500 VSAT terminals in the USA. Today there are over 100,000!

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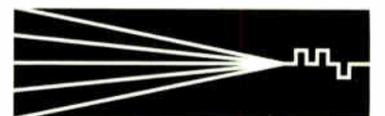
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## STUDIO GEAR

# Studio Gear for Any Application Displayed

**LAS VEGAS** No matter what your station may need, the right type of studio gear can make the difference; the latest choices will be on display at NAB '95.

**SESCOM**, for example, will be showing a variety of audio accessories, and its current model "Rackem 'N' Stackem" audio products. New products from **Ward-Beck Systems** include the RS 8216 16x1 stereo routing switcher. And **Radio Design Labs** will be offering its new RC-1U rack chassis and JP-1 universal jack panel.

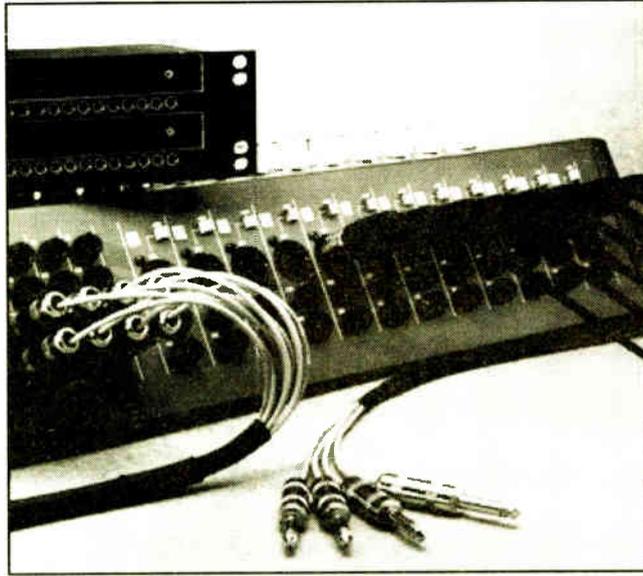
A number of interconnect components, such as coax connectors, patching systems, panels and assemblies, will be on display at the **Trompeter Electronics** booth. **Switchcraft** will be showing its DSX panels, offered in both hardwired and modular configurations from eight to 84 circuits, as well as patch cords and other accessories.

A line of multiformat tape storage products, both mobile and static, and storage for small formats such as CD, will be the order of the day at the **Storeel** booth.

Routers will be in the spotlight at the **Sandar Electronics** booth. The new AD-2000 16x16 AES/EBU router in 1RU, and the new PESE 2.3 software for PC-control of routers, will be on display.

Established products from the company at NAB '95 will include the AA-2000 16x16 stereo audio router in 1RU.

**DGS Pro-Audio** will be on the show floor with its new universal panel mount



Audio Accessories' patch panel

XLR connectors (latching and non-latching) and gold contacts, which will be offered in nickel or black chrome. A series of Deltron XLR connectors will be

among the company's established products on view.

The new D-2800 routing switcher system for analog and digital audio will be shown by **Datatek**; the company's standing D-2500 series of 20x10 and 20x20 routing switchers for analog and digital audio, and a selection of analog and digital audio distribution amplifiers, will also be on display.

**Autogram's** NAB '95 product offerings include a number of current products, including the RTV-20 20 slide pot, the Pacemaker 1032 10 slide pot, and the Autocount count-up clock.

New from **Audio Accessories** will be Project Patch, a reconfigurable interface system for fast, easy studio wiring through pre-terminated patchbays and cables. A host of audio jack panels and jacks, and pre-wired audio patch panels, will be among the company's existing products on display.

**Acoustical Solutions** will showcase its new AlphaSorb acoustical wall panels and hanging baffles, and the company's current model Alpha Pyramid, Alpha Wedge and Sonex acoustical foam absorbers.

**Preco** will be showing its model 220 Weircliffe Metal Tape Eraser, offering a HI8 or DAT throughput of 270 tapes per hour. **Neutrik USA's** NAB '95 products include the new A/B Series XLR connector: the Neutrik connector, featuring up to 12 poles in a miniature configuration; and the new Easy Patch patch panel, offered in 96 Bantam and 48 "B" gauge styles. The company's established line of XLR audio connectors, patch cords, jacks, plugs, speaker connectors, and a full line of XLR accessories, will also be on display.

Stations looking for a high resolution audio meter should think about stopping by the **Logitek** booth, where the new

Ultra-VU model will be shown. The company's new Mini RateGate digital audio sample rate converter will also be on display, as will the line of current model Bright-VU LED bargraph audio meters, and the Pre-10 10x2 routing switcher.

**Leitch** will be showing its new 32x16 and 32x32 audio routers, and its current line of audio routing switchers. **Kay Industries** will be displaying its Phasemaster Rotary Phase Converter. And the new STC 64 Noise Lock Acoustic Door will be offered by **Industrial Acoustics**, as will the company's current window and wall system that isolates noise.

A variety of new and established products will be offered at NAB '95 by **ESE**. On the new side, the ES-996 Six Digit two-inch red slave clock, and the ES-126/ES-127 half-inch and one-inch time and date displays will be shown. Also new: the ES-181 modem-based Master Clock/Time Code Generator, and the ES-185 GPS Master Clock/Time Code Generator. Established products from **ESE** include a variety of digital clocks and timers, audio level indicators and impedance matching interfaces, and SMPTE time code generators.

**DYNAIR Electronics** will be displaying its new System 2000 routing systems, available in digital to 400 Mbps, new configuration sizes, and stereo audio. Among the company's established products at the show will be the Genesis modular line of digital interfacing and conversion units.

A selection of audio level meters, with peak and average for analog and digital, will be shown by **Dorrough Electronics**. And **Spectral** will be displaying three new products, including the MediaFiler digital audio file converter; and the Translator, an eight channel digital audio signal format converter for Alesis, Yamaha, and Tascam equipment.

**Wohler Technologies** will be showing its new AES/EBU digital level meters for powered monitor speakers and as many as 10 stand-alone units in a one rack space, and its AES/EBU routing switcher, from 8x1 to 16x4.

## Gil Garcia, Chief Engineer of a Texas radio station, just before he made his escape from Autogram's maximum security compound.



General Managers, Program Directors, Sales Managers, and Engineers want the secret information on this new "black-box", developed by Autogram. It has a lot to do with ratings. It's not a console, processor, phone system, or storage device.

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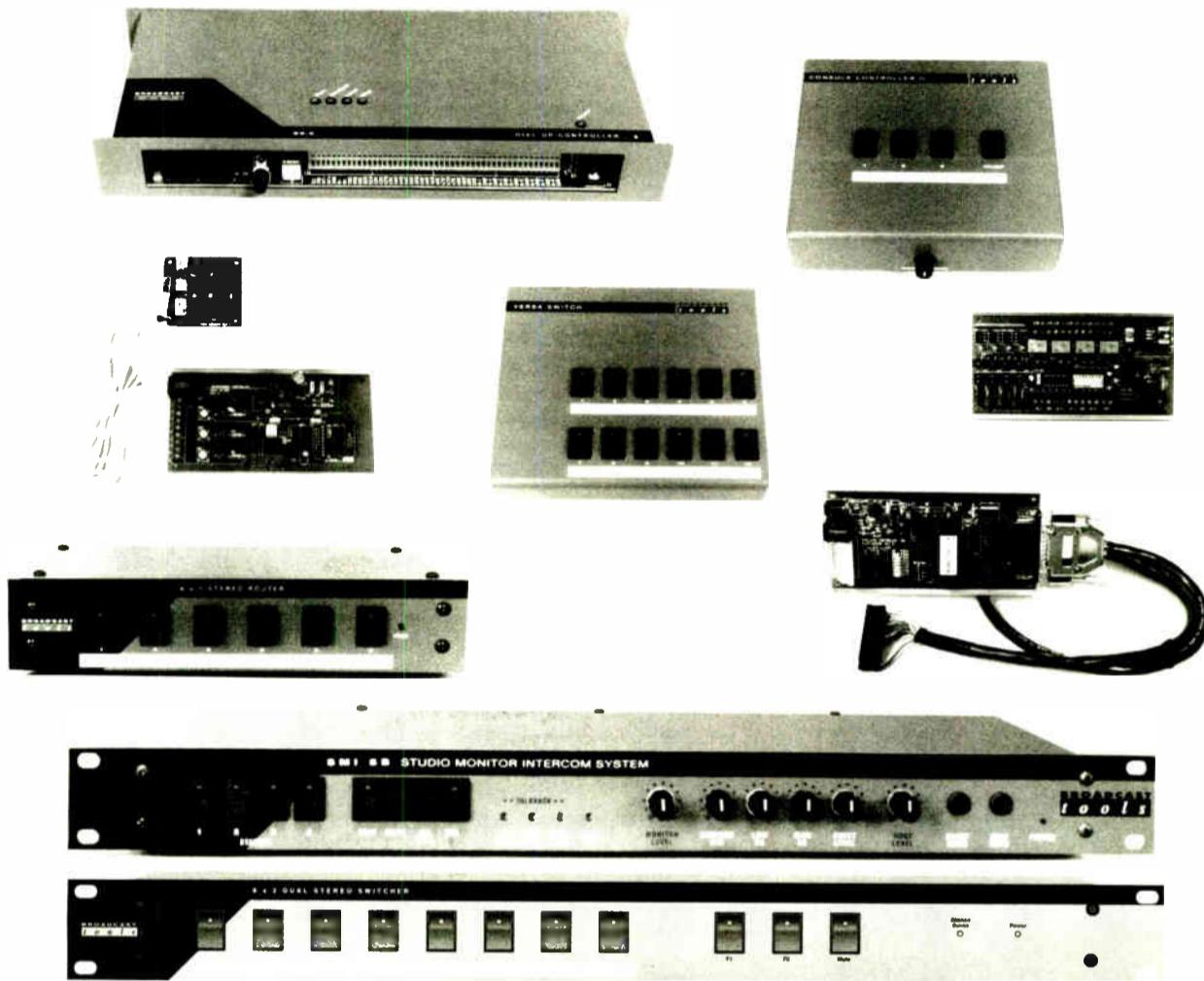
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**Talking Duck** Audio Circuit Identifier

**CCH** Broadcast Interface for Non-broadcast Consoles  
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## CONSOLES

# Wide Variety of Consoles Unveiled in Vegas

**LAS VEGAS** Anyone looking for a console at this year's NAB Radio show will not be disappointed, as manufacturers plan to address the needs of every level of user. The following is a run-down, in no particular order, of who will show what in the area of audio consoles.

**Pacific Recorders & Engineering** will bring along its veritable raft of console products. Among them will be the BMX III on-air console for network and major-market broadcasting. The third-generation unit has been designed to handle a talk show with two separate telephone

mixes, record a stereo feed for later broadcast and the ability to work and communicate with two studios and a remote, all simultaneously.

PR&E's AMX stereo production console will offer showgoers a board that takes the on-air functions of the BMX and adds features like equalization, auxiliary sends and effects returns. Its standard features include three main stereo mix busses, two effect/foldback sends, stereo effects return, multifunction metering, multiway talkback system, voice slating system, four telco mix-

minus feeds and telephone monitor mix.

As if all that weren't enough, PR&E will also display the established RMX RADIOMIXER on-air console and the PRODUCTIONMIXER board. The latter functions as the production companion to the RADIOMIXER and can also serve as a backup on-air console.

## Otari Status

New for the show from **Otari Corp.** will be the B-10 broadcast production and on-air console, as well as the Status digitally controlled analog console, which offers console-wide image recall. Established fare from Otari will include the Concept I digitally controlled analog board, a 24-bus console with fader and mute functions, as well as snapshot automation.

Meanwhile, **Mark IV Pro Audio's** booth will have the new XL-200 console from Midas. It has four-band parametric EQ, eight auxiliary sends, eight mute

Auditronics will include the AirMaster 90 Series in 8-, 12- and 16-input versions; the 210 Series audio console drop-in system with 12-, 18- and 24-input mainframes; and the 801/851 Series production consoles with 12-, 18- and 24-input position mainframes.

**ATI (Audio Technologies Inc.)** reports it will display the Vanguard Series consoles amid its many types of audio processing gear.

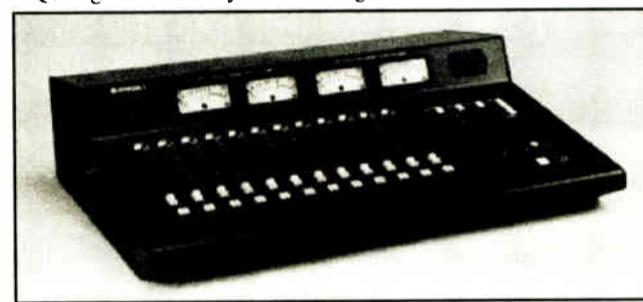
**Audioarts Engineering**, a division of Wheatstone, will introduce the MR-40 audio production console for the ENG, A/B-roll and DAW environments. The board features four-channel submaster output (D-2 and Digital Beta), master stereo program output, four-channel return on submasters for mix-down, stereo aux/mix-minus bus and six master output meters.

Also new from Audioarts will be the R-60 "on-air" audio console, which features as standard a six-source line selector, module

extenders, gold contact switches, Penny & Giles faders, Sifam meters, 16-bit digital audio performance and the new Simple Phone module. The R-60 is available in 8-, 12- and 18-input module sizes.

## SSL Axiom Solid State Logic

reports it will introduce the Axiom digital production system, an integral hard disk, multitrack editor. The company also will have on hand the new SL9000 J Series "total studio system," an advanced ana-



Auditronics 2500 console

groups, eight VCA groups and a 12 x 8 matrix section.

Established boards on display in the Mark IV booth will be the Profile, FMR and Forum Mute consoles from DDA. The Profile boasts 32 inputs and 24 outputs; the FMR has up to 32 inputs with 24 outputs; and the Forum Mute offers six full-time auxiliary sends and eight mute groups.

**LPB** will be on hand to display its 7000 Series consoles in 12- and 18-channel configurations as well as the Signature III Series consoles. The 7000 Series will be shown in conjunction with LPB's SALSA digital automation and digital production systems (which feature Pentium processing).

**Fidelipac** reports that among its various displays will be the Series IV broadcast audio console.

**Broadcast Supply Worldwide** will have a wide variety of audio gear for the radio professional, including consoles from **Mackie**.

Meanwhile, the Air Trak 90 and Mix Trak 100 consoles are slated for display by **Broadcast Electronics Inc.**

## Small footprint

**Auditronics** expects to make a big splash with the new 2500 Series audio console system, billed by the company as "a smaller footprint console" designed for radio on-air and production with music or talk formats, program, audition and two mix-minus busses. Three frame sizes and many options are available.

Established products on display from



Audioarts MR-40 console

log mixer with an optional hard disk editor.

Established fare from Solid State Logic will include the Omnimix digital surround sound audio/video system; the Scenaria digital audio/video system; and the SL 8000 GB on-air/production console.

For its part, **Seem Audio** promises to have on hand a line of radio broadcast mixing consoles.

New from **Arrakis Systems** will be the Gemini live radio, triple play and record digital workstations, control surfaces and mixing consoles. Established consoles from Arrakis will include the 1200 Series 5- and 10-channel boards and the 12,000 and 22,000 Series consoles in 8-, 18- and 28-input mainframes with an 8-bit control bus for air.

**Ward-Beck Systems** will have on display its established lineup of Renaissance audio consoles.

**Solidyne** will offer its latest digital audio console, the Solidyne 2500.

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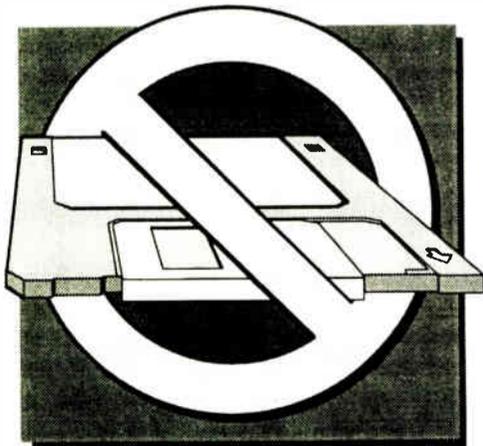
A Digilink workstation stores audio on an internal hard disk and comes out of the box with a capacity of 547 one minute, stereo carts for only \$7,995. Even better, the Digilink hard disk has an average 15 year life. Imagine how many floppies you will break, wear out, lose, and replace over 15 years. That doesn't count all of the floppy disk mechanisms that will jam, break, and simply fail...

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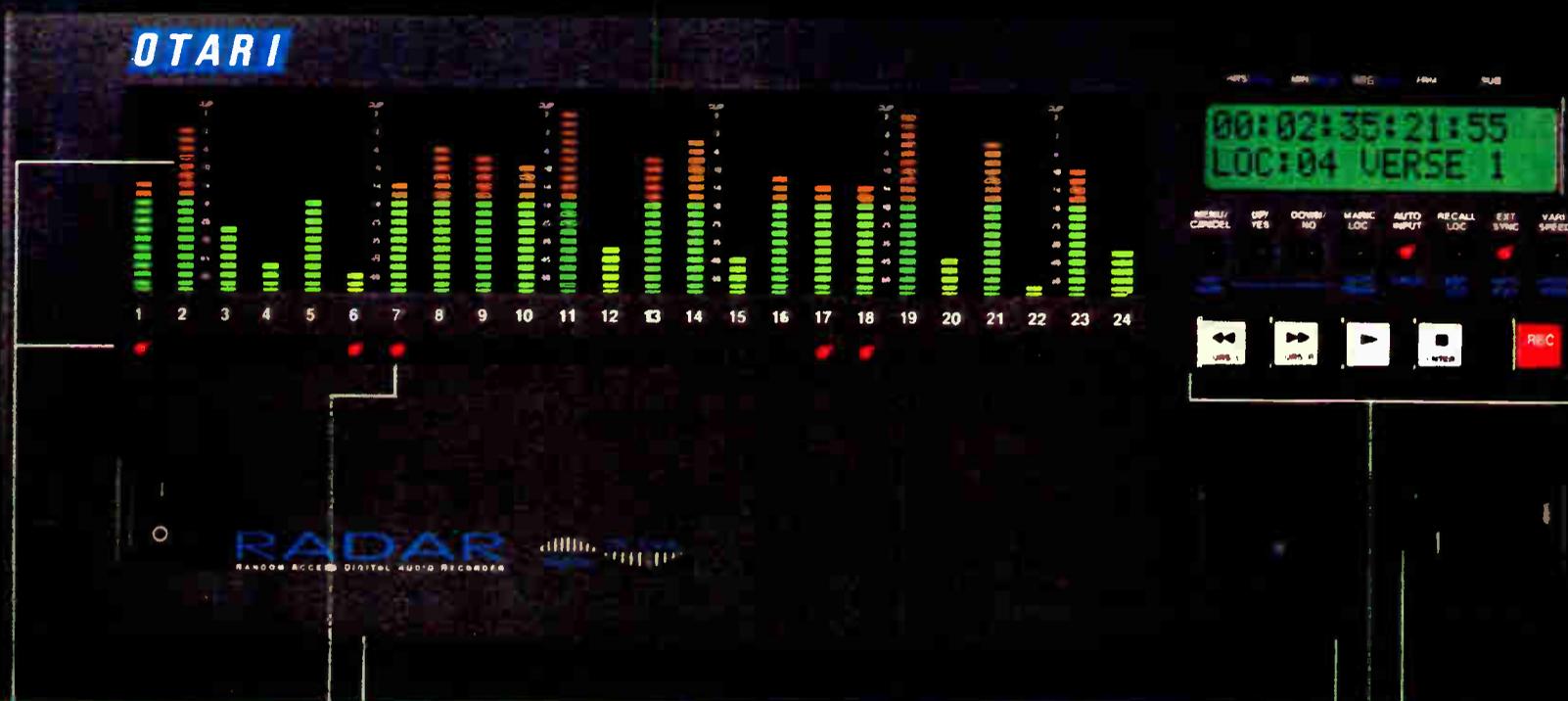
With all of these features, it is easy to see why there are more than 500 Digilink workstations around the world from Paris to Moscow to Taiwan to Jamaica and in your own backyard. Don't suddenly come to the realization that you could have bought a Digilink! Call Arrakis now...

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## AUTOMATION

# Keeping Pace with Choices in Automation

## Manufacturers Continually Improve Product Lines And Add Assortment of Features and Fail-Safes

**LAS VEGAS** The incidence of automation at radio stations across the country is increasing, making a perusal of automation products on display at NAB '95 a must.

The Phantom digital automation system will be on display at Register Data Systems' booth. And TM Century will be showing its Ultimate Digital Studio, for full live or unattended operation.

Datacount will be displaying revision

seven of its DARTS traffic and billing system, used by over 1,600 stations. DARTS enables traffic operators to do multistation combined traffic for up to eight stations, and allows more flexible automation interfacing thanks to downloads and automatic log reconciliation to most major digital automation systems.

Solidyne's new offerings include the Audicom 922 full automation system.

Digital hard disk automation and editing

systems for LAN networks will be among the new products on display from Smarts Broadcast Systems. The company's standing satellite automation products will also be shown.

Scott Studios is showing the Net Catcher, which records and stores network audio for delayed playback.

RCS Traffic, a fully-automated commercial scheduler that offers complete inventory control and management, and a variety of custom reports, will be on display at Radio Computing Services's booth. Another of the company's established products of interest is the Selector

music scheduling software.

Prophet Systems is demonstrating new features for its Wizard for Windows Digital Automation System, including time and temperature announcements to allow satellite and hard drive-automated stations to insert current time and temperature, and a backtiming module to enable an easier-run live shift (and ensure that music will play during automated times).

New advanced satellite automation products, and the "improved" On Air Navigator module—for live assist and music automation—will be shown by Dalet.

The Digilink digital system for satellite, HD and CD automation, and live assist and production, will be shown by Arrakis Systems, as well as in the Broadcast Supply Worldwide booth.

A new version of The Management's

*Looking for the ultimate affordable digital STL solution?*



# Look No Further!

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**W**HEN Moseley introduced the DSP 6000 in 1992 it was immediately acclaimed by the broadcast industry as THE digital STL solution. Here's why. The DSP 6000 virtually eliminates the problems associated with conventional analog transmission such as noise due to signal fades, birdies from intermod interference, and lack of spectrum for multiple audio feeds to LMA and Duopoly transmitter sites. Almost three years later, the DSP 6000 is the de-facto industry standard for sonic clarity and reliability with sales approaching 2,000 installations worldwide. But you probably already knew all of that stuff, right?

What you may not have known, is that the DSP 6000 also works in conjunction with your existing Moseley analog composite STLs! If you've invested in a Moseley PCL 505/C, 600, 606, 606/C or 6000, a few simple modifications convert your entire system to digital! And it won't cost a pot of gold (just under \$6,000). **Call us for modification instructions, or better yet, ship us your STL and for a mere hundred bucks, we'll make the modifications and do the setup for you.**

Isn't it time you stopped chasing rainbows and started enjoying the sonic clarity of digital? "Digitally clear. Clearly digital. Just the way we planned it." ▼

**Automation at radio stations across the country is increasing, making a perusal of automation products at NAB '95 a must.**

AXS digital audio automation system, featuring time announce, linked announcer intros, a remote access telco/RPU interface that can be attached to standard audio interfaces, and Powerfill, which can accomplish real-time audio segment fill for hard disk and CD music systems, will also be on display.

Electric Works' new line of audio automation hardware and software will be on view, including the CD1 custom CD player controllers that are able to control up to 32 mixed types of consumer (Pioneer or similar brand) multidisc CD players.

Broadcast Electronics will be showing its CORE digital automation system.

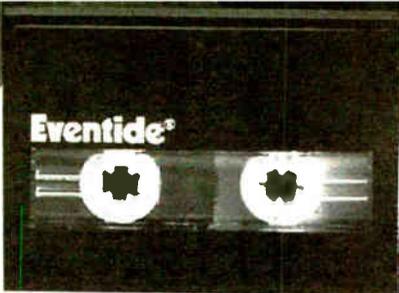
Bradley Broadcast's NAB '95 offerings include 360 Systems' Instant Replay hard disk audio player that provides instant access to 500 individual audio cuts, regardless of length.

A.E.Q. S.A.'s ISO/MPEG Layer II editor for the MAR hard disk broadcast automation system will be among the company's products on display.

The SALSA digital automation system will be shown by LPB. The company will also demonstrate the use of its 7000 series audio consoles for added automation functions.

International Tapetronics will be displaying its schedule simulation software, Virtual Scheduler, which can be used in automation applications.

ENCO Systems will be showing its DAD486x Digital Audio Delivery System, which matches DOS-based software with industry-standard computer hardware, and is targeted for a variety of uses, including program scheduling. The system also offers multiple output reproduction capability.



# LOG FOR LESS

Everyone loves Eventide digital audio-loggers. They've thoroughly obsoleted old-fashioned reel-to-reel logging recorders. But for some stations, our 24-channel model VR240 is more than the budget can handle. And many stations will never need to record up to 24 channels.

## 500 hours, half the price

The Eventide VR204 4-channel digital logger is the perfect answer. It costs less than half the price of a fully optioned Eventide VR240! The high density DDS2 drive of the VR204 can actually record more than 500 hours, divided among up to 4-channels, on a single DAT tape. That's twice the record time of our original models.

## Built-in hard disk

The VR204 is a single drive machine, yet it can play and record simultaneously. That's because it features an ingenious built-in hard disk memory module that keeps recording even if the tape is playing back an

earlier segment (or if the tape runs out). When the tape resumes recording, the content of the hard disk is transferred to tape, maintaining the completeness of the taped log.

## Two-way compatibility

There's also a play-only model, the VP204, which is ideal for the GM's or PD's desk or for the group's main office. And both the VR204 and VP204 can playback any of the 24 channels recorded on an Eventide VR240.

Keep an accurate audio record of everything that goes out on your air. Keep track of the competition as well. Contact your broadcast dealer or Eventide for the full story on the economical VR204. Because without an Eventide digital logger, you really don't know what you're missing.



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## STL, REMOTE &amp; TELCO

# Digital Makes Inroads in STL Gear

**LAS VEGAS** STL, telco and remote equipment manufacturers are sending out signals loud and clear: There will be plenty of new equipment to look over at this year's NAB.

## Codecs and such

**Corporate Computer Systems** will demonstrate its new family of CDO Prima digital audio codecs, featuring bidirectional 20 kHz stereo, ISO/MPEG Layer II and G.722 audio and SMPTE time code.

**Harris Allied** will be displaying the **Telos Zephyr** digital audio network transceiver that provides bidirectional full-duplex 15 kHz stereo audio plus data transmission on a single ISDN line. Both paths are also compatible with older 7

3550 remote control unit for model DSR-3610 Encore receivers, which will also be on display.

**RE America** will have its established RE 660/661 Layer II audio codec on display, which transports up to 20 kHz stereo over ISDN phone lines, including AES EBU in/out. The RE 662/663 Layer II audio codec multiplexes up to three ISDN lines for 384 kbps contribution transport.

RE will also be displaying the RE 532 RBDS encoder for FM data transmission and the RE 533 RBDS coder.

## STLs

**Energy-Onix** unveils two frequency agile composite STL systems, RPU transmitters and receivers, an FM relay

Established products include the D-MUX 500 CD-quality highly linear digital multiplexer and the 8000 modular configured rack frame system.

**QEI Corporation** will show the Cat-Link AES/EBU audio transport and the Quick-Link Spread Spectrum RPU system.

The Starlink 9000 all-digital, open-

Control software, PCL 6000 studio transmitter link, DSP 6000 digital transmission equipment for STLs and the PCL 6000 multichannel studio transmitter link.

## More codecs

**Intraplex** will introduce its new line of fully integrated digital audio

**STL, telco and remote equipment manufacturers are sending out signals loud and clear: There will be plenty of new equipment to look over at this year's NAB.**

kHz codecs that use G.722, and a V.35/X.21 port allows connection to one or two Switched 56 lines, spread spectrum wireless modems, satellite links and other data paths.

**Gorman Redlich** will have its established line of EBS encoders and decoders on hand.

Italy's **DB Elettronica** will be unveiling new digital encoders and decoders for aural STL, FM transmitters and composite STL transmitters and receivers. DB's established STL transmitters and receivers will also be shown, as will antennas and accessories.

**Scientific Atlanta** will debut the SRC-

receiver and AM transmitters.

**National Supervisory Network Services (NSN)** will display the world's first VSAT Internet system. The InSAT satellite Internet terminal system provides Internet access from anywhere on earth.

NSN will also show **Comstream** digital audio products and Gilat satellite data products.

**J.N.S. Electronics** will debut the spectrum-efficient DRFL 700 digital microwave terrestrial link, the RFM8323 FM receiver and the DFM 8252 composite sense module, pilot and L&R.



The Comrex family of digital codecs

architecture modular system for CD-quality audio transmission will be displayed by **Moseley Associates**. The 9000 also has remote control and stereo/SCA/RDS generation capabilities. Plug-and-play modules include ISO/MPEG/ADPCM, 16-bit linear digital audio, D/I and variable rate mux, speech/fax/data card, T1/E1/ISDN/Switched 56 drivers and intelligent remote control.

MRC 2 and MRC 1620 remote control products from Moseley include PC

codecs, including the Model 4464 MPEG Audio Layer II codec for ISDN lines. The 4464 includes bidirectional stereo MPEG audio, auxiliary data channel, BONDING-compatible inverse multiplexer and ISDN terminal adapter.

Also new from Intraplex is a set of plug-in program audio transmission modules for its T1 and E1 multiplexers: the PT-250 MPEG stereo transmitter and PR-250 MPEG stereo receiver. Both modules incorporate the ISO/MPEG Audio Layer II coding algorithm, allowing transmission of 20 Hz to 20 kHz stereo audio in as little as 64 kbps.

Intraplex's established STL Plus linear uncompressed STL/TSL multiplexing system for T1 lines and digital multiplexers for T1, E1 and satellite applications will also be on hand.

**Comrex Corp.** will show its DX200 MusicLine ISO/MPEG Layer 2 codec for full bandwidth stereo on ISDN and Switched 56 lines. Upgraded G.722 DXR.1 digital audio codecs capable of bidirectional 15 kHz mono on an ISDN line will also be unveiled.

Comrex will also display its frequency extenders, telephone couplers, wireless cue systems for ENG and SNG and special purpose remote audio consoles.

Spain's **A.E.Q. S.A.** will debut its ACD-3.001 multistandard audio codec that operates in ISO/MPEG II and G.722 modes.

A.E.Q. will also show the BC-2000 and BC-500 broadcast mixing consoles, MP-10 and TLE-02 portable mixers, a Systel-3.000 telephone multi-conference system and the TH.02 EX Digital Hybrid with frequency extender.

**Audio Processing Technology** will show the MCE800 encoder and the

continued on page 83 ►

## AXS (Ax'-sess)... Jocks Love It!

AXS is an entirely new approach to digital audio controllers. It starts with superb audio using the premium quality apt-X™ system. AXS is easy to learn, easy to use, and powerful beyond words.

AXS is a modular design that begins as a simple cart replacement and grows to any combination of CD, hard disk, satellite or specialty programming with ease.

AXS has all the sophisticated feature options including device independent multi-channel background audio record and replay. Macro programming makes tough to run event sequences easy. Software drives a powerful programmable real time IOMAP.

**Jocks love AXS:** A fast 99 page, 28 button Jock F/X panel that can be time linked and remote wired is standard.

Use a software driven four-channel stereo audio switcher with on-screen control or the powerful eight-channel dual-buss routing switcher, or include both if you wish. AXS is controlled through a trackball, touchscreen, keyboard, buttonbox, telco or remote modem. *AXS systems...*

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READER SERVICE NO. 203

## The CircuitWerkes DTMF-16 TouchTone Decoder



### Inexpensive & Convenient Control

- Decodes all 16 DTMF tones.
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- Jumper selectable beep-tone acknowledges commands.
- Momentary or Interlocked Latching output modes.
- New, two tone decoder & anti-falsing filter improve reliability & versatility.
- Combine with an AC-2 auto-coupler for an economical dial-up remote control.

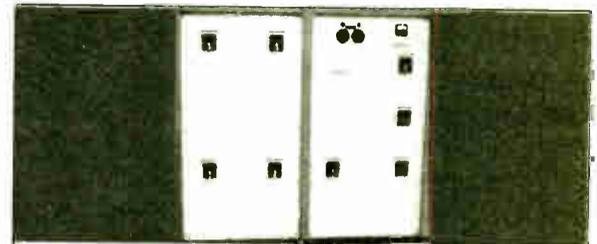
The DTMF-16 is perfect for interfacing networks to your automation, controlling remote satellite receivers, repeaters, etc. With a list price of only \$199, the compact, light & rugged DTMF-16 can be put almost anywhere to provide the remote controls that you need. For more info, contact your favorite broadcast supplier or call us.

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READER SERVICE NO. 148



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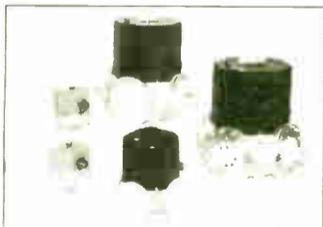
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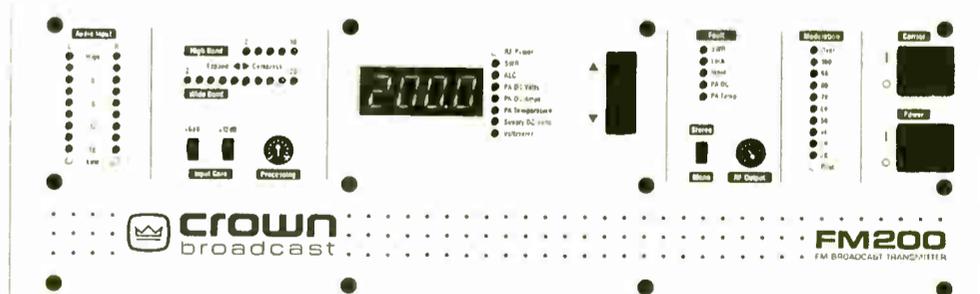
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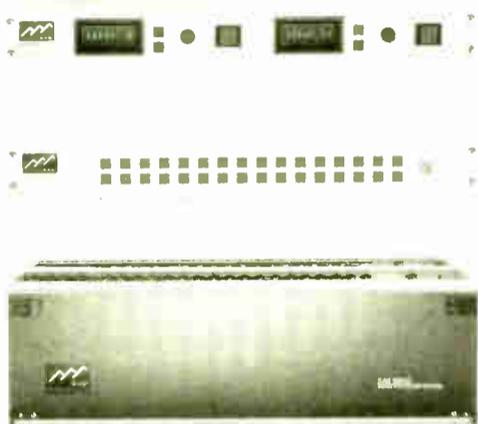
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For more information on the products shown below, circle the appropriate Reader Service No.(s) on the enclosed Subscription/Reader Service card or contact the advertiser directly.

BROADCAST AUDIO ROUTING  
SAS 32000 SWITCHER



Specifically designed for Radio, the SAS 32000 Stereo Audio Routing & Mixing System is perfect for directing signals throughout any size broadcast facility. Typical applications include remote routing, monitor switching, ISDN interface assignment, and control room output / transmitter routing.



Unlimited summing of inputs is standard and allows for mix-minus feeds, IFB and voice-over work. System sizes up to 32 x 16 stereo in one 3 RU frame. The modular matrix configuration expands to 192 x 192.

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- Encoder FCC Type Accepted
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It's a balanced-in, balanced-out stereo line amp.

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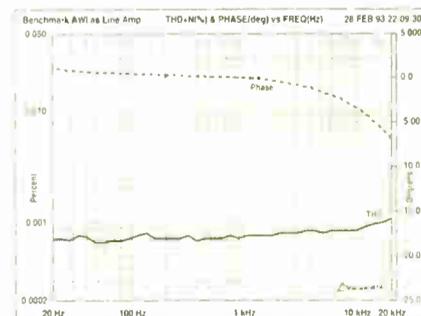
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READER SERVICE NO. 33

# Digital Makes Inroads in STL Gear

► continued from page 80

MCD800 decoder. Used together, these products allow distribution of up to eight channels of audio over a digital network.

Also from APT, the DRT 128 is a portable unit designed to deliver high-quality audio common in outside broadcast and limited bandwidth applications. It incorporates a two-channel ISDN terminal adapter with internal IMUX to ensure channel synchronization. APT's proprietary audio data compression tech-

complete talk show systems.

MPR's new audition listening test system will also be displayed. The Audition Jr! automates, improves and simplifies subjective evaluations of audio equipment. Jr! comes with a PC card and software package all designed for a standard PC.

### More products to choose

Will-Burt's new mechanical telescoping masts will be available in 30- and 38-

10 hours.

Marti Electronics will debut a frequency-agile remote pickup unit, and show established STLs, RPU's and sub-carrier generators and demodulators.

The established Gentner TS612 DCT multiline telephone system, designed for fast-paced broadcast use, will be shown

**Manufacturers of equipment continue to exploit the use of digital technology.**

by Harris Allied. Features include connections for six phone lines, on-air/off-air talkability, expanded control surfaces, digital superhybrids, Next and Mute functions, VIP buttons, Record and two auxiliary functions.

Gentner Communications will display an enhanced TS612 talkshow system, along with an enhanced version of the ET100 portable teleconferencer. Established products include telephone interfaces, hybrids, couplers, talk show systems and transmitter remotes.

Henry Engineering will introduce its Telestor digital actuality recorder for automatic recording of news reports, weather updates and other actualities sent to broadcast stations using regular dial-up phone lines.

Henry will also be showing its established Matchbox, USDA, Stereoswitch, Mixminus Plus and other problem-solving interface products.

Broadcast Supply Worldwide will display the Telos Zephyr.

Systems Wireless Ltd. will display the



Intraplex's entry into the codec field

nology provides high-quality audio over low-capacity digital circuits.

APT's DSM100 digital audio transceiver allows CD-quality stereo audio to be carried over the ISDN or similar low capacity digital telephone circuits. The Pro-Link ISDN Manager from APT combines an ISDN T.A. with an intelligent six channel IMUX.

The ACE100 series of PC and MAC digital audio expansion cards are also among the products APT will demonstrate.

MPR Teltech will introduce a host of new products at NAB. Polaris is a road reporter's kit that contains an ISO/MPEG Layer II/G.722 codec and an ISDN terminal adapter. It connects to a notebook via a PCMCIA port. The Polaris software includes a notebook record, cart storage, audio editing and text editor.

Also from MPR, the Capella card ISO/MPEG Layer II/G.722 PC card is able to send live audio. Features include: all ISO/MPEG Layer II sampling rates, AES/EBU in and out, S/PDIF in and out, G.722 and sample rate converter, ISDN terminal adapter add-on is available. LII Blue is a Layer II audio codec that comes standard with remote control software, G.722, easy flash prom updating, multiplexer, J.52, other manufacturer's inverse muxing, all sample rates and the ability to control 1271 LII blues from a single RS232 link. Optional features include SMPTE time code, terminal adapters and WG1/WG2 DAB interfaces.

Telos Systems will display its Zephyr digital audio network transceiver and introduce the ZephyrNet ISDN point-to-multipoint hub for audio program distribution and back-up to satellite.

Telos' range of broadcast-to-telephone interface products will also be demonstrated. These products include the 100 Delta digital hybrid with dynamic digital equalization; the Link, for connecting phone lines to intercoms; the One plus One dual hybrid; Call Screen Manager software for talk show production; and

foot heights. Will-Burt's established products on display include pneumatic telescoping masts for radio remote broadcasting and the 25-foot Hurry-Up mast.

The Register Data Systems Phantom will also be shown. This digital audio system controls multiple satellite or network input sources and can replace carousels and cart machines in live operation as well as tape-based or CD-based automation. It has recording storage capability from 90 minutes to more than

## The Wizard™ has gone STEREO!

The new DIGITAL FMSA-I gives The Wizard System unmatched stereo monitoring capabilities. . .



Superlative stereo performance. Linear-phase filters that reveal the true performance of your audio processing. The stability of digital stereo demodulation. The sophisticated graphical presentation of The Wizard. And—with the RS-232 port—operation on site or off.

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World Radio History

Matrix Plus II, a point-to-point digital intercom system that allows broadcasters to interface to existing party line intercoms, telephones, two-way radios and IFB systems. Remote switching is another feature provided by the Matrix Plus II.

Systems Wireless will also display the Vega Model RMT-10 Wireless IFB system. Features include a two-channel pocket receiver for reliable IFB, PL, talent cue and audio monitoring applications compatible with Clear-Com and RTS-wired intercom systems.

Bradley Broadcast Sales will display several Telos products, including the Zephyr codec, telephone hybrids and One-x-Six telephone talk system. The Gentner TS-612 telephone talk system will also be on hand.

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TEST & MONITORING

# Innovations in Test and Monitoring

**LAS VEGAS**

A familiar and stalwart category, audio test and monitoring equipment will once again make an impressive stop at this year's show. From new gear to upgraded models, manufacturers will exhibit the wares of a host of both handheld and system devices.

**Neotek** is introducing its multisource monitoring system. The unit is available in four-channel Dolby stereo and the new 5.1 channel formats of Dolby digital, AC-3 and the MPEG II Layer 3. The company is targeting this less-costly monitor system to many of the new users of multichannel sound, such as music studios, project studios, jingle houses, in-house studios and even artists and composers.

**Tektronix** will display numerous test and monitoring products, including the new TG2000 signal generation platform, featuring analog and digital precision, and the 764 digital audio monitor, a level, phase and format monitor combining traditional monitoring with measurement and analysis capabilities.

**Handheld tools**

Established products on hand in the Tektronix booth include the AM70 handheld digital audio analyzer/generator,

AM700 mixed-signal audio measurement set, WFM 601i serial component monitor, TPG20 test pattern generator, 2712 spectrum analyzer, R3272 Advantest spectrum analyzer, SDH/Sonet test set, WFM90 handheld monitor, TSG601 handheld serial component generator and the SDA601 handheld serial digital analyzer.

**Modulation Sciences** plans to showcase its RDS-1 RBDS generator, RDS-X RBDS data receiver, PRD-3000 RBDS decoder/monitor/analyzer, FMMM-2 FM modulation monitor/analyzer, MYB-2 StereoMaxx spatial image enlarger, CP-803 composite audio processor, DSCA-188 data subcarrier generator, SCA-186 subcarrier generator and the DSCA-1, two-data subcarrier receiver.

**Satellite terminals**

**NSN Network Services** is unveiling the InSAT satellite Internet terminal system, which provides Internet access to and from any location on earth through any TDMA X.25 shared or private hub. It also accepts dial-in telco. In addition, the company's complete network and space-time services, including ComStream, Gilat, Titan and ViaSat satellite systems, will be on display. Spacetime services are offered on GE-1, Satcom C-5,

PanAmSat, Orion and other satellites.

**Hallikainen & Friends** will exhibit its Election Central software that runs on networked IBM-compatible computers; the DRC200 transmitter control system; the DRC190 transmitter control system; the TVA series of monaural rack-mount

screen audio level display keyer, Model TVU.

**Belar** will feature the newly-introduced FMSA-1 FM digital stereo analyzer, the digital stereo companion to the Wizard, and the Model RBDS-1 RBDS monitor. Also on display will be its complete line of FM, AM and TV modulation monitors, modulation analyzers and frequency monitors, including the Wizard for FM, the Wizard for AM and the FMM-2/FMS-2 FM test set.



Narda's Survey Meter

audio mixers; the TEL171 digital telemetry adapter that updates Moseley TRC-15A remote control systems to digital metering; and the ITO178, which interfaces the TEL171 to IBM-compatible computers.

Among the many products at the QEI booth are the 710 digital stereo generator with AES/EBU and the 691 modulation monitor.

New from **Inovonics** is the AM modulation monitor, Model 540; David-II FM stereo processor/generator, Model 716; FM stereo generator, Model 708; and RBDS encoder/decoder computer interface. Established monitoring products on display include the FM Mod-Monitor, Model 530; the Sentinel all-mode diagnostic receiver, Model 550; and the on-

**Potomac Instruments** will exhibit a number of test products, including 1900 Series directional array antenna monitors, AA-51A audio analyzer, AG-51 audio generator, FIM-41 medium wave field strength meter, SMR-11 synthesized AM monitor receiver, QA-100 program audio analyzer, and 1750-TLM tower light monitor.

**Loral Microwave-Narda** is unveiling the Model 8718 survey meter, a handheld meter that displays field readings in any unit as direct readings against standards. It features single-touch automatic zeroing. In addition, the Model 8520 broadcaster compliance meter will be on display. It provides the FM/VHF broadcaster with an accurate way to comply with

continued on next page ▶

## Multimedia Tools & Automation Components

Electric Works Corp now offers their time proven multi-media and automation control components for systems integrators and audio/visual suppliers. Software development kits available.

**DMX-4B Audio Switcher:** A superb quality software-controlled audio/switcher. Mounts directly inside any PC 16-bit computer slot. Four unbalanced stereo in, one balanced stereo and one balanced mono out. Eight programmable logic lines in, eight out. DAC control internal level faders. Multi-units may be installed.

**CDI-1A CD Player Interface:** External RS-232 microprocessor controller for up to 32 intermixed units of the popular Pioneer™ multi-magazine 6, 12 and 18 disc CD players and the Pioneer™ PD-FD100 single platter 100 disc jukeboxes using the SR control jack.

Also programmed for the JVC™ XL-MC100 100 disc jukebox and some Technics™ machines. Custom programming for other machines including the Pioneer™ video disc and karaoke and other CD devices. Balanced stereo audio output. External power supply.

**AS-28 Audio Switcher:** Advanced stereo dual buss eight channel audio routing switcher controlled by an external logic card like the PCL-720 or equivalent. Two independent balanced stereo outputs. Optional level sensing for two DTMF tones. External power supply.

**SRPAR-1 CD & I/O Microprocessor:** RS-232 based microprocessor controller for custom SR control of CDs, VDs, etc. Includes eight incoming logic lines and generates eight outgoing logic closures. Balanced stereo audio out. External power supply.

### ELECTRIC WORKS CORP.

Box 136992 • Ft. Worth TX 76136

817-740-0296 (voice & fax)

Multimedia World Booth (Hilton) 1808

Send for brochures and pricing • OEM quantities available

**BIG SAVINGS**  
on the **BEST**  
**Transmitter Remote Control...**  
the **VRC-2000**

**\$500.00**

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Call Gentner at 801-975-7200 or

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Offer good on Gentner's VRC-2000 or VRC-2000 package only. Good through participating Gentner dealers only. Offer expires June 30, 1995. Call Gentner for details.

► continued from previous page

FCC and OSHA limits for exposure to RF radiation.

**Audio Precision** will highlight its new System Two, a comprehensive digital and analog domain test instrument for measurement of AES/EBU interface parameters. The unit includes analog and digital performance levels to support measurement of 20-bit converters. Also new from Audio Precision will be APWIN, Windows-based software for System One and System Two.

**Burk Technology** will introduce audio test equipment, emergency alert equipment and automatic transmitter control equipment.

**Avcom of Virginia** will unveil new features to the PSA-37D portable spectrum analyzer and feature other portable spectrum analyzers, satellite receivers and microwave accessories.

At the **Holaday Industries** booth, a new ankle current meter will be on exhibit. The unit is used to measure RF-induced currents in the body in accordance with the latest revision of the ANSI RF exposure standard. In addition, broadband isotropic RF field strength meters used for measuring potentially hazardous electric and magnetic fields will be on display.

**Delta Electronics** will showcase RF AM meters, operating impedance bridges, receiver/generator, AM stereo exciter and monitor, coaxial transfer switches, antenna monitor, splatter monitor, noise generator and high-power pulse reflectometer.

**Asaca/Shibasoku** will introduce its CM147/207 14-inch and 20-inch HR multistandard color monitors with digital control and CM148/208 14-inch and 20-inch mid-range HR multistandard color monitors with digital control. In addition, the company's full range of audio test and monitoring devices will be on hand.

**Radio Design Labs (RDL)** is highlighting a host of new products this year, including the ACM-2 synchronous AM noise monitor and the AMX-84 audio matrix.

**ATCi** is introducing inclined orbit satellite tracking systems, vanguard instruments portable spectrum analyzer, satellite receiver and monitor.

**Joselyn Jennings Corp.** will highlight more than 800 capacitor models with applications that include a wide range of communications, power, electronic, semi-conductor fab, dielectric heating equipment and medical MRI and heart defibrillators. Voltage ratings are to 100 kV, available in variable and fixed, vacuum and gas filled configurations. In addition, the company's complete line of relays, coaxial relays, contactors, interrupters and test equipment will be on display.

At the **Broadcasters General Store** booth, the "Thermal Sentry" transmitter temperature monitor by Sine Systems will be on hand. In addition, the RFC-1/B dial-up remote controller will be on display.

Finally, **Gorman Redlich** is highlighting the company's digital antenna monitors for AM directional arrays.

ANTENNAS

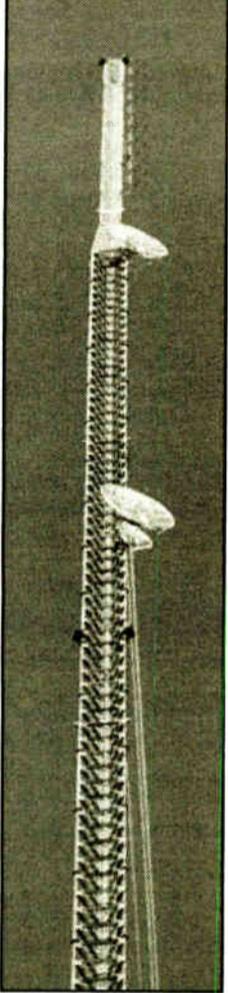
# Latest in Antenna Design Displayed

**LAS VEGAS** It is time again for the awaited NAB conference with its array of broadcasting products from all over the world. NAB '95 will include new products and exhibitions from many antenna and tower manufacturers that will help your station reach your listeners with the quality you expect.

**Harris Allied** will introduce the Harris DX Series EPAC for high-power digital solid-state medium-wave transmitters. Harris will also introduce the Audio-Metrics CD-10E and the Oktava Microphones.

Also on display will be a variety of Harris FM and MW transmitters, FM transmitters with DIGIT Digital FM exciters, MW transmission equipment and sound enhancement and recording systems.

Other Harris products also on display include ISDN and Switched 56 equipment, digital audio network transceivers, register Data Systems Phantom and digital audio delivery systems.



One of Jampro's Antennas

**DB Elettronica** will introduce the 300 W FM transmitter with built-in digital stereo coder. The company will also introduce the digital stereo coder for FM stations, 300/600/ 1000 W FM MOSFET amplifiers and TD116 and RD116 digital encoder and decoder for aural STL.

DB Elettronica will also display its 2500/5000 W, 10 kW FM tube-powered amplifiers with high-efficiency HMV cavity, solid-state modular FM amplifiers, FM exciters and transmitters, analog STL transmitters and receivers, antennas and accessories.

**Tennaplex Systems Ltd.** will display its Kathrein broadband FM CP panel antennas that are suited for omni-directional or custom pattern requirements.

**S.W.R., Inc.** will show a full range of FM transmitting antennas, FM directional antennas, rigid transmission line and components, and multistation combiners.

**Stainless, Inc.** will introduce its Master Tower Leasing that will give broadcasters the opportunity to build new or upgraded antenna support structures. "Leasing is a very capital-efficient method of financing major purchases of this type," said Dave Donelson, president of Stainless Inc.

Stainless also offers complete antenna tower design, fabrication, erection, modification and maintenance. Antenna support for all broadcast, two-way and other

applications. Inspection and structural analysis of existing towers.

**Shively Labs** will introduce UHF broadcast antennas and MMDS repeater antennas.

The company will also have on display a complete line of FM broadcast antennas and such related gear as combining networks, transmission line, pressurization equipment and pattern work.

**Scala Electronic Corp.** will introduce FM transmitter combiners, cavity filters and isolators.

Also on display will be professional antennas for FM translators and low-

power transmitters, precision monitoring antennas for FM broadcast stations, and antennas for STL and RPU systems.

**Micro Communications Inc.** will introduce 7/8" and 4 1/16" EIA coaxial transfer switches, FM all-band dipole antennas, FM interdigital bandpass filters, coax break-away sections, and non-radiation studies.

Other Micro Communications products include 1 5/8", 3 1/8" and 6 1/8" EIA coaxial transfer switches, switching and multistation combiners, interference filters, hybrid combiners and

continued on page 128 ►

**Rumor:**  
*"Harris Allied is in the TV Hall."*

1995 NAB, Las Vegas, April 10 - 13

# Why is DIGILINK the #1 Selling Hard Disk System for Radio ?



- **Over 1,000 workstations have been sold.**
- **A complete Digilink system starts at under \$8,000.**
- **Use Live On Air, for Automation, and for Production.**
- **Simultaneous Record, Play, Crossfade, & Network transfer.**
- **Use just one or connect more than 15 workstations together.**

With over 1,000 workstations sold, Digilink is by far the #1 digital audio system for live On Air radio, Production, and Automation. Digilink has achieved this unique success because it is easier to use, does much more, and costs less than any other digital product on the market today.

Digilink does more than other systems because of its abilities in On Air with live, CD, & satellite; in production with its multitrack editor; and in news with text. This makes it so that a Digilink workstation can be placed in each studio of your station to replace cart machines, reel machines, CD players, and often even consoles. At an average price of under \$8,000 per studio, Digilink is actually less expensive than the tape equipment that it replaces while giving you CD quality audio performance, an average media life of over 15 years, and equipment that requires no routine maintenance. You can even create a digital highway around your station by connecting all of your Digilink workstations and scheduling computers on our digital network to transfer audio, text, and schedules in perfect digital between studios.

With its ability to *simultaneously* record, play, crossfade, and network transfer, a single Digilink workstation can do all that is required for recording and playback for an entire studio. It is literally a studio in a box. It can be crossfading out of a CD into a hard disk song, dropping a hard disk jingle over the middle of the crossfade, recording a network audio feed for later playback, and receiving a new spot over the network from the production workstation. Digilink is the complete digital solution to your radio station's studio needs.

To create a *professional* digital broadcast solution you can't simply buy a digital audio board and IBM PC computer. Therefore, Arrakis builds our own DSP board; SCSI board; I-O board; audio routing switchers; video switchers; and modular, broadcast quality cabinets. This makes Digilink remarkably powerful with radio specific features such as digital crossfade and Trak\*Star multitrack editing. This also reduces cost so that we are able to sell Digilink for as little as 1/2 the price of other products which have to buy less powerful cards and mark them up. Perhaps most importantly, building Digilink ourselves assures you of long term customer support from a single *broadcast* source. With Digilink, you don't have to be a computer expert, because Digilink is a digital audio workstation, not a computer !

Whatever your studio needs- to replace a cart machine, add a new production studio, or add some level of automation, Digilink can do the job. Put a Digilink in one studio today, another next year, add a scheduling computer and network, and you will eventually discover that you have painlessly gone digital one step at a time. There is no question that Digital audio is here *TODAY*- it improves your sound, speeds your production, increases your reliability, and reduces your costs. Call and find out why Digilink is #1 and why customers come back again and again: customers like the United States Air Force who have selected Arrakis Digilink, consoles, and furniture for all of their radio stations worldwide.

**for more information call...**

**(303) 224-2248**



**arrakis**  
SYSTEMS INC.

2619 Midpoint Drive, Fort Collins, CO. 80525  
Voice- 303-224-2248, Fax- 303-493-1076

**Audioarts Engineering** 2211  
Intro: R-60 on-air audio console features six-source line selector, module extenders, gold contact switches, Penny & Gies faders, Sifam meters, 16-bit digital audio performance and Simple Phone module.  
Also: MR-40 multitrack audio production console, with four mono mic/line input modules and eight stereo line modules.  
Contact: Rick Strage, Prod. Mgr.  
7305 Performance Dr.  
Syracuse, NY 13212  
315-452-5000

**Audio-Technica U.S. Inc.** 11206  
Intro: AT-MX341a SmartMiser automatic telephone mixer with digital switching. ATH-M40 and ATH-D40 precision studiophones. ATM75 head-worn cardioid condenser microphone for hands-free studio performance. AT815b and AT835b cardioid shotgun microphones that operate on battery or phantom power.  
Also: AT4050/CM5, a multipatter, large diaphragm capacitor microphone for studio applications.

**Audio Labs** 1603  
On Display: VoxPro on-air digital audio editor designed to replace reel-to-reel machines in control newsrooms.  
Contact: Charlie Brown, CEO/Pres.  
190 Queen Anne Ave. N  
Seattle, WA 98109  
206-285-1735

**Audiopak** 4219  
P.O. Box 3100  
Winchester, VA 22604  
703-667-8125

**Auditronics Inc.** 2721  
Intro: 2500 Series audio console system for radio on air and production with music or talk formats. Features program, audition, and 2 mix-minus buses; 3 frame sizes available.  
Also: AirMaster 90 series desktop audio console system; 210 series - drop-in audio console system with 12, 18 and 24 input mainframes; 801/851 series - on-air and production audio console system; 1900 Mix-Minus system, modular rack-mounted mix-minus/IFB audio system.  
Contact: Robert C. Greenwald, III  
Sales Eng.  
3750 Old Getwell Rd.  
Memphis, TN 38118  
901-362-1350

**Autogram Corp.** 4719-21  
Intro: CYA-3.  
Also: A number of consoles, including the RTV-20, the Pacemaker 1032, the AC-8, the Mini Mix 8A and the Mini Mix 12A. Autoclock, which measures time and temperature. Autocount, a countup clock.  
Contact: Ernest T. Ankele, Jr.  
1500 Capital Ave.  
Plano, TX 75074  
214-424-8585

**Avcom of Virginia Inc.** 11502  
Intro: PSA-370 with new features: 4-digit LCD frequency read out; Horiz. positions the display on screen; Selectable 12 or 18 VDC LNA/BDC power for feedline powering of system components; Bat Mon displays the voltage of internal battery pack on the LCD.  
Also: Portable spectrum analyzers; satellite receivers; microwave accessories.  
Contact: Charlie Odom, Int'l Sales  
500 Southlake Blvd.  
Richmond, VA 23236  
804-794-2500

**A-Ware Software Inc.** 2210  
On Display: MusicMaster, a flexible music scheduling and inventory system. Features an advanced scheduling algorithm that improves average turnover control; interfaces with nearly every automation and traffic system available. Includes foreign language and special government reporting modules for many countries. Paperless in-studio module also available.  
Contact: Scott Wirt, V.P.  
22600 Arcadian Ave.  
Waukesha, WI 53186  
414-521-2890

**Belar Electronics Laboratory Inc.** 3119  
Intro: FMSA-1 FM digital stereo analyzer, the digital stereo companion to the Wizard. RBDS-1, an RBDS monitor.  
Also: Complete line of FM, AM and TV modulation monitors, modulation analyzers and frequency monitors, including the Wizard for FM, the Wizard for AM and the FMM-2/FMS-2 FM test set.  
Contact: David C. Hirsch, Mktg. Dir.  
119 Lancaster Ave.  
P.O. Box 76  
Devon, PA 19333  
610-687-5550

**Belden Wire and Cable** N/A  
Intro: Plenum RGB cables in 3, 4 and 5 coaxial cable versions; High flex RG-59/U and RG-11/U triaxial camera cables in several jacket colors.  
Also: Serial digital video coaxes; AES/EBU digital audio cables, mic and musical instrument cables; line level audio cables, precision video coax, triax cables; camera cables; fiber optics 50 ohm transmission cables and power cords.

**Benchmark Media Systems Inc.** 10052  
Intro: Audioworld interface, combining a two-way recorder interface with switch selectable operation as a line amplifier or mono mix amplifier; the Junior Audio Director Plus, a stereo mode controller with four switch selectable inputs per channel; DA-102DM, a two-channel audio distribution amplifier featuring two sets of front-panel 13-segment LEDs for monitoring left and right channels simultaneously.  
Also: The System 1000 uses 14 different cards and four power supplies, along with numerous controllers and accessories; the

Microframe series, a 1 RU modular frame housing 16 amplifiers and two power supplies; line of mode controllers, mic amplifiers, meter systems and interface amplifiers.  
Contact: R. Rory Rail, Sales Mgr.  
5925 Court Street Rd.  
Syracuse, NY 13206-1707  
315-437-6300

**Bext Inc.** 3815  
Intro: Solid state SF Series MOSFET amplifiers, with up to 5000 W FM.  
Also: 27 models of FM amplifiers in 30 configurations, from 100 to 30 kW; STL systems, from 1.5 to 15 W; exciters from 1 W to 150 W; UHF or VHF solid state or tube amplifiers from 2 W to 40 kW.  
Contact: Dennis Pieri, G.M.  
1045 Tenth Ave.  
San Diego, CA 92101  
619-239-8462

**beyerdynamic** 11214  
Intro: EQ Magix from SPL, a high-quality microphone pre-amp designed for live or studio use. Features variable gain, 48 V phantom power use, phase reverse, a defeatable insert point and a 30 dB pad for line use. DT 200 series headphones and headsets, available in on-air or monitor versions, with a choice of dynamic or condenser elements.

**Bradley Broadcast Sales** 1903  
Intro: Tascam's DA-P1 portable pro DAT machine with XLR. Telos One-x-Six telephone talk system. Panascheme wood equipment racks and studio furniture. Innovative Quality Software SAW computer-based audio editing software. Gentner TS-612 telephone talk system. Yamaha ProMIS 01 digital audio mixer. 360 Systems Instant Replay morning show sampler.  
Also: Telos Zephyr digital audio codec. Telos telephone hybrids. Middle Atlantic Rack products.

**Broadcast Electronics Inc.** 3625  
Intro: FM-5C 5 kW solid state FM transmitter. FM-250C 250 W solid state transmitter. AM-500 500 W solid state AM transmitter.  
Also: AudioVAULT, a digital audio storage system. CORE digital automation system. Air Trak 90 console. Mix Trak 100 console. Operating studio. Disc Trak digital cart machine. Dura Trak 90A cart machine. FM-30B 30 kW FM transmitter. AM-5 5 kW solid state AM transmitter.  
Contact: Dave Newton, Mktg.  
4100 N. 24th St.  
Quincy, IL 62301  
217-224-9600

**Broadcasters General Store** 3007  
Intro: DNF Industries ST-2005/SM slow motion VTR controller. SW 1x8 RS-422 switcher.  
Also: SAW digital editing software by Innovative Quality Software. RFC-1/B dial-up remote controller by Sine Systems, as well as the company's Thermal Sentry transmitter temperature monitor. American Recorder Technologies cleaning products for recording equipment.

**Broadcast Programming** 3625  
Intro: Music-on-HardDrive, complete music libraries on computer hard drive. Digitalease, complete digital equipment and radio programming package.  
Also: Full line of digital radio programming formats, including new '90s alternative (Radio X) and '70s greatest hits (Heart of the Seventies). Weekly Chartbreakers hit CDs. Playlist Plus scheduler. The Localizer. Recurrent CDs. BP Consulting Group. NAB-only special on music libraries.  
Contact: Keith Chambers, Mktg. Mgr.  
2211 Fifth Ave.  
Seattle, WA 98121  
206-728-2741

**Broadcast Richmond** 5625  
On Display: Solid state Nautel radio transmitters and various studio systems.

**Broadcast Supply Worldwide** 1825  
Intro: Roland DM800 digital audio workstation. 360 Systems Instant Replay.  
Also: VoxPro, DigiLink, Telos Zephyr and Mackie Consoles.  
Contact: Tim Schwieger  
7012 27th St. W  
Tacoma, WA 98466  
800-426-8434

**Burk Technology** 3702  
Intro: Audio test equipment, emergency alert equipment and automatic transmitter control equipment.  
Also: Transmitter control packages featuring the ARC-16 system for full-time or dial-up control. Waikaway packages using the ARC-16 with AutoPilot transmitter control software. LX-1 six-input stereo selector for audio switching.  
Contact: Dan Rau, Sales Mgr.  
7 Beaver Brook Rd.  
Littleton, MA 01460  
508-486-0086

**Canare Cable Inc.** 11118-22  
Intro: AES/EBU/SPDIF impedance transformers for digital equipment.  
Also: Star Quad microphone cable.

**CBSI** 2113  
On Display: Classic traffic and billing software system for duopolies, consolidated operations, and multiple and single stations; Elite system; InterAcct, an interactive accounting system; Digital Universe, an advanced generation digital audio storage and management system; CustomRemote; Custom Reports; PowerPlus; CustomNet and CustomMusic software programs.

**CCA Electronics Inc.** 4421  
Intro: FM transmitters and exciters.  
Also: FM, AM, MW and shortwave radio broadcast transmitters up to 65 kW.  
Contact: Steve McElroy/Howard M. Ginsberg, V.P. Sales  
360 Bohannon Rd., P.O. Box 426  
Fairburn, GA 30213  
404-964-3530

Central Tower Inc. N/A

**Circuit Research Labs Inc. (CRL)** 2719  
Intro: DP-100 FM digital processor, based on a 32-bit floating point DSP processor. Includes a true digital stereo multiplex generator, AGC, five-band compressor and four-band limiter. SC-100 RDS/RBDS and SCA generator, featuring complete front panel ASCII keyboard and easy-to-use menu system.  
Also: DAA-50, which decodes AES/EBU, IEC958, SPDIF and EIAJCP-340 signals into stereo analog audio. Amigo FM and Amigo AM processors. Audio Signature digitally controlled processing system. AM-4S, featuring C-QUAM-compatible stereo limiter.  
Contact: Valerie Hummer, Mktg. Dir.  
2522 W. Geneva Dr.  
Tempe, AZ 85219  
602-438-0888

**Communications Data Services Inc.** 1811  
Intro: Additions to CDS dial-up on-line services, including LPTV interference study, AM groundwave analysis, LMA duopoly study, ZIP codes for contours and mapping services.  
Contact: Mark Holland, G.M.  
6105 Arlington Blvd.  
Falls Church, VA 22044  
703-534-0034

**Computer Concepts Corp.** 2503  
Intro: Digital audio products including newsroom editing, multi-track production, live assist control and Cartrack cart selection system.  
Also: Digital Commercial System (DCS) audio storage system.  
Contact: Kevin Alcock  
8375 Melrose Dr.  
Lenexa, KS 66214  
913-541-0900

**Comrex Corp.** 12105  
Intro: DX200 MusicLine, an ISO/MPEG Layer II codec for full bandwidth stereo on ISDN and Switched 56 lines. Upgraded G.722 DXR.1 and DXP.1 digital audio codecs capable of bidirectional 15 kHz mono on an ISDN line.  
Also: Frequency extenders for high-quality audio feeds (up to 8 kHz) on standard analog phone lines. Telephone couplers, wireless cue systems for ENG and SNG, and special-purpose remote audio consoles.  
Contact: Lynn Distler, V.P. Mktg.  
65 Nonset Path  
Acton, MA 01720  
508-263-1800

**FACT:**  
*"Harris Allied is in Both Halls."*  
**TV Hall #16001**  
**Radio Hall #3615**  
1995 NAB, Las Vegas, April 10 - 13

# CCS Introduces the

# CDQPrima™ Series



CDQPrima Model 120 shown

## Five of the best codecs in the world

**A**fter you've built over eight thousand codecs, what do you do for an encore?

Introducing the CDQPrima Series, our third generation family of five codecs built with one goal in mind—to give you the most advanced communications tool in the world.

With ISDN rapidly becoming available everywhere, line charges dropping and new standards emerging, you need a full bandwidth codec that can grow with you and not leave you stranded. And growing is what CDQPrima does best.

We've eliminated obsolescence from CDQPrima. Every CDQPrima model can be upgraded directly over the ISDN line, so changing chips when standards come and go is a thing of the past. And our modular construction makes hardware upgrades a snap.

CDQPrima gives you full 20 kHz bi-directional stereo, plus ancillary data and SMPTE time code. World standard MUSICAM® and G.722 audio, with connectivity to over ten thousand codecs worldwide. And built-in ISDN terminal adapters with internal bonding to take you all the

way to astounding 384 kbps audio quality.

CDQPrima lets you program each unit for automatic functions and instant networking with no external hardware. And with five models to choose from, there's a CDQPrima to fit your budget.

We've got lots more to tell you about the new CDQPrima. Call us, or your authorized CCS dealer for details, and be ready for tomorrow with the best codec in the world today.

 **CCS** Audio Products  
Crystal Clear Digital Audio

670 North Beers Street, Building 4, Holmdel, New Jersey 07733 USA Phone: (908)739-5600 Fax: (908)739-1818

**ComStream Corp.** 5615  
Intro: Developments in satellite radio networks, as shown in the demonstration of the new Public Radio Satellite System from National Public Radio (NPR). ABR700 digital audio receiver, supplied with a live NPR satellite feed.  
Also: Products for transmitting high-quality audio, video and data in efficient, adjustable bandwidths. Live demonstrations of these products working for television, radio and data service producers.  
Contact: John Schmuhl  
10180 Barnes Canyon Rd.  
San Diego, CA 92121  
619-458-1800

**Comtech Antenna Systems Inc.** 13402-3  
Intro: EC8 microprocessor control system with optional IBM-compatible software "C" or "Ku" fly-away antenna for SNG-type applications.  
Also: Complete line of satellite antenna systems from 35 inches to 7.3 meters. Offsat antenna, for SCPC uplink requirements.

**Comtek Inc.** 17521  
Intro: BST-25 frequency-synthesized base station transmitter, featuring front-panel tuning to any one of over 100 frequencies. PR-50, a wireless cuing and IFB product.

**Connectronics Corp.** 13627  
Intro: Accessories for Big Ears, a parabolic microphone reflector.  
Also: Audio and video wire and cable patch bays and patch panels. Bodge plugs.

**Continental Electronics Corp.** 3619  
On Display: Complete line of radio broadcast transmitters, antennas and other RF equipment.  
Contact: Steve Claterbaugh  
P.O. Box 270679  
Dallas TX 75227-0879  
214-381-7161

**Cooper Sound Systems** 13619  
Intro: ENG-style four-channel stereo audio mixer, featuring analog meters, Jensen coupler inputs and outputs, insert points and channel outs, PFL and an ergonomic design.  
Also: CS 106 + 1 audio mixer, featuring up to seven fully modular input channels and an output module with a comprehensive communications system. CS 108 + 1 audio mixer, featuring two more input channels than the CS 106 + 1.

**Corporate Computer Systems** 3813  
**Audio Products (CCS)**  
Intro: A demonstration of the new CDQPrima digital audio codecs, featuring bidirectional 20 kHz stereo, ISO/MPEG Layer II and G.722 audio, and SMPTE time code. PACE Lite, a desktop version of the PACE digital newsroom editor. PrimaNet, an instant audio network based on the CDQPrima codec. POTS codec, providing program-quality audio on regular dial-up phone lines. POTS codec.  
Also: PACE, a full-function, standalone editing system with networking and audio routing switcher control capabilities. CDQ1000, CDQ2000, CDQ2001 and Micro series digital audio codecs.  
Contact: Art Constantine, V.P. Sales  
670 N. Beers St., Bldg. 4  
Holmdel, NJ 07733  
908-739-5600

**Cortana Corp.** 3909  
On Display: Stat-Cat lightning prevention system.  
Contact: David Stockmar, V.P. Sales  
P.O. Box 2548  
Farmington, NM 87499-2548  
505-325-5338

**Crown Broadcast** 3203  
Intro: FM-XA-1K and FM-XA-2K 1 kW and 2 kW expandable solid state FM transmitters. Crown AirForce Wings System, allowing network-fed radio stations to sound local while retaining the benefits of the network feed.  
Also: Integrated FM transmitter packages. FM30, FM100 and FM200 integrated transmitter/exciter packages. Audio amplifier and microphone lines.  
Contact: Mark Potterbaum  
1718 W. Mishawaka Rd.  
Elkhart, IN 46517-1000  
219-294-8050

**Crown International** 46515  
Intro: CM311-HS microphone.  
Also: Amplifiers, microphones and IQ computer control.

**CTE International SRL** 3201  
7 Zona Ind Mancoasale  
I-4200 Reggio Emilia  
Italy  
39-588-516663

**Cutting Edge Technologies** 4203  
Intro: Unity software version 4.X, providing a wide range of processing settings for every format.  
Also: A demonstration of the Unity 2000i FM and the Unity AM processors. Showing of the Dividend Composite Filter, which provides full spectral protection, including RBDS and other SCA signals. Dividend boosts main channel modulation and reduces multipath distortion.  
Contact: Danielle Cline, Mktg.  
2101 Superior Ave.  
Cleveland, OH 44114  
216-241-3343

**Dalet Digital Media Systems** 5007-9  
Intro: Traffic scheduling software under Windows: ISDN application for transferring audio files and logs to distant sites; advanced satellite automation.  
Also: On-air navigator module for live assist and music automation; multi-track editor.

**Dan Dugan Sound Design** 13619  
On Display: The Model D automatic mixing controller, the live mixing assistant.

**Datacount Inc.** 5419-20  
Intro: Revision 7 of the DARTS traffic and billing system, which maximizes the benefits of computers with faster CPUs and

expanded file sizes. New traffic features include multistation combined traffic, customized history reporting, data export to spreadsheet programs. DARTS 7 also interfaces with automation systems to download logs for automatic reconciliation and with Novell and Lantastic LANs.  
Contact: Debbie Hamby  
P.O. Box 3078  
Opelika, AL 36801-3078  
205-749-5641

**Datatek Corp.** 13824  
Intro: The D-2800 Routing Switcher System for analog audio, digital audio, analog video, digital video, time code and data routing.  
Also: The D-25000 series of 20-by-10 and 20-by-20 routing switchers for analog and digital audio and video, as well as analog and digital audio distribution amplifiers. A/D and D/A converter modules.

**Dataworld** 20814  
Intro: Detailed ethnic and demographic reporting in tabular and graphical (map) formats. A large on-line database provides instant access to information and Internet communications capabilities are available too. New ethnic/demographic shading overlays for any base map are also available.  
Also: Allocation map books, coverage analysis, terrain digitizing, AM, FM, TV, LPTV and wireless cable databases, interference studies and directories—all with 24-hour remote access.  
Contact: John Neff and Bob Richards.

Sales  
4827 Rugby Ave., Ste. 200  
Bethesda, MD 20814  
800-368-5754 or 301-652-8822

**DB Elettronica** 4201  
**Telecomunicazioni SpA**  
Intro: 300 W FM transmitter with built-in digital stereo coder. Digital stereo coder for FM stations. 300/600/1000 W FM MOS-FET amplifiers. TD116 and RD116 digital encoder and decoder for aural STL.  
Also: 2500/5000/10000 W FM tube-powered amplifiers with high-efficiency HMV cavity, solid-state modular FM amplifiers, FM exciters and transmitters, analog STL transmitters and receivers, antennas and accessories.  
Contact: Luciano Ditadi  
Via Lisbona, 38  
Padova 35127  
Italy  
39-49-8700588

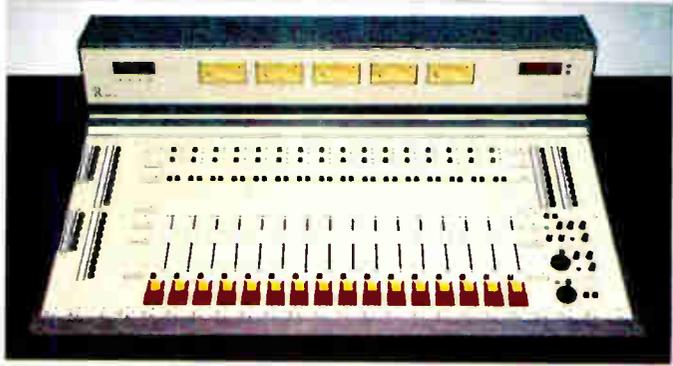
**Delta Electronics Inc.** 4125  
On Display: R.E. Ammeters, operating impedance bridges, receiver/generator, AM stereo exciter and monitor, coaxial transfer switches, antenna monitor, spatter monitor, noise generator and high-power pulse reflectometer.

**Denon Electronics** 4004-5  
Intro: The DN80R portable MiniDisc (MD) recorder, which includes features found in better DAT and reel-to-reel portables, but with the advantages of MD.  
Also: The DN790R professional tape recorder with Dolby S Noise Reduction, the DN740R professional double cassette deck, the DN1400F 200-CD jukebox with two transports, CDR63 and CDR74 ultra-high-quality recordable CD blanks and a free upgrade for DN990R and DN980F MD cart machines.  
Contact: Mike Stelts, Prod. Mgr.  
222 New Rd.  
Parsippany, NJ 07054  
201-575-7810

**Developing Technologies** 12802/2203  
Intro: The dB Technologies model AD122 stereophonic A/D converter and model 3000 digital optimizer. Sanken CSS-5 shotgun stereo mic.  
Also: Sanken COS-11 omni-directional miniature electret lavaliere mic. Brainstorm SR-15+ time code distributor.

**DG Systems** 1809-10  
On Display: DG Systems provides multimedia transaction networking services to the broadcast advertising industry, including accurate and timely digital delivery of CD-quality audio commercials and associated traffic instructions from advertising agencies and production studios to radio stations.

ONCE YOU'VE  
SET THE STANDARD,  
THERE'S ONLY  
ONE THING TO DO



RAISE IT.

RENAISSANCE

Ward-Beck Renaissance Series consoles once again set the standard for today's desktop radio environment. • They offer easy integration with automation systems; modular units to make expansion and service easier; 4 trico send outlets; 8 to 24 input channels; live, live assist and walk-away operating modes, and more. • Once you've seen the quality of Ward-Beck, you'll understand why Renaissance is the first choice of discerning radio engineers the world over. • Call toll-free 1-800-771-2556 or write, Ward-Beck Systems Ltd., 841 Progress Avenue, Scarborough, Ontario, Canada, M1B12X4, in Toronto call (416) 438-6550 or fax us at (416) 438-3865.

WARD — BECK SYSTEMS LTD.

Give it a look and a listen at NAB '95, Las Vegas  
April 10-13, Booth 15704, Hall S-3.

Circle (13) On Reader Service Card

# 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.

## Composite Audio DA and Switcher!



The CDS-200 Composite DA/Switcher

### APPLICATIONS

- Switching Between Composite STL's
- Main/Alternate Processing Switching
- Feed Two Transmitters and an ROBS Encoder
- Feed one SCA Generator to Two Transmitters
- Distribute Composite with the Ease of Audio

### FEATURES

- 2 Input Switcher
- 3 Isolated Outputs
- Individual Level Control for Each Output
- Front Panel and Remote Control with Full Status
- Power Fail Memory with Bypass Mode
- Inputs Selectable for Balanced or Unbalanced Operation
- Front Panel Test Jack

**bdi** Broadcast Devices, Inc.  
5 Crestview Avenue  
Peekskill, NY 10566

Tel: (914) 737-5032 Fax: (914) 736-6916

READER SERVICE NO. 23



## THE CELLULAR DIFFERENCE

- Easy to Use
- Reliable
- Cost Efficient
- Portable
- Flexible



Technology & convenience combine to bring you on-the-spot remote broadcast capabilities with excellent sound quality. Cellular transceiver, frequency extender, and mixer all in one! Powered by Ni-cad rechargeable batteries or AC power supply — utilizes cellular technology or land lines.

For more information call

**1-800-852-1333**

READER SERVICE NO. 92



## TELESCOPING MAST

- for fast and easy deployment of lightweight antennas
- Manually deployed with quick lock release collars in one minute or less
- 25' extended height / 6' retracted
- 20 lb. top load capacity
- Rigid azimuth locking
- Over 50 mph wind speed capacity
- Free standing
- Universal vehicle mounting stand included
- Portable - 20 lb.
- High strength anodized aluminum construction
- Ideal for lightweight antennas



**WILL BURT**  
P.O. Box 900  
Orrville, Ohio 44667-0900  
Phone 216 682-7015

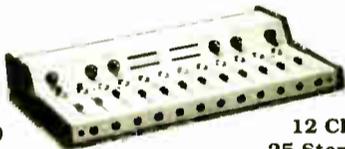
READER SERVICE NO. 17

## EVEN THE BEST CAN BE MADE BETTER

Introducing the new

## MINI-MIX 12A

THE COMPACT MIXER WITH A COMPACT PRICE FROM THE QUALITY LEADER



\$3499 **12 Channels**  
**25 Stereo Inputs**

Service & Affordable Quality for Over 23 Years

**AUTOGRAM CORPORATION**

1500 Capital Avenue (214) 424-8585  
Plano Texas 75074-8118 1-800-327-6901  
FAX (214) 423-6334

READER SERVICE NO. 133

## VACUUM CAPACITORS



Broadcast Capacitors for transmitters, couplers and phasers

- Variable or Fixed Capacitance
- Capacitance Ranges from 3 pF to 6600 pF
- Peak Test Voltages from 3 kV to 100 kV
- Current Ratings to 1000 Amperes
- Custom Designs Available on Request

**COMET NORTH AMERICA, INC.**

11 BELDEN AVE. • NORWALK • CT • 06850  
203-852-1231 • FAX: 203-838-3827

READER SERVICE NO. 201

A Broadcast Industry

# BEST BUY

Mono Play Stereo Play  
**\$1050 \$1150**

F.O.B. Factory  
Reliable/Rugged/Professional Design



DL Series

**AUDI-CORD CORPORATION**

1845 West Hovey Avenue  
Normal, Illinois 61761 USA  
Phone 309-452-9461  
Fax 309-452-0893

Available Through Your Regular Distributor

SEE US AT NAB BOOTH #3615

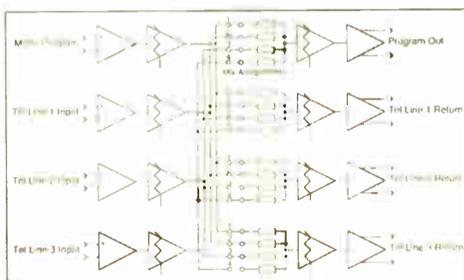
READER SERVICE NO. 5

## Mix-Minus with Ease



SEE US AT NAB BOOTH# 10052

The IFA-10 4x4 mixer is the perfect device for creating any simple mix-minus. Use it as a mono input to your console or down stream and get a mix-minus for three telco lines, or use it down stream from a stereo console and conference two lines. Need more lines? Combine two or more units. At \$300, power supply included, it's priced right. Now you can get that talkshow on the air without having to buy a high priced, fancy-dancy console. Call Rory Rall today for details.



**Benchmark**  
...the measure of excellence!

**BENCHMARK MEDIA SYSTEMS, INC.**  
Phone 800-262-4675, FAX 315-437-8119

READER SERVICE NO. 20

# Exhibitor Directory

The 1995 Exhibitor Directory is a listing of information provided by exhibitors who responded to an RW NAB questionnaire. Past and potential NAB exhibitors were asked about new and established products scheduled to be shown at NAB this year. Questionnaires returned by the deadline are included here. N/A for booth number means a booth assignment had not yet been made.

**3ED Systems** 2116  
Intro: Instant replay hard disk audio player; OnScreen/II PC computer software program in windows that provides visual information about DigiCart's drives, directories and cuts; PC Hot-Key: PC software for DigiCart/II; Series 2500 DigiCart/II's with standard digital I/O in AES/EBU, AES/IEBU, AES/SMPTE & IEC 958 Type II format, as well as conventional analog I/O.  
Also: DigiCart/II digital audio hard disk recorder; Am16/B audio crosspoint switcher.  
Contact: Doug Leighton, Mktg. Dir.  
5321 Sterling Center Dr.  
Westlake Village, CA 91361  
818-391-0360

**Accu-Weather Inc.** 19205  
Intro: Forecast with ISDN technology, Switched 56 digital transmission, and Comex. Forecast includes local weather forecasts, on-air presentations by broadcast meteorologists.

**Acoustical Solutions Inc.** 13419  
Intro: AlphaSorb acoustical wall panels and hanging baffles - high performance sound absorbers.  
Also: Alpha Wedge, Alpha Pyramid and Sorex acoustical foams, ceiling tiles, Soundtex fabric wall covering, Audiosal sound barrier and barrier/absorber combination blankets, Alpha Enviro wall panels, Alphalex ceiling banners.  
Contact: Michael Binns, Pres.  
2723 Enterprise Pkwy., Ste. 101  
Framond, VA 23294  
804-346-8350

**Adient Communications Ltd.** 19377  
Intro: NewSwift digital Ku-band motor satellite uplink; NewSwift C-SNG manual flyaway satellite uplink system; G-Band digital motor flyaway system.  
Also: Up converters, Up/down converters, down converters; modulators; modems; VSAT/DAMA systems; Comms packages; test and monitoring systems.  
Contact: Steve McGuinness, Dir.  
Preston Hill House, Nashleigh Hill  
Chesham, Bucks  
HP 53HE U.K.  
44-3-1494-77400

**A.E.Q. SA** 5307  
Intro: ACD-30001 audio codec (Switched 56 and ISDN compatible); ISO/MPEG Layer II and 6.722 modes; MUSICAM audio editor/module for MAR system application (up to 8 tracks).  
Also: RE-02 portable mixer with telephone line extender; BC-1000 mixing console; BC-2000 mixing console; AM 03 audio monitor; MP-10 portable mixer; MAR system hard disk application for broadcast automation; TH-02EX digital hybrid with telephone line extender; Systel 3000 multiconference system.  
Contact: Gerardo Vargas, Dir.  
2241 South 48th St., Ste. H  
Tempe, AZ 85282-1008  
602-431-0334

**AEV INC** 2716

**The Aircraft Production Music Libraries** 19203-4  
Intro: Jazzvertising jazz-based CDs featuring co-pilot split tracks for assembly.  
Also: 34+ CDs featuring Speed Search; American Music Series - historical period music; Rock Sweepers - guitar riffs and effects for radio and TV; ADS Up: music for commercials over 500 CVB on 2 CDs

**AICAI Digital** 5021  
Intro: DR8 hard disk recorder.  
Also: DR4 hard disk recorder; DD1500 digital audio workstation; S-800/3000/S3200/CD3000 digital samplers.  
Contact: James Martin, Mktg. Mgr.  
1116 E. Lancaster  
Ft. Worth, TX 76102  
817-336-5114

**AKG** 2910  
Intro: C680 BL microphone; WM5900 wireless system; C577 on-air talent miniature lavalier microphone and D230 dynamic omnidirectional reporter lavalier microphone

**Alesis** 18372  
Intro: Matica 500 & 900 audio amplifiers with wide bandwidth and dual channel power for production monitoring applications; Monitor Two studio reference monitors; 10" 3-way utilizes SuperPort venting technology; Q2 Dual Channel Octal Processing master effects with digital input/output enables eight audio affects run simultaneously by using digital patch bay visible on display.  
Also: ADAT 8-track modular digital multitrack audio recorder; A1-2 multipurpose audio/video interface chase synchronizer; A1-1 AES/EBU, SPDIF digital interface with sample rate converter; Monitor One near field studio reference monitor.  
Contact: D. Oren,  
Mgr. Prof. & Brdcst. Sales  
3630 Holdrege Ave.  
Los Angeles, CA 90016  
213-558-4530

**Altron Research Inc.** 15800  
Intro: Model 3500 Digital Calorimetry for air-cooled dummy loads.  
Also: Model 67150, A-150 MW air-cooled dummy load.  
Contact: Doug Starkey, Mktg. Dir.  
P.O. Box 249  
Fellville, AR 72687  
501-449-4093

**Amco Engineering Co.** 12510  
Intro: Line of enclosures for monitoring applications. Line features 3 base units - vertical, sloped front and low silhouette. Also: Enclosures for elec-

tronic/electrical packaging, in single or multibay configurations. Variety of heights, widths, and depths.

**AMS Neve** N/A  
On Display: Capricorn digital mixing console, 55 Series broadcast console, Logic 3 digital console, as well as other established products.

**Andrew Corp.** 19914  
Intro: Vertically polarized shadowmaster antenna; new 6-foot grid antennas for STL; 3 1/8-inch HRLine rigid line; EIA flange connectors from 2 1/4-inch through 5-inch; new wide-band connectors for EQ20 elliptical waveguides; top-mount ALP antennas; digital ValuLink; 4.5 meter dual-reflector Earth Station antenna; MT 050 low-volume automatic membrane dehydrator; MRS 052 slim line manual regenerative dehydrator.  
Contact: Bobbi Rick, Exhibit Mgr.  
10500 W. 153rd St.  
Orland Park, IL 60462  
708-349-3300

**Anton Bauer Inc.** 11210  
Intro: Digital Trimpac battery with 2.75#/1.25kg design provides more energy than two equipment slide-in type batteries; Lifesaver dual charger provides field charge capability; Lifesaver Q2 charger for travel or back-up applications; Ultralight satellite light fixture includes Ultralight 2, mated to a gold mount bracket.

**Aphex** 2125  
Intro: Tubessence Model 107, a dual-channel thermionic microphone preamp. Models 320A and 323A enhanced "A" Series Compellers. Dominator, a multiband peak limiter, Model 722.  
Also: Aircham FM audio processing equipment. Four-channel Logic-assisted Gate, Model 105. Model 106 Easyrider, a four-channel compressor. Expander Gate Model 622. Aural exciter Model 250 and Model 104 Aural Exciter Type C2 with Big Bottom. Audio processing rack Model 900. 8000 Modular Audio Distribution System.  
Contact: Brad Lunde,  
Dir. of Sales & Mktg.  
11068 Randall St.  
Sun Valley, CA 91352  
818-767-2929

**Apogee Electronics** N/A  
Intro: AD-1000 digital conversion system; Master tools UV22 encoding software for Digidesign; Master Dat with "type-3" designs

**Arrakis Systems, Inc.** 4725  
Intro: Gemini live radio, triple play and record digital workstations, control surfaces and mixing consoles; Disc & AVCR satellite store & forward receivers and network origination systems.  
Also: 1200 series consoles: compact; 5 & 10 channel consoles with P&G faders, cue, talkback, mix minus; 12,000 & 22,000 consoles; modular console in 8, 18, & 28 input mainframes with 8-bit control bus for air.  
Contact: Jon Young, V.P. Sales  
2619 Midpoint Dr.  
Fort Collins, CO 80525  
303-224-2248

**Asaca/Shibasaku Corp. of America** 17406  
Intro: CM147/207 14" (700 lines) and 20" (900 lines) HR multistandard color monitors with digital control; series of mid-range multistandard color monitors. ACL-400 40 cartridge tape library w/ digital betacam. Betacam SP D3, MIT or S-VHS; VH03AZ VTR dropout counter.  
Also: Line of audio and video test, monitoring and systems products including audio and video signal analyzers, audio and video routing switchers; auto setup, high resolution and digitally-controlled monitors; display assessment systems, closed-captioning equipment decoders; digital audio generators, distribution amplifiers, dropout counters, encoders, envelope delay measuring sets, erasable, rewritable magneto-optical disk audio files; video disk recorders; still stores; mass storage systems. GCR and HDTV equipment; signal, sync and sweep generators, tape cleaners, evaluators and rewinders; video cart systems, and video noise meters

**Associated Press** N/A  
On Display: AP All News Radio, an all-news radio network delivering turnkey news and information programming, live, 24 hours a day. AP NewsDesk, a news management software. NewsDesk captures, sorts and edits wire copy, computes script read time and creates custom categories. Also features a pronunciation guide, a calendar and an atlas.  
Contact: Matt Hoff, Radio Sales Mgr. East  
Steve Crowley, Radio Sales Mgr. West  
1825 K St. NW, Ste. 710  
Washington, D.C. 20006-1253  
202-628-6400

**ATCI** 13643  
Intro: Inclined orbit satellite tracking systems; Vanguard instruments portable spectrum analyzer, satellite receiver and monitor; PROPLITE voice and data digital electronics

**ATI-Audio Technologies Inc.** 16602, 16702  
Intro: DA412XLR and DA206XLR quad and dual 1 x 3 audio DA with XLR-type input and output connectors.  
Also: Vanguard series consoles, NanoAmp small mixers and headphone amp, MicroAmp series microphone, line, phono, monitor and distribution amplifiers, System 10000 distribution line and microphone modules, Studio Metering System 5.  
Contacts: Ed Mullin or Sam Wenzel  
328 W. Maple Ave.  
Horsham, PA 19044  
215-443-0330

**Audi-Cord Corp.** 4416  
On Display: NAB cartridge machines.  
Contact: Andrew Rector

1845 W. Hovey Ave.  
Normal, IL 61761  
309-452-9461

**Audio Accessories Inc.** 13642, 13742  
Intro: Project Patch, a reconfigurable interface system that allows fast, easy studio wiring through preterminated patch bays and cables.  
Also: Audio jack panels and jacks, prewired audio patch panels, patch cords and patch cord holders, Polysand, video panels, RS-422 patching, Edac connectors and accessories, and nickel-plated patch cords.

**Audio Precision** 4113  
Intro: System Two, a comprehensive digital and analog domain test instrument including a complete measurement of AES/EBU interface parameters, plus analog and digital performance levels to support measurement of 20-bit converters. APWIN, a Windows-based software for System One and System Two.  
Also: System One testing system and Portable Plus One, a portable test set.  
Contact: Thomas E. Mintner,  
Dir. of Sales & Mktg., USA

5465 SW Western Ave., Ste. J  
Beaverton, OR 97005  
503-627-0832

**Audio Processing Technology** 4007-9  
Intro: MCE800/MCD800. The MCE800 encoder operates in conjunction with the MCD800 decoder to permit distribution of up to eight channels of high-quality audio over a digital network. DRT128, a compact, portable unit designed to deliver high-quality audio in outside broadcast and limited bandwidth applications.  
Also: DSM100, a digital audio transceiver that allows CD-quality stereo audio to be carried over ISDN or similar low-capacity digital telephone circuits. Pro-Link ISDN Manager, combining an ISDN T.A. with a six-channel IMUX ACE100 series of PC and Mac digital audio expansion cards together with the X-console, a digital audio editing software, will be demonstrated.  
Contact: John Knapton, Sales Mgr.  
Edgewater Water Road  
Belfast BT3 5JQ  
Northern Ireland, U.K.  
44-1232-371110

# Rumor: "Harris Allied is in the Radio Hall."

1995 NAB, Las Vegas, April 10 - 13



**Audioarts Engineering** 2211  
Intro: R-60 on-air audio console features six-source line selector, module extenders, gold contact switches, Penny & Gies faders, Sifam meters, 16-bit digital audio performance and Simple Phone module.  
Also: MR-40 multitrack audio production console, with four mono mic/line input modules and eight stereo line modules.  
Contact: Rick Strage, Prod. Mgr.  
7305 Performance Dr.  
Syracuse, NY 13212  
315-452-5000

**Audio-Technica U.S. Inc.** 11206  
Intro: AT-MX341a SmartMiser automatic telephone mixer with digital switching. ATH-M40 and ATH-D40 precision studio phones. ATM75 head-worn cardioid condenser microphone for hands-free studio performance. AT815b and AT835b cardioid shotgun microphones that operate on battery or phantom power.  
Also: AT4050/CM5, a multipattern, large diaphragm capacitor microphone for studio applications.

**Audio Labs** 1603  
On Display: VoxPro on-air digital audio editor designed to replace reel-to-reel machines in control newsrooms.  
Contact: Charlie Brown, CEO/Pres.  
190 Queen Anne Ave. N  
Seattle, WA 98109  
206-285-1735

**Audiopak** 4219  
P.O. Box 3100  
Winchester, VA 22604  
703-667-8125

**Auditronics Inc.** 2721  
Intro: 2500 Series audio console system for radio on air and production with music or talk formats. Features program, audition, and 2 mix-minus buses; 3 frame sizes available.  
Also: AirMaster 90 series desktop audio console system; 210 series - drop-in audio console system with 12, 18 and 24 input mainframes; 801/851 series - on-air and production audio console system; 1900 Mix-Minus system, modular rack-mounted mix-minus/IB audio system.  
Contact: Robert C. Greenwald, III  
Sales Eng.  
3750 Old Getwell Rd.  
Memphis, TN 38118  
901-362-1350

**Autogram Corp.** 4719-21  
Intro: CYA-3.  
Also: A number of consoles, including the RTV-20, the Pacemaker 1032, the AC-8, the Mini Mix 8A and the Mini Mix 12A. Autoclock, which measures time and temperature. Autocount, a countup clock.  
Contact: Ernest T. Ankele, Jr.  
1500 Capital Ave.  
Plano, TX 75074  
214-424-8585

**Avcom of Virginia Inc.** 11502  
Intro: PSA-37D with new features: 4-digit LCD frequency read out; Horiz. positions the display on screen; Selectable 12 or 18 VDC LNA/BDC power for feedline powering of system components; Bat Mon displays the voltage of internal battery pack on the LCD.  
Also: Portable spectrum analyzers; satellite receivers; microwave accessories.  
Contact: Charlie Odum, Int'l Sales  
500 Southlake Blvd.  
Richmond, VA 23236  
804-794-2500

**A-Ware Software Inc.** 2210  
On Display: MusicMaster, a flexible music scheduling and inventory system. Features an advanced scheduling algorithm that improves average turnover control; interfaces with nearly every automation and traffic system available. Includes foreign language and special government reporting modules for many countries. Paperless in-studio module also available.  
Contact: Scott Wirt, V.P.  
22600 Arcadian Ave.  
Waukesha, WI 53186  
414-521-2890

**Belar Electronics Laboratory Inc.** 3119  
Intro: FMSA-1 FM digital stereo analyzer, the digital stereo companion to the Wizard. RBDS-1, an RBDS monitor.  
Also: Complete line of FM, AM and TV modulation monitors, modulation analyzers and frequency monitors, including the Wizard for FM, the Wizard for AM and the FMM-2/FMS-2 FM test set.  
Contact: David C. Hirsch, Mktg. Dir.  
119 Lancaster Ave.  
P.O. Box 76  
Devon, PA 19333  
610-687-5550

**Belden Wire and Cable** N/A  
Intro: Plenum RGB cables in 3, 4, and 5 coaxial cable versions; High flex RG-59/U and RG-11/U triaxial camera cables in several jacket colors.  
Also: Serial digital video coaxes: AES/EBU digital audio cables, mic and musical instrument cables; line level audio cables, precision video coax, triax cables, camera cables; fiber optics 50 ohm transmission cables and power cords.

**Benchmark Media Systems Inc.** 10052  
Intro: Audioworld interface, combining a two-way recorder interface with switch selectable operation as a line amplifier or mono mix amplifier; the Junior Audio Director Plus, a stereo mode controller with four switch selectable inputs per channel; DA-102DM, a two-channel audio distribution amplifier featuring two sets of front-panel 13-segment LEDs for monitoring left and right channels simultaneously.  
Also: The System 1000 uses 14 different cards and four power supplies, along with numerous controllers and accessories; the

Microframe series, a 1 RU modular frame housing 16 amplifiers and two power supplies; line of mode controllers, mic amplifiers, meter systems and interface amplifiers.  
Contact: R. Rory Pail, Sales Mgr.  
5925 Court Street Rd.  
Syracuse, NY 13206-1707  
315-437-6300

**Bext Inc.** 3815  
Intro: Solid state SF Series MOSFET amplifiers, with up to 5000 W FM.  
Also: 27 models of FM amplifiers in 30 configurations, from 100 to 30 kW; STL systems, from 1.5 to 15 W; exciters from 1 W to 150 W; UHF or VHF solid state or tube amplifiers from 2 W to 40 kW.  
Contact: Dennis Pieri, G.M.  
1045 Tenth Ave.  
San Diego, CA 92101  
619-239-8462

**beyerdynamic** 11214  
Intro: EQ Magix from SPL, a high-quality microphone pre-amp designed for live or studio use. Features variable gain, 48 V phantom power use, phase reverse, a defeatable insert point and a 30 dB pad for line use. DT 200 series headphones and headsets, available in on-air or monitor versions, with a choice of dynamic or condenser elements.

**Bradley Broadcast Sales** 1903  
Intro: Tascam's DA-P1 portable pro DAT machine with XLR. Telos One-x-Six telephone talk system. Panaschemo wood equipment racks and studio furniture. Innovative Quality Software SAW computer-based audio editing software. Gentner TS-612 telephone talk system. Yamaha ProMis 01 digital audio mixer. 360 Systems Instant Replay morning show sampler.  
Also: Telos Zephyr digital audio codec. Telos telephone hybrids. Middle Atlantic Rack products.

**Broadcast Electronics Inc.** 3625  
Intro: FM-5C 5 kW solid state FM transmitter. FM-250C 250 W solid state transmitter. AM-500 500 W solid state AM transmitter.  
Also: AudioVAULT, a digital audio storage system. CORE digital automation system. Air Trak 90 console. Mix Trak 100 console. Operating studio. Disc Trak digital cart machine. Dura Trak 90A cart machine. FM-30B 30 kW FM transmitter. AM-5 5 kW solid state AM transmitter.  
Contact: Dave Newton, Mktg.  
4100 N. 24th St.  
Quincy, IL 62301  
217-224-9600

**Broadcasters General Store** 3007  
Intro: DNF Industries ST-2005/SM slow motion VTR controller. SW 1x8 RS-422 switcher.  
Also: SAW digital editing software by Innovative Quality Software. RFC-1/B dial-up remote controller by Sine Systems, as well as the company's Thermal Sentry transmitter temperature monitor. American Recorder Technologies cleaning products for recording equipment.

**Broadcast Programming** 3625  
Intro: Music-on-HardDrive, complete music libraries on computer hard drive. Digitalease, an affordable, complete digital equipment and radio programming package.  
Also: Full line of digital radio programming formats, including new '90s alternative (Radio X) and '70s greatest hits (Heart of the Seventies). Weekly Chartbreakers hit CDs. Playlist Plus scheduler. The Localizer. Recurrent CDs. BP Consulting Group. NAB-only special on music libraries.  
Contact: Keith Chambers, Mktg. Mgr.  
2211 Fifth Ave.  
Seattle, WA 98121  
206-728-2741

**Broadcast Richmond** 5625  
On Display: Solid state Nautek radio transmitters and various studio systems.

**Broadcast Supply Worldwide** 1825  
Intro: Roland DM800 digital audio workstation. 360 Systems Instant Replay.  
Also: VoxPro, DigiLink, Telos Zephyr and Mackie Consoles.  
Contact: Tim Schwiager  
7012 27th St. W  
Tacoma, WA 98466  
800-426-8434

**Burk Technology** 3702  
Intro: Audio test equipment, emergency alert equipment and automatic transmitter control equipment.  
Also: Transmitter control packages featuring the ARC-16 system for full-time or dial-up control. Walkaway packages using the ARC-16 with AutoPilot transmitter control software. LX-1 six-input stereo selector for audio switching.  
Contact: Dan Rau, Sales Mgr.  
7 Beaver Brook Rd.  
Littleton, MA 01460  
508-486-0086

**Canare Cable Inc.** 11118-22  
Intro: AES/EBU/SPDIF impedance transformers for digital equipment.  
Also: Star Quad microphone cable.

**CBSI** 2113  
On Display: Classic traffic and billing software system for duopolies, consolidated operations, and multiple and single stations; Elite system; InterAcct, an interactive accounting system; Digital Universe, an advanced generation digital audio storage and management system; CustomRemote; Custom Reports; PowerPlus; CustomNet and CustomMusic software programs.

**CCA Electronics Inc.** 4421  
Intro: FM transmitters and exciters.  
Also: FM, AM, MW and shortwave radio broadcast transmitters up to 65 kW.  
Contact: Steve McElroy/Howard M. Ginsberg, V.P. Sales  
360 Bohannon Rd., P.O. Box 426  
Fairburn, GA 30213  
404-964-3530

Central Tower Inc. N/A

**Circuit Research Labs Inc. (CRL)** 2719  
Intro: DP-100 FM digital processor, based on a 32-bit floating point DSP processor. Includes a true digital stereo multiplex generator, AGC five-band compressor and four-band limiter. SC-100 RDS/RBDS and SCA generator, featuring complete front panel ASCII keyboard and easy-to-use menu system.  
Also: DAA-50, which decodes AES/EBU, IEC958, SPDIF and EIA/JCP-340 signals into stereo analog audio. Amigo FM and Amigo AM processors. Audio Signature digitally controlled processing system. AM-4S, featuring C-QUAM-compatible stereo limiter.  
Contact: Valerie Hummer, Mktg. Dir.  
2522 W. Geneva Dr.  
Tempe, AZ 85219  
602-438-0888

**Communications Data Services Inc.** 1811  
Intro: Additions to CDS dial-up on-line services, including LPTV interference study, AM groundwave analysis, LMA duopoly study, ZIP codes for contours and mapping services.  
Contact: Mark Holland, G.M.  
6105 Arlington Blvd.  
Falls Church, VA 22044  
703-534-0034

**Computer Concepts Corp.** 2503  
Intro: Digital audio products including newsroom editing, multi-track production, live assist control and Cartrack cart selection system.  
Also: Digital Commercial System (DCS) audio storage system.  
Contact: Kevin Alcock  
8375 Melrose Dr.  
Lenexa, KS 66214  
913-541-0900

**Comrex Corp.** 12105  
Intro: DX200 MusicLine, an ISO/MPEG Layer II codec for full bandwidth stereo on ISDN and Switched 56 lines. Upgraded G.722 DXR.1 and DXP.1 digital audio codecs capable of bidirectional 15 kHz mono on an ISDN line.  
Also: Frequency extenders for high-quality audio feeds (up to 8 kHz) on standard analog phone lines. Telephone couplers, wireless cue systems for ENG and SNG, and special-purpose remote audio consoles.  
Contact: Lynn Distler, V.P. Mktg.  
65 Nonsat Path  
Acton, MA 01720  
508-263-1800

**FACT:**  
*"Harris Allied is in Both Halls."*  
**TV Hall #16001**  
**Radio Hall #3615**  
1995 NAB, Las Vegas, April 10 - 13

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CDQPrima Model 120 shown

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way to astounding 384 kbps audio quality.

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Crystal Clear Digital Audio

670 North Beers Street, Building 4, Holmdel, New Jersey 07733 USA Phone: (908)739-5600 Fax: (908)739-1818

# MARKETPLACE

Recently Introduced Products for the Radio Broadcast Professional

► continued from page 20

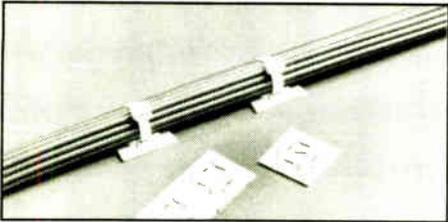
## Products for the Small Broadcaster

RF Consulting offers a line of products aimed at the small broadcaster. The TX20FM FM stereo transmitter kit is a crystal-controlled, phased-locked kit with an output power adjustable to 200 MW (88-108 MHz).

The company also offers FM broadcast antennas, such as the 6 dB gain Yagi-style FM broadcast antenna and a one-quarter wave vertical FM broadcast antenna. Both antennas work well in low-power applications and as emergency back-up. All the company's antennas can handle a minimum of 200 W input power.

Other equipment available from RF Consulting includes coax, low-cost studio systems, audio consoles and RF connectors.

For information, contact the company in Oregon at 503-740-8132.



## Cable Tie Mounts

Panduit Corp. offers a series of improved adhesive-backed cable tie mounts designed for use with miniature, intermediate or standard cross-section cable ties. These mounts feature two-up construction to speed liner removal and simplify installation. A mounting hole in the center of the mount permits fastening with a screw for applications requiring more strength than the adhesive provides.

The mounts are available in white, gray, beige or black nylon and offer increased flammability protection. The rubber-based adhesive tape can be used on powder-coated surfaces.

For information, contact the company in Illinois at 708-990-0220; fax: 708-990-2556.



## Radio Modem

Monior Electronics Corp. offers a low-cost radio-modem for supervisory control and data acquisition applications (SCADA). The radio-modems contain a UHF radio transceiver, which transfers data at 4800 baud. A sensitive receiver, powerful transmitter and transparent protocol support line-of-sight distances up to several miles. Greater distances are possible with optional gain/directional antennas.

Each radio has an RS-232 communica-

tions port that can be configured for any terminal. Input and output data rates can be up to 19,200 baud. Additional internal signal processing converts incoming ASCII characters to synchronous radio data. The synchronous data at the receiving end is processed to deliver original ASCII data.

For information, contact the company in Florida at 305-979-1907; fax: 305-979-2611.

## MPEG-2 Compliant Encoder/Decoder

MUSICORE v.1.1 from Philips Semiconductors is an MPEG-2 compliant audio encoder and decoder. This single DSP implementation enables hardware manufacturers to implement real-time digital compression/decompression of audio to make their own MPEG-2 audio products and applications, using MPEG-2 sub-sample rates.

Applications of this chip set include CD-quality digital audio distribution, broadcast via satellite, cables, terrestrial or ISDN; multimedia applications of high-quality digital audio; and audio storage.

MUSICORE v.1.1 offers MPEG-2 low sample rates of 16, 22.05 and 24 kHz, at lower bit rates of 8, 16 and 24 kbps. It also supports all audio modes (joint stereo, stereo, single-channel and dual-channel) and all bit rates and sample frequencies of ISO/MPEG-1 Layers I and II.

For information, contact the company in California at 800-447-1500, ext. 3021.

## Ergonomic Crimp Tool

Clark Wire & Cable offers an ergonomic crimp tool that can be custom-fitted with a wide range of interchangeable die sets.

This crimp tool features a patented, ergonomically correct handle for maximum comfort and ease of use. It requires 40 to 50 percent less force to operate than comparable crimp tools.

This product offers high mechanical gain and is fully ratcheted with a safety release. It features a 50,000 cycle life span and is backed by a one-year unconditional guarantee.

Clark also offers a wide range of interchangeable ErgoCrimp die sets for use with this tool.

For information, contact the company in Illinois at 708-272-9889; fax: 708-272-9564.



## Meter Bridge Option

Studiomaster offers the P7-MB meter bridge option for its P7 eight-bus mixing console (pictured). The P7-MB is available in 16-, 24-, 32- and 40-channel versions. It comes standard with its own pro-

prietary power supply, eliminating any possibility of "loading down" the main console and power supply, regardless of the input configuration.

For information, contact the company in California at 714-524-2227; fax: 714-524-5096.

## Rack Tuner

The Sabine RT-1601 rack tuner fits into a single rack space or sits on top of an amp. It features an easy-to-read LED display, a mute function for silent tuning, and dual inputs and outputs for front- or back-panel access.

The RT-1601 offers fast note sensing for hands-free tuning, accurate tuning over the full chromatic range to accommodate even the low "B" of a five-string bass, manual recalibration to any of 12 precise pitches, a tone generator for tuning by ear and a transpose function for shifting the tuning scale to match any key.

For information, contact the company in Florida at 904-371-3829; fax: 904-371-7441.



## Adjustable Carts

Adjusta Cart from Anthro Corp. is designed for use in both stand-up and sit-down applications. Like all AnthroCarts, the Adjusta is mobile, sturdy and can be accessorized with over 50 accessories.

The front surface of the Adjusta Cart can be adjusted with a squeeze of a control pad. This surface can be positioned from 7 inches above to 5.75 inches below the rear stationary surface. Once the control pad is released, the system locks firmly in place. Also, the surface can be tilted as far as 9 degrees toward the user and 15 degrees away.

Adjusta Carts have a lifetime warranty and are available in two widths, 36 inches and 48 inches.

For information, contact the company in Oregon at 503-691-2556; fax: 503-691-2409.

## Digital Audio Cables

Gotham Switzerland offers a range of multipair AES/EBU 110-ohms digital audio cables. Four different multipair types are available: GAC-4, -8, -10 and -12 (numbers indicate the number of pairs).

The basis for these cables is the GAC-

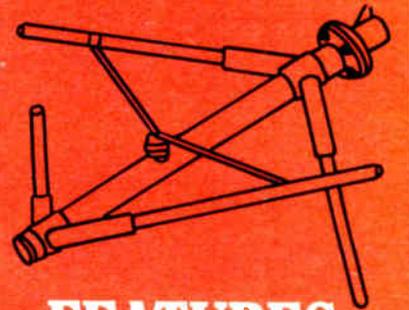
2/1 AES/EBU cable, which guarantees a constant impedance of 110 ohms over the entire run of the cable.

Gotham's double Reussen shield, featuring two opposing, spiral-wound, bare copper shields, helps the cable achieve high flexibility with tight electrical performance tolerances.

Constant impedance is achieved by means of two nonconducting strands in the core that maintain the correct geometrical position of the two conductors, even when the cable is bent or kinked.

For information, contact DGS Pro-Audio in Texas at 800-292-2834; fax: 817-473-7712.

## FM ANTENNAS



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**DGS Pro-Audio** 4605  
Intro: Four-, eight-, 10- and 12-pair digital multipair cables for digital transmission. GAC-2 low-noise cables, speaker cable, universal panel-mount XLR connectors and color-coded quarter-inch phone plugs.  
Also: Deltron XLR connectors, RCA plugs and quarter-inch phone plugs and Gotham audio cable, including unbalanced, 34 pairs and ultra-flexible, double-shielded microphone cable.

**Dic Digital** 18385  
Intro: New 8mm digital audio cassette for multitrack recording applications. Cassettes are available in 15-, 60-, 90- and 120-minute lengths.  
Also: Complete line of DAT products, Recordable CDs and magneto-optical discs, as well as 8mm videotape and Betacam SP.

**Dielectric Communications** 15720  
On Display: A complete line of VHF, FM and UHF broadcast components, including antennas, transmission line, waveguides, filters, combiners and associated RF components.

**Dolby Labs** 16567  
Intro: DP524 AC-3 decoder for decoding Dolby AC-3 digital audio coding. New features for the Dolby DSTL digital studio-transmitter link.  
Also: Dolby Fax System for linking studios worldwide via ISDN. Model 740 Spectral Processor for personalized audio processing.  
Contact: Kevin Tam, Dir. of Mkt. & Sales, 100 Potrero Ave., San Francisco, CA 94103, 415-558-0200

**Dorough Electronics** 91311  
On Display: Audio level meters featuring the Dorough trademark of peak and average for both analog and digital audio.

**Dynair Electronics Inc.** 13800  
Intro: System 2000 routing systems for digital transmission at 400 Mbps in new configuration sizes and with stereo audio. Series 36 now provides stereo audio for 36-by-36 routers.

**Dynatech NewStar Multimedia** 17124  
Intro: EditStar script-based, non-linear editor designed specifically for broadcast news automation. NewStar for Windows newsroom automation system now includes capability to run under Microsoft Windows '95 and Windows-NT operating systems.

**Econco** 4823  
On Display: High-quality rebuilt power tubes and klystrons for radio and TV transmitters.  
Contact: Debbie Baker, Sales, 1318 Commerce Ave., Woodland, CA 95776, 800-532-6626

**EEV Inc.** 17136  
On Display: Broadcast tetrodes for AM/FM transmitters.

**Electric Works Corp. Multimedia** 1808  
On Display: A new line of multimedia, audiovisual, pro audio, consumer audio and audio automation hardware and software, including multipurpose DMX-4 stereo four-channel audio switcher and I/O board for PCs, the AS-28 eight-channel stereo audio switchers, the DCE digital clip editor for apt-X audio cards, and CDI custom CD player controllers.  
Contact: Pete Charlton, Pres., Box 1-36992, Ft. Worth, TX 76136, 817-625-9761

**Electro Voice** 15717  
Intro: RE2000 studio condenser mics, which feature ultra-quiet, high-sensitivity and smooth "tube-like" sound.  
Also: RD50, RD50N/D, 635A, 635N/D, RE20, RE27, RE38, RE45, RE16, ELX1-A, S-60A and S-80A microphones.  
Contact: Peter Igel, Broadcast/Prod. Mktg. Spec., 448 Post Rd., Buchanan, MI 49107, 616-695-4750

**Elenos SRL** 1225  
Intro: SF series solid-state transmitters up to 4 kW with improved protection characteristics. ELC 60S exciter with stereo coder included.  
Also: Low-cost eight-channel MNDS TV System. Compact series of tube amplifiers. Rack series of tube amplifiers up to 30 kW.  
Contact: M. Cilloni, Mktg. Mgr., Via G. Amendola, 9 Poggio Renatico (FE), Italy, 39-532-829965

**ENCO Systems** 5619  
On Display: The DAD486x digital audio delivery system. DOS-based software coupled with industry-standard computer hardware, provides powerful digital audio recording, editing, library management, program scheduling and multiple output reproduction capabilities.  
Contact: Larry Lamoray, V.P. Sales/Mktg., 24403 Halsted Rd., Farmington Hills, MI 48335, 810-476-5711

**Energy-Onix** 4707  
Intro: Two composite frequency-agile STL systems, a 100 W exciter/transmitter with excellent specs and RPU transmitters and receivers.  
Also: The ECO series grounded-grid triode tube FM transmitters ranging from 1 to 11 kW. The MK series of FM grounded-grid triode tube transmitters from 1.5 to 50 kW. The SST series of low-power transmitters from 30 to 500 W and the legend series from 1 to 10 kW. Multiple preset dual-frequency shortwave transmitters.  
Contact: Ernie Belanger, 752 Warren St., Hudson, NY 12534, 518-828-1690

**ERI (Electronic Research Inc.)** 16604

**ESE** 13606  
Intro: ES-996 six-digit two-inch red slave clock, ES-126/ES-127 half-inch and one-inch time and date displays, ES-217/XLR 1 x 4 audio DA, ES-181 modem-based master clock/time code generator and ES-185 GPS master clock/time code generator.  
Also: Digital clocks and timers, master clock system products, audio level indicators and impedance matching interfaces, audio and video DAs and SMPTE time code generators, readers, inserters and converters.  
Contact: Brian Way, 142 Sierra St., El Segundo, CA 90245, 310-322-2136

**Euphonix** 3603  
Intro: CS2000 B broadcast system, a digitally controlled audio mixing system suitable for on-air and post production. The system includes 12 mix-minus feeds and optional multiformat mixing buses that can be configured for SurroundSound mixing.  
Also: CS2000 audio mixing system, digital controlled analog audio mixing with options available for music, TV, audio, post and film audio post markets.

**Eventide Inc.** 2707  
Intro: The DSP4000B, H3500B and H3000B + Ultra-Harmonizer brand effects processors with special broadcast/post production software and the latest additions to its full line of audio and video broadcast obscenity delays. VR and VP series digital audio loggers, with models that can record more than 500 hours on a single DAT tape, divided among up to four or 24 channels.  
Also: BD980 and BD941/BD942 obscenity delays.  
Contact: Gil Griffith, Sales Mgr., One Alsan Way, Little Ferry, NJ 07643, 201-641-1200

**E-Z UP International Inc.** 4821-2  
Intro: Eclipse and Encore model E-Z UP Instant Shelters for indoor/outdoor instant displays. Fully self-contained, these instant shelters set up without the need for ropes or poles. Also, the new E-Z UP instant monitor stand that provides quick displays for promotional material and company videos.  
Also: E-Z UP Instant Shelters to help keep cool and to grab attention on remote locations. All E-Z UP products can be silk-screened with station call letters or slogans for high visibility.

**Fiber Options Inc.** 16573  
Intro: 177B, Y/C Component Video, 315B, AES/EBU Digital Audio, 1240SB, Video and Digitally processes stereo Audio for Single-mode fiber; 1121B, Long Haul Broadcast Grade Video

**Fidelipac Corp.** 3122  
On Display: Dynamax DCR1000 Series with magneto-optical drive system, CTR 10 Series cartridge machines, related accessories and cartridges; DCR 1000 Series digital cartridge machines with magneto optical drive; MX Series Modular console; Broadcast Audio Series VI console.  
Contact: Roger Thanhauser, Pres., P.O. Box 808, Moorestown, NJ 08057, 609-235-3900

**Firstcom Music** 13623  
Intro: Musiquick Search Software, keyword search program  
Also: Sound Designer II, Sound Designer, Nashville: The Promo Library and maximum impact digital production library, Sound Ideas SFX packages

**Flash Technology Corp. of America** 1819  
Intro: Series of dual beacons for medium- and high-light intensity. Antenna lighting. ElectroFlash FTB 312 Medium Intensity Dual Beacon, ElectroFlash FTB 224 and 225 High Intensity Dual Beacons, ElectroFlash AOL 302-D Dual Antenna Obstruction Light  
Also: SMART Obstruction Lighting Hardware—System Monitoring and Reporting Telemetry, EAGLE Obstruction Lighting Software, ElectroFlash FTB 310 Medium Intensity White Beacon, ElectroFlash FTB 205 High Intensity White Beacon.

**Gentner Communications Corp.** 5621  
Intro: Updated version of ET100 portable teleconferencer; enhancements to TS612 multiline telephone talkshow telephone system.  
Also: Telephone interface; hybrids; couplers; talk show systems; teleconferencing systems; transmitter remote control; audio processing; patch panels; audio distribution amplifiers.  
Contact: Elaine Jones, 1825 Research Way, Salt Lake City, UT 84119, 801-975-7200

**Geppo International** 13251

**Gorman Redlich Mfg. Co.** 1913  
Intro: EAS Equipment  
Also: Digital antenna monitors for AM directional arrays; Model CRW NOAA weather radio; EBS encoders and decoders.  
Contact: Jim Gorman, 257 W. Union St., Athens, OH 45701, 614-593-3150

**Hafner/Rockford Corp.** 3903  
Contact: Rick Gentry, 641 S. Rockford Dr., Tempe, AZ 85281, 602-967-3565

**Halland Broadcast Services Inc.** 5625  
Intro: New update discs for adult contemporary and country music CD libraries.  
Also: "Rock 'n' Roll Graffiti" oldies CD library; "The Seventies" AC-Gold CD library; "The Eighties Plus" AC library; "Halland's Country Hits" country music CD library.  
Contact: Steve Steinberg, 1289 East Alosta Ave., Glendora, CA 91740, 818-963-6300

**Hallikainen & Friends** 4223  
On Display: Election Central software runs on networked IBM compatible computers. DRC200 transmitter control system brings hypertext to transmitter control. DRC190 transmitter control system brings basic programming to transmitter control. TVA series of monoaural rack mount audio mixers include Audio Follow Video, allowing their use on air, newsroom, dubbing stations, etc. TEL171 digital telemetry adapter updates Moseley TRC-15A remote control systems to digital metering, ITO178 interfaces the TEL 171 to IBM compatible computers.

**Harman Professional Audio Group** 2910

**Harris Allied** 16001, 3615  
Intro: Harris DX Series EPAC for high-power digital solid-state medium-wave transmitters; Audio-Metrics CD-10E, Oktava Microphones.  
Also: Harris FM and MW transmitters; Harris FM transmitters with DIGIT Digital FM exciters; MW transmission equipment; sound enhancement and recording systems; ISDN and Switched 56 equipment; Digital audio network transceiver; register Data Systems Phantom; Telephone and digital audio delivery systems.  
Contact: Martha Rapp, 3200 Wismann Ln., P.O. Box 4290, Quincy, IL 62305-4290, 217-222-8200

**Henry Engineering** 5625  
Intro: Telesort digital actuality recorder for automatic recording of news reports, weather updates and other actualities sent to broadcast stations using regular dial-up phone line.  
Also: Matchbox, USDA, Stereoswitch, Mismnus Plus and other problem-solving interface products.  
Contact: Hank Landsberg, Owner, 503 Key Vista Dr., Sierra Madre, CA 91024, 818-355-3656

**HHB Communications Ltd.** N/A  
Intro: Advanced Media Products Blank CDR discs.  
Also: PORTADAT professional portable DAT recorders and accessories; HHB BitBox CDR optimizer; Cedar audio restoration products; Coles microphones; HHB DAT tape.

**Holiday Industries Inc.** 12908  
Intro: New ankle current meter for directly measuring RF induced currents in the body in accordance with the latest revision of the ANSI RF exposure standard.  
Also: Broadband isotropic RF field strength meters for measuring potentially hazardous electric and magnetic fields in the vicinity of transmitting facilities.  
Contacts: Burton Gran, Pres. or Michael Leighton, Sales & Mktg., 14825 Martin Dr., Eden Prairie, MN 55344, 612-934-4920

**Industrial Acoustics Co.** 14039  
Intro: STC 64 Noise Lock Acoustic Door.  
Also: High-performance window and wall systems to provide ultimate noise isolation for proper broadcasting.

**Inovonics Inc.** 1625-8  
Intro: AM modulation monitor, Model 540; David-II FM stereo processor/generator, Model 716; FM Stereo generator, Model 708; RBDS encoder/decoder computer interface.  
Also: NRSC AM Audio Processor, Model 222; FM Audio Processor, Models 250, 255, 260; FM Mod-Monitor, Model 530; SENTINEL All-Mode Diagnostic Receiver, Model 550; RBDS Encoder, Model 710; RBDS Decoder, Model 510; On-Screen Audio Level Display Keyer, Model TVU.  
Contact: Jim Wood, Pres./C.E., 1305 Fair Ave., Santa Cruz, CA 95060, 408-458-0552

**International Datacasting** 4122-3  
Intro: SR121/MA MPEG PRO Digital Audio Receiver; SR251/DA DataNet Data Broadcast Receiver; Media Manager  
Also: Satellite digital audio and data broadcast products for point-to-multipoint distribution; the FlexRoute digital audio and DataNet broadcasting systems, along with corresponding network management system.  
Contact: Pierre Lemoyne, Dir. Int'l Sales, 2680 Queensview Dr., Ottawa, Ontario, Canada K2B, 613-596-4120

**International Tapetronics Corp. (ITC)** 1410  
On Display: DigiCenter 33, NEWS, CD control systems, virtual console, PD MATE; DPR-612; audio routing switcher; expanded networking management; multitasking operations in workstations; Multi Volume HDD Backup; new recording templates; Expanded Integrated Mixer Operations; Increased Operator Interfaces: Enhanced Traffic and Music Interfaces; Virtual Scheduler.  
Contact: Charlie Bates, Sales & Mktg. Dir., 2425 S. Main St., Bloomington, IL 61704, 309-828-1361

**Intralex Inc.** 3904-5  
Intro: Model 4464 MPEG Audio Layer II codec for ISDN lines. Includes bi-directional stereo MPEG audio, auxiliary data chan-



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- nel, built-in bonding-compatible inverse multiplexer and built-in ISDN terminal adapter; PT-250 MPEG stereo transmitter and PR-250 MPEG stereo receiver, incorporating ISO/MPEG Audio Layer II coding algorithm, allowing transmission of 20 Hz to 20 kHz stereo audio in 64 kbps.  
 Also: STL Plus, a linear, uncompressed STL/TSL multiplexing system for T1 lines; digital multiplexers for T1, E1 and satellite applications, with plug-in modules for compressed and uncompressed audio, voice and data.  
 Contact: Christine Doyle  
 3 Lyberty Way  
 Westford, MA 01886  
 508-692-9000
- Itelco SpA** 18514  
 Intro: 1 and 5 kW FM transmitters fully solid state; 2 kW UHF TV transmitter fully solid state; TV R.O. system.
- Jampro RF Systems Inc.** 16617  
 Intro: FM switchless combiner system; JIDC and JIDF interdigital combiners and filters for low-power FM applications; frequency match tower; rigid coaxial transmission line and all related components; complete line of passive RF components.  
 Also: Penetrator series sidemount antenna; JCPD circularly polarized flat panel antenna and JAHD arrowhead dipole antenna; JBC and JBPC combinator systems.  
 Contact: Barbara Kee  
 6340 Sky Creek Dr.  
 Sacramento, CA 95828  
 916-383-1177
- JBL Professional** N/A  
 Intro: The EON 10-inch two-way powered speaker system, incorporates monolithic 60 W power amplifier for low-frequency section and monolithic 25 watt power amplifier for high-frequency driver.
- J.N.S. Electronics Inc.** 1625-8  
 Intro: DRLF 700 digital microwave terrestrial link; RFM8323 FM receiver; DFM 8252 composite sense module, Pilot, L&R.  
 Also: 8000 modular configured rack frame system, 30 modules that can be selected for monitoring, switching and control; applications studios, D-MUX 500 highly linear digital multiplexer CD quality.  
 Contact: John Stannard, V.P.  
 P.O. Box 32550  
 San Jose, CA 95152  
 408-729-3838
- Jones Satellite Networks** N/A  
 Intro: Z Spanish, a Spanish radio network that combines danceable music with the style of well-known Spanish-language talent.  
 Also: Other radio formats, including CD Country, Soft Hits, U.S. Country, FM Lite, The Team, GTO (Good Time Oldies) and Adult Choice.  
 Contact: Gene Ferry, Nat'l Affil. Sales Mgr.  
 8250 S. Akron St.  
 Englewood, CO 80112  
 800-876-3303
- Joslyn Jennings Corp.** N/A  
 On Display: Capacitor models; applications include communications, power, electronic, semi-conductor fab, dielectric heating equipment, medical MRI and heart defibrillator. Full line of relays, coaxial relays, contactors, interrupters and test equipment.  
 Contact: Dwane Gisi, Dir. of Mktg.  
 970 McLaughlin Ave.  
 San Jose, CA 95122  
 408-292-4025, ext. 358
- Kay Industries** 2507  
 On Display: Phasemaster rotary phase converter
- Kintronic Labs Inc.** 2119  
 Intro: High-power RF contractors for 0.5 to 1 MW applications.  
 Also: Directional antenna phasing system for AM; AM multiplexing system; AM dummy load series; line of RF components.
- Contact: Tom King, Pres.  
 P.O. Box 845  
 Bristol, TN 37621  
 615-878-3141
- Killer Tracks** 10455  
 Intro: TuneBuilder self-editing music software.
- Larcen-TTC** 12500  
 Intro: FMS500, 500 W solid state FM transmitter.
- LDL Communications** 15855  
 On Display: Larcen's complete line of FM transmitters, ranging from 30 W to 25 kW. Six models of power levels up to 8 kW are solid state.
- Lectrosonics Inc.** 11232  
 Intro: All-new UDR200 synthesized UHF receiver with helical resonator front end design. UMC190 and UMC195 antenna multicouplers for compact UHF receivers. A-GPU UHF ground plane antenna and A-Y3U UHF Yagi antennas.
- Leitch Inc.** 15748  
 Intro: 32 x 16 audio router; 32 x 32 audio router; audio DA with programmable sub module.
- Logitek** 2725  
 Intro: Ultra-VU high-resolution audio meter. Mini Rate Gate low-cost digital audio sample rate converter.  
 Also: Bright-VU low-cost LED bargraph audio meters. TR2 12-channel rackmount console. Pre-10 low-cost 10 x 2 routing switcher.  
 Contact: Tag Borland, Pres.  
 3320 Bering Dr.  
 Houston, TX 77057  
 713-782-4592
- Loral Microwave-Narda** 5425  
 Intro: Model 8718 survey meter using electromagnetic radiation measurement. Hand-held meter that displays field readings in any units as direct readings against standards. Features single-touch automatic zeroing.  
 Also: Model 8520 broadcaster compliance meter, to comply with FCC and OSHA limits for exposure to RF radiation. Electric and magnetic are measured separately with a single probe attached to meter.  
 Contact: Robert Johnson,  
 Instrument Sales Mgr.  
 435 Moreland Rd.  
 Hauppauge, NY 11788  
 516-231-1700
- LPB Inc.** 2727  
 Intro: SALSAs digital audio systems. New feature for the SALSAs production system: CD recorder option for SALSAs production, allowing users to download backups to CD or dump all spots to their own customized CDs. FM stereo transmitter for limited area broadcast applications.  
 Also: 7000 series audio consoles in 12- and 18-channel configurations. Signature III series audio consoles. PSSA/PSRA 30, 60 and 100 W transmitters.  
 Contact: John E. Devecka, Sales Mgr.  
 28 Bacton Hill Rd.  
 Frazer, PA 19355  
 610-644-1123
- The Management** 2109-11  
 Intro: New versions of the AXS digital audio automation system, the DCM Digital Cart Machine, the DCE digital clip editor and the DLR digital longform recorder. The AXS system has new extended features for time announce, linked announcer intros, a remote access telco/RPU interface for attachment to standard audio interfaces and Powerfill, designed for real-time audio segment fill for CD and hard disk music system.  
 Contact: Pete Charlton, Pres.  
 Box 1-36457  
 Ft. Worth, TX 76136  
 817-625-9761
- Manhattan Production Music** 13633  
 Intro: Apple Trax music library, a collection of CDs that is indicative of today's hottest radio music including hip-hop, hot country and alternative rock.
- Mark IV Pro Audio Group** 15717  
 Intro: Klark Teknik DN3600, a stereo programmable graphic equalizer that is digitally controlled and has 66 memories: DN 3600 computer control for up to 66 stereo DN 3600 programmable graphic equalizers via Windows; and DN 728 RM remote control option for DN 728 digital delay allowing access to any of 64 memories via simple switch matrix.
- Marti Electronics** 4119-20  
 Intro: Frequency-agile remote pickup unit and Marti 40 W FM exciter.  
 Also: STLs, RPUs and subcarrier generators and demodulators.  
 Contact: Jim Godfrey, Dir. Sales & Mktg.  
 1501 N. Main St.  
 Cleburne, TX 76033  
 817-645-9163
- Maxell Corp. of America** 18136  
 Intro: Digital Betacam featuring higher output and lower noise, durable binder, filler dispersion, smooth base film and rigid cassette tolerances.
- Micro Communications** 19401  
 Intro: 7/8-inch EIA and 4 1/16-inch EIA coaxial transfer switches. FM all-band dipole antenna, FM interdigital bandpass filters, coax breakaway section and non-radiation studies.  
 Also: 1 5/8-inch EIA, 3 1/8-inch EIA and 6 1/8-inch coaxial transfer switches, switching combiners, multistation combiners, interference filters, hybrid combiners and directional couplers.  
 Contact: Debra Bureau  
 P.O. Box 4365  
 Manchester, NH 30108-4365  
 603-624-4351
- Micron Audio Products Ltd.** 16451  
 Intro: TX-505 wireless microphone system and Micron SDR portable diversity receivers. SQN-IIIa location stereo audio mixers.
- Microtechnology Unltd.** 412  
 P.O. Box 21061  
 Raleigh, NC 27619  
 919-870-0344
- Modulation Sciences** 11113-5  
 On Display: RDS-X data receiver, a live-working demonstration for message signs and other applications. RDS-1 RBDS generator. PRD-3000 RBDS decoder/monitor/analyser. FMMM-2 FM modulation monitor/analyser. MYB-2 StereoMaxx spatial image enlarger, CP-803 composite audio processor, DSCA-188, data subcarrier generator. SCA-186 subcarrier generator, DSCA-1, 2 data subcarrier receiver.  
 Contact: Judy Englert  
 12A World's Fair Dr.  
 Somerset, NJ 08873  
 908-302-3090
- Moseley Associates Inc.** 1419  
 Intro: Starlink 9000 all-digital, open-architecture modular system for CD-quality audio transmission, facility for remote control and stereo/SCA/RDS generation. Complete range of plug-and-play modules: ISO MPEG/ADPCM, 16-bit linear digital audio, D/I and variable rate mux, speech/fax/data card, T1/E1/ISDN/Switched 56 drivers. Intelligent remote control. Integrated network management.  
 Also: MRC 2 and MRC 1620 remote control products; PC control software for MRC 2 and MRC 1620; PCL 6000 STL (aural); DSP 6000 digital transmission equipment for STLs; PCL 6000 multichannel STL.  
 Contact: Jamal Hamdani, Pres. & CEO  
 111 Castilian Dr.  
 Santa Barbara, CA 93117-3093  
 805-968-9621
- MPR Teltech Ltd.** 4410  
 Intro: Polaris road reporter's kit featuring ISO/MPEG Layer II/G.722 code, ISDN terminal adapter; Capella card with ISO/MPEG layer II sampling rates, AES/EBU in and out, S/PDIF in and out, G.722 and sample rate converter; Lil Blue Layer II audio codec includes remote control software, G.722 flash prom updating, built-in multiplexer, J.52 and all sample rates; Audition Jr! listening test system.  
 Contact: Mary Ann Seidler  
 Obere Hauptstrasse 52  
 D-85354 Freising  
 Germany  
 49-8161-42400
- Murphy Studio Furniture** 3122  
 On Display: A full line of furniture for the broadcast studio will be found at the Fidelipac booth.  
 Contact: Dennis Murphy  
 4153 N. Bonita St.  
 Spring Valley, CA 92077  
 619-698-4658
- Myat Inc.** 15714  
 Intro: New test-quality reducer/adaptor devices for EIA rigid line to type "N" female and 7/16.  
 Contact: Rita Stange, Sales Adm.  
 380 Chestnut St., P.O. Box 425  
 Norwood, NJ 07648  
 201-767-5380
- Nagra Kudelski SA** 11805  
 Intro: ARES-C solid state recorder with PCM/IA support. Nagra Lysis integrated information system and broadcast architecture for radio including hardware and software for sound editing, scheduling, broadcasting, administrative tasks, statistical analysis and news editing
- National Supervisory Network (NSN) Services** 5101-2  
 Intro: InSat Satellite Internet terminal system provides access to and from any location on earth. World's first VSAT Internet system.  
 Also: ComStream digital audio products; Gilat satellite data products.  
 Contact: Kelly Hethcote, Dir. Audio Sales  
 Box 578  
 Avon, CO 81520  
 800-345-8728
- Nautel** 2421  
 Intro: NS Series AM transmitters in power ranges of 6 kW to 60 kW available with AM stereo. Can be serviced while on air and has dual exciters.  
 Contact: Gary K. Manteuffel, Brcdst. Sales  
 201 Target Industrial Cir.  
 Bangor, ME 04401  
 902-823-2233
- Nemal Electronics** 13636  
 Intro: Flexible composite audio/video cables that include multiple video and audio lines. Audio lines are 22 AWG shielded pairs with drain wire and are available either with or without a color-coded inner jacket. Extra durable multipair field cables.
- Neotek Corp.** 1907-9  
 Intro: MPX-4A four-channel microphone preamplifier, MPX-4D four-channel digital controlled microphone preamplifier EQ4X-M1 microphone and four-band parametric equalizer, multisource media monitoring system
- Network Music Inc.** 13122  
 Intro: Network Classical Library of 15 CDs featuring the greatest composers of all time
- Neutrik** 2127  
 Intro: A/B Series XLR connector with the smallest size and the highest packing density. Connectors feature up to 12 poles in miniature configuration. Easy Patch patch panel available in 96 bantam and 48 "B" gauge styles.  
 Also: XLR audio connectors including solderless 1/4-inch phono/jack "combo" connectors, bantam and 1/4-inch jack panels, patch cords, miniature and subminiature, jacks, plugs, speaker connectors and a full line of XLR accessories.

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Contact: Ellen A. Wagner, Mktg. Comm. Coord.  
196 Lehigh Ave.  
Lakewood, NJ 08701  
908-901-9488

**NPR Satellite Services** 4221-2  
Intro: Now offers ComStream digital audio equipment that increases network control and maximizes network efficiency.

Also: Full-time satellite channels using C-band, SCPC transmission. The satellite space is on Galaxy IV. Transponder 1 and 3, that can accommodate both digital and analog audio transmission.

**NSM Consumer Electronics** 5201  
Contact: Jon Taylor  
694 Ft. Salonga Rd.  
Northport, NY 11768  
516-261-7705

**Orban** 2910  
Intro: 8202 stereo encoder, a compact standalone unit with all-digital processing. Designed for large network applications, especially those using digital program distribution. New features for the DSE7000 include time compression and expansion by +/- 25 percent, networking capability to the ENCO audio delivery system, and V5.0 software with enhanced graphics and help screens, vari-speed copy over two octaves and reverse audio.

Other updates include PC software for the Optimod-FM 8200.  
Contact: Howard Multinack  
1525 Alvarado St.  
San Leandro, CA 94577  
510-351-3500

**OSC** 18463  
Intro: 16-Track Tool, a breakthrough in Pro Tools digital audio playback technology. Software enhancement for the Deck II hard disk recording program that quadruples the playback track capacity of any four-channel Digidesign Pro Tools systems allowing playback of 16 simultaneous, independent tracks of CD-quality digital audio.

**Otari Corp.** 1414  
On Display: RADAR multitrack hard disk recorder. MR-10 MD recorder/player. CDC-600 dual drive, 360 CD-capacity CD changer. B-10 broadcast production and on-air console. Also, Concept I digitally controlled 24-bus analog console with fader and mute and snapshot automation.  
Contact: Lee Pomerantz,  
Nat'l Sales Mgr.  
378 Vintage Park Dr.  
Foster City, CA 94404  
415-341-5900

**Pacific Recorders & Engineering (PR&E)** 3025  
Intro: ADX Ensemble digital audio workstation with an on-board automated mixing surface housed in a convenient roll-around package. Comes fully equipped, featuring touch-sensitive faders and snapshot automation of mix settings. The ADX Eight is a replacement for conventional eight-track linear tape decks.  
Also: BMX III air console, AMX stereo production Console, RMX Radiomixer air console, production multitrack console and custom furniture.  
Contact: Barbara Laramie  
2070 Las Palmas Dr.  
Carlsbad, CA 92009  
619-438-3911

**Phasetek Inc.** 5427-8  
Intro: New high-voltage RF switches, new isolation units.  
Also: Custom phasing and branching equipment, antenna tuning units, RF components, RF inductors, RF connectors, switching systems and multiplexing equipment.  
Contact: Kurt Gorman, Pres.  
550 California Rd., Unit 11  
Quakertown, PA 18951  
215-536-6648

**Potomac Instruments** 2510-11  
On display: Series of monitors, audio analyzers and generators, automatic remote control system, various meters, program audio analyzer, programmable transmitter controller with DOS-compatible software, tower light monitor and instrumentation amplifier.  
Contact: Dave Harry, Mktg. Dir.  
932 Philadelphia Ave.  
Silver Spring, MD 20910  
301-589-2662

**PRECO Inc.** N/A  
On display: Weircliff tape eraser Model 220 with Hi8 or DAT throughputs of 270 tapes per hour.

**Promusic Inc.** 13047-8  
Intro: Dozens of new releases in music and sound effects libraries.  
Also: Existing libraries of music and sound effects.  
Contact: Alain Leroux  
941-A Clint Moore Rd.  
Boca Raton, FL 33487  
407-995-0331

**Prophet Systems Inc.** 5421  
Intro: Many new features have been added to make even fully automated stations sound live and professional. Time and temperature announcements allow satellite and hard drive automated stations to insert the current time and temperature at will, enhancing listener enjoyment. Backtiming modules make running a live shift easier and ensures that music plays during automated times.  
Contact: Kevin Lockhart  
111 West 3rd  
Ogallala, NE 69153  
800-658-4403

**QEI Corp.** 4419  
Intro: Quantum 10 kW solid state FM transmitter, 1 kW solid state FM transmitter, 710 digital stereo generator with AES/EBU, Model 50E, 150E, 300E FM excitors, Cat-Link AES/EBU digital audio transport. Quick-Link spread spectrum RPU system.  
Also: Cat-Link, FMQ Series transmitters, 691 Modulation Monitor.  
Contact: Jeff R. Detweiler,  
Sales & Mktg. Mgr.  
P.O. Box 805  
Williamstown, NJ 08094  
800-334-9154

**Radio Computing Services (RCS)** 5403  
Intro: ProSonic full-featured digital multitrack audio editor. NewsLink computerized newsroom with digital audio option.  
Also: Master control all-digital, paperless, cartless radio studio. Selectro music scheduling software. SongTrack for creating music tests, callouts, etc. RCS Traffic fully automated commercial scheduler. Linker scheduler for rotating non-music, non-commercial links like PSAs, promos, jingles and liners. Pro-Rate sales software.

**Radio Design Labs (RDL)** 2407-8  
Intro: In the RDL Stick-On Line, the ST-MXL3 mic level output line mixer and the ST-TC1 telephone system coupler. In the Rack-Up Line, the RU-VA2 video attenuator, RU-LA2D IHF-PRO interface, RU-UDA4 unbalanced audio DA, RU-MP2 adjustable stereo mic preamp, RU-BLA2 adjustable stereo line amp, RU-DBA3 balanced audio DA and the RU-MDA3 mic DA. In the New Transformer Group, the TX-10B bridging input transformer, TX-1A adjustable line transformer, TX-LM2 line matching transformer and the TX-70A 70/25 V input interface. The RC-1U rack chassis and the JP, a universal jack panel.  
Also: Stick-On products. Rack-Up products, ACM-2 synchronous AM noise monitor and the AMX-84 audio matrix.  
Contact: Jerry Clements, Dir. Mktg.  
5025 8th St.  
Carpenteria, CA 93013  
800-281-2683

**Radio Systems** 3615  
Intro: DDS Digital Delivery System, a UNIX-style multi-user operating system that can service multiple audio channels and multiple studios from a single CPU. User interfaces include a 1/3 rack Cart Emulator control panel with easy-to-use cart machine functions, and the Sound Slate multicut access panel.  
Also: RS-Series consoles, available in 6-, 12-, 18- and 24-channel models. T1-101 telephone interfaces. DA-16 distribution amplifiers. Master clock and timer systems, both analog and digital.  
Contact: Daniel J. Braverman, Pres.  
P.O. Box 458, 601 Heron Dr.  
Bridgeport, NJ 08014-0458  
609-467-8000

**RE America Inc.** 18378  
On Display: RE 660/661 Layer II audio codec for transporting up to 20 kHz stereo over ISDN lines. RE 662/663 Layer II audio codec, which multiplexes up to three ISDN lines for 384 kbps contribution transport. RE 532 RBDS encoder for FM data transmission. RE 533 coder low-cost RBDS solution for broadcasters. RE 4500 component digital video codec.  
Contact: Maria Street, Sales Sec.  
31029 Center Ridge Rd.  
Westlake, OH 44145  
216-871-7617

**Register Data Systems (RDS)** 2121  
Intro: RDS Traffic for Windows, a Windows-based traffic system.  
Also: The Phantom digital automation system. Traffic Master I, II, III single-user traffic systems. System 6, 7 multi-user traffic systems.  
Contact: Russell Nelson, Sales & Mktg. Rep.  
404 General C. Hodges Blvd.  
Perry, GA 31069  
800-521-5222

**RF Technology Inc.** 13128  
Intro: High-performance heterodyne fixed links (1.5 to 15 GHz), ultra-portable UPL Series transmitters (1.5 to 15 GHz), HRC-Series ENG central receive systems and SVX-Series analog/digital C-, X-, and Ku-band SNG systems.

# Why would anybody put 50 compact discs into something like this?

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High capacity CD players are all but a must these days, no question of that. How high a capacity, that's a question. Which one's the easiest to load, that's another good question. And what brand is the most reliable, that's probably the best question.

**Introducing the 100-CD "Instant Library Change" CD Player/Changer from NSM of Germany.**

It's the answer to all those questions. And a lot more.

Put simply, our Model 3101 is the most efficient, totally flexible, all-but-infallibly reliable CD Player/Changer ever made for broadcasters.

**The snap-in/snap-out 50-CD magazines are the key.**

Once CD's are loaded in the magazine's numbered slots, you never have to touch them again. You simply snap-in two magazines, 100 CD's worth, into our 3101 Player/Changer. Then any of its 100 CD's are all but instantly accessible. It takes an average of less than five seconds for our 3101 to find and begin playing any one of them.

You can change the entire library in just about the same time ... just by snapping out the two magazines, snapping in another pre-loaded set.

**What happens if our 3101 breaks down?**

We won't say it could never happen. We will say that it'll be rare. Our 3101 has the highest reliability rating in the industry, way above all the others. Its MSBF (Mean Swaps Between Failures) is over 200,000 and our current units in laboratory

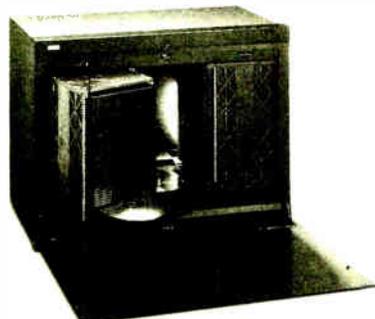


tests are experiencing well over 400,000. What's more, our reliability is street-tested every day in coin-operated jukeboxes throughout the country — we're the largest manufacturer of commercial jukeboxes in the world.

But when the inevitable happens — when something does go wrong — just snap-out the magazines and put them in another 3101. You're back in business. Try that with any other CD Player/Changer.

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Program any selections, in any order, for any start time ... cue up, blend, whatever you like. Store any number of loaded 50-CD magazines you need nearby.

If you don't want to use a computer, no problem. We have a stand-alone controller that's fully programmable and has its own back-up CD player.

**Not only won't you touch your CD's again, our 3101 won't either.**

Each CD is cradled in its own tray. And our mechanism grips the trays to remove and replace CD's, never the CD's themselves.

The sealed changer also protects your CD's against dust, dirt, and other airborne contaminants.

**We've told you a lot. Make us prove it.**

Call, write or FAX for detailed literature and a copy of our 2-year limited warranty, the best in the business. Then try a "you heard it with your own ears" test of our 3101's superb sound quality. Your CD Changer search will be over.

And you'll know exactly why we put 50 CD's into a little magazine.



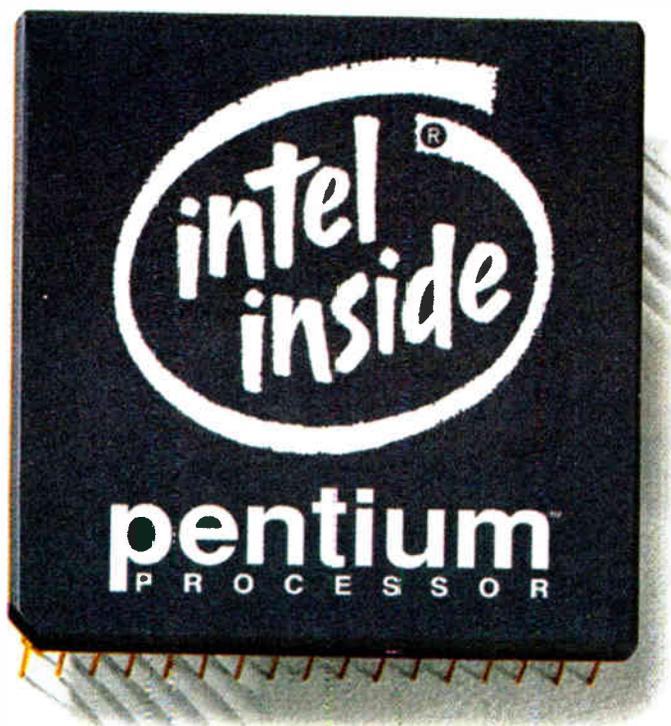
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World Radio History

Also U-Series portable transmitters/receivers (1.5 to 15 GHz)

- Roland Corp. U.S.** 4713  
Intro: The DM-800 digital audio workstation, a self-contained eight-channel hard disk recorder and editor offering automated mixing, non-destructive editing, parametric EX, video display outputs and more. Also being shown is the RSS-10 Roland Sound Space processor.  
Also: The DM-80 digital audio workstation and the SN-550 fully digital noise elimination system that utilizes two separate noise reduction circuits.  
Contact: Erika Lopez, Sales & Mktg. Spec.  
7200 Dominion Cir.  
Los Angeles, CA 90040  
213-685-5141
- Rules Service Co.** 1528
- Sandar Electronics A/S** 15661  
Intro: AD-2000 16 x 16 AES/EBU router in one rack unit; PESE 2.3 software for PC control of routers.  
Also: VAA-2000 16 x 16 video/stereo audio router in three rack units, AA-2000 16 x 16 stereo audio router in one rack unit; VD-2000 16 x 16 and 32 x 32 digital video router in three rack units.
- Scala Electronic Corp.** 15707  
Intro: FM transmitter combiners, cavity filters and isolators.  
Also: Professional antennas for FM translators and low-power transmitters; precision monitoring antennas for FM broadcast stations; antennas for STL and RPU systems.  
Contact: Ellis Feinstein, Pres.  
P.O. Box 4580  
Medford, OR 97501  
503-779-6500
- Scientific-Atlanta** 13828  
Intro: SRC-3500 remote control unit for model DSR-3610 encore receiver.  
Also: DSR-3610 encore receiver.  
Contact: Executive Acct. Mgr.  
420 N. Wickham Rd.  
Melbourne, FL 32935  
407-255-3053
- Scott Studios Corp.** 2714  
Intro: Scott System '95, a new touch-screen hard disk digital audio system with 9GB hard drives, on-screen telephone recorder/editor, hot keys that start hundreds of recordings at a touch, Wall of Carts with all audio at a touch, Full Day's log editing.  
Also: CompuCarts cart machine replacement; Net Catcher for recording and storing of network audio for delayed playback.  
Contact: Dave Scott, Pres.  
13375 Stemmons Freeway, Ste. 300  
Dallas, TX 75234  
214-620-2211
- Seem Audio A/S** 4604  
Intro: DDC-1 digital/digital converter; SEEPORT modules for the portable mixer.  
Also: Radio broadcast mixing consoles.
- Sennheiser Electronic Corp.** 12035  
Intro: MD421II cardioid dynamic microphone with ability to handle high sound pressure levels; EM2004 tuneable UHF diversity receiver; ME67 shotgun back-electret microphone capsule offering high directionality; BF1053 body pack transmitter system with lavalier microphone.  
Also: EK 4015 miniature UHF true diversity receiver for interference-free signal transmission; SK250 16-channel UHF high-power pocket transmitter; K6/ME64 cardioid back-electret microphone capsule with powering module featuring smooth frequency response.  
Contact: Laura Sordi, Mktg. Coord.  
P.O. Box 987, 6 Vista Dr.  
Old Lyme, CT 06371  
203-434-9190
- Sescom Inc.** 13600  
Intro: Rackem 'N' Stackem electronics.  
Also: Audio accessories; Rackem 'N' Stackem Series.  
Contact: Franklin J. Miller, Pres.  
2100 Ward Dr.  
Henderson, NV 89015  
702-565-3400
- Shively Labs** 4425  
Intro: UHF broadcast antennas; MMDS repeater antennas.  
Also: Complete line of FM broadcast antennas and such related gear as combining networks, transmission line, pressurization equipment and pattern work.  
Contact: Jonathan R. Clark, Mktg. Mgr.  
56 Harrison Rd.  
Bridgton, ME 04009  
207-647-3327
- Shure Brothers Inc.** 11800  
Intro: M367 six-input portable microphone mixer designed for professional applications in ENG/EFP and general audio mixing. Handles up to six microphones or line-level signals and can be used with any balanced, low-impedance dynamic or condenser microphone.  
Also: VP3 portable receiver powered by a single 9 V battery, delivering seven hours of operation. Weighs 8 ounces and measures 5 inches x 2 1/3 inches. Pivoting "rubber-duck" antenna can be set in either a horizontal or vertical position to optimize reception.
- Sierra Automated Systems** 2710  
Contact: Al Saici  
2112 N. Glenoaks Blvd.  
Burbank, CA 91504  
818-940-6749
- Smarts Broadcast Systems** 5416-7  
Intro: Digital hard disk automation and editing systems; LAN networks; GUI interface (live screen); Version 7 office systems on new screens.  
Also: Hard disk audio systems; satellite automation.

- Contact: Jan Schad, Mktg. Dir.  
P.O. Box 284  
Emmetsburg, IA 50536  
712-852-4047
- Solid Electronics Laboratories** 5103  
Intro: FM composite processor Model DCP-1, performing the functions of instantaneous limiting and composite low-pass filtering in a single structure.
- Solid State Logic** 16621  
Intro: Axiom digital production system, a fully digital audio mixing console with an integral hard disk multitrack/editor; SL-9000 J Series total studio system, an analog mixing console with optional hard disk multitrack/editor.  
Also: OmniMix digital surround audio/video system, Scenaria digital audio/video system; SL-8000 GB on-air production console.
- Solidyne** 5007  
Intro: Solidyne 2500 digital audio consoles; Solidyne 262 Turbo digital audio processor; PC-based digital audio for broadcasting; Audicom 922 full automation systems; voice-quality phone call reconstruction.  
Also: Automatic recording of incoming phone calls from journalists; virtual radio systems.  
Contact: Oscar Bonello, Pres.  
3 De Febrero 3254  
Buenos Aires, A429  
Argentina  
54-1-701-8622

- Spectral Inc.** 4801  
Intro: Media Filer, digital audio file converter; Translator, eight-channel digital audio signal forward converter for Alesis, Yamaha, Tascam and Spectral; Prisma Music, music production user interface for NE Prisma DAW.  
Also: Prisma, Audio Engine.  
Contact: Mark Doenges, V.P. Mktg.  
18800 142nd Ave. NE  
Woodinville, WA 98072  
206-487-2931
- Stainless Inc.** 16608  
Intro: Tower leasing program details available. Offered to tower users of all types for building or upgrading antenna support structures without the up-front capital commitment of an outright purchase.  
Also: Complete tower design, fabrication, erection, modification and maintenance, antenna support structures for all broadcast, two-way and other applications. Inspection and structural analysis of existing towers; full-service field operations for antenna installation, repairs and regular tower maintenance.
- Storell Corp.** 18114  
On Display: Tape storage, mobile and static, for all formats, setup trucks for tape and CDs, select storage for all small formats, including CDs.

- Studio Audio & Video** N/A  
Intro: SADIe PC-based digital audio editor, version 2.2. Features SCSI CD-R, DDP 8mm CD mastering format, back-up to Exabyte, 16-, 20- and 24-bit editing and a hardware controller interface.  
Also: SADIe digital editor.  
Contact: Julian Mitchell, Mktg. Mgr.  
1808 West End Ave., Ste. 1119  
Nashville, TN 37203  
615-327-1140
- Studio Technologies** 3003  
Intro: Studio Comm Series Model 60 central controller and Model 61 control console; Studio Tools family of professional audio products including the Model 80 stereo analog audio distribution amplifier and the Model 85 AES/EBU digital audio distribution amplifier.  
Also: Studio Comm series monitoring and communications; IFB Plus Series two-channel IFB unit for mobile trucks; Mic Pre-Eminence microphone preamplifier; line of stereo simulator units for on-air and production use.
- Studio Technology** 3615  
Contact: Vince Fiola  
4 Pennsylvania Ave.  
Malvern, PA 19355  
215-640-5880

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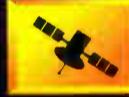
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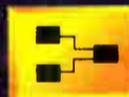
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Intro: YC130 replacement tetrode for 35 kW FM transmitters; 4CX3500A replacement tetrode for 5 kW FM transmitters; 3CX3000A7 replacement high mu triode for FM transmitters; 3CX2500F3 replacement triode for AM transmitters.  
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Contact: George Badger  
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Intro: Model 610 broadcast audio delay for profanity delay on live and taped radio talk shows.  
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Also: System 800 UHF wireless headset system interfacing to any standard cabled intercom system. Features tone squelch, full duplex operation and an operating range of up to 2,000 feet. Matrix Plus point-to-point digital intercom system. Vega Model RMT-10 wireless IFB system

**TASCAM — TEAC Prof. Div.** 17167  
Intro: M 501B I/O production console; DA-P1 portable DAT recorder; ES-61 audio edit controller.  
Also: Remainder of TASCAM's product line.  
Contact: Roger Maycock, Mktg. Support Rep.  
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213-726-0303

**Tektronix Inc.** 16528  
Intro: TSG2000 signal generation platform; Model 764 digital audio monitor; VM100 video measurement set.  
Also: AM700 hand-held digital audio analyzer/generator; AM700 mixed-sig-

nal audio measurement set; WFM90 hand-held waveform, vector, picture and audio monitor

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Intro: 45- and 90-degree BNC connectors; J24 WMST jack monitor; serial digital; RGB.  
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**Valentino Inc.** 12102  
Intro: Valentino Production Music and Sound Effects Libraries "ROM Reference Disc," a complete audio catalog on CD-ROM for both PC and Macintosh.  
Also: 80-CD production music library; 44-CD sound effects library. Both are single collections, not combinations.  
Contact: Thomas Valentino, Pres.  
500 Executive Blvd.  
Elmsford, NY 10523  
914-347-7878

**Vega** 15717  
Intro: Model T-678 Pro Plus synthesized miniature UHF body pack wireless microphone transmitter.  
Also: R-662 four-frequency UHF wireless mic receivers; PRO PLUS VHF and UHF hand-held wireless mic transmitters; VX 20 audio-frequency wireless mic; O800 wireless belt pack intercom system

**Ward-Beck Systems** 15704  
Intro: RS 8216 16 x 16 stereo routing switcher; MF82-4 four-DA assembly; MR207 audio compressor; MR208 remote level distribution amplifier.  
Also: Renaissance audio consoles; DB212 distribution assembly and card family; MicroCOM II communications systems.  
Contact: Eugene L. Johnson, Mng. Dir.  
841 Progress Ave.  
Scarborough, Ontario M1H 2X4  
Canada  
416-438-6550

**Wegener Communications** 16335

Intro: Digital audio workstation with store and forward  
Also: Digital audio satellite receivers; addressable network control system

**Wheatstone Corp.** 4709  
Intro: Audioarts Engineering R-60 on-air audio console. Standard features include a six-source line selector, module extenders, gold contact switches, Penny & Giles faders. Audioarts Engineering MR-40 radio production and/or on-air console. Comes standard with four mono mic/line input modules and eight stereo line modules.  
Contact: Ray Esparolini, Dir. Sales  
7305 Performance Dr.  
Syracuse, NY 13212  
315-455-7740

**Whirlwind Music Dist. Inc.** 12507  
Contact: Bonnie Gardner  
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Contact: Patrick Hayes, V.P.  
713 Grand View Dr.  
S. San Francisco, CA 94080  
415-589-5676

**Wolf Coach** 15862  
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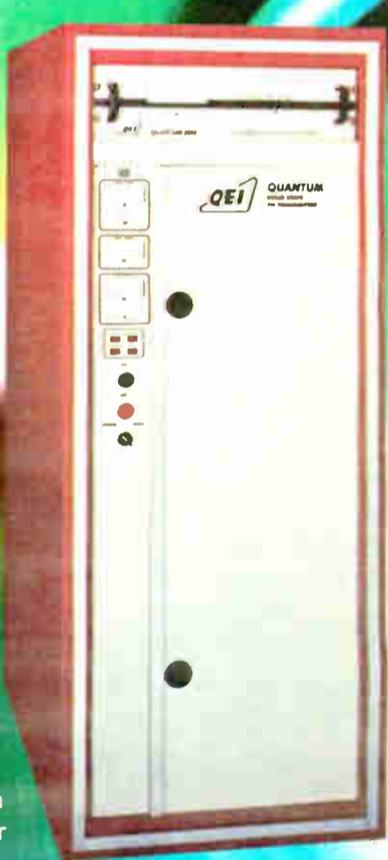
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# Maintenance Primer for Digital Gear

by Bruce Bartlett  
with Jenny Bartlett

**ELKHART, Ind.** Many stations have made the switch to modular digital multi-tracks (MDMs). Models such as the Alesis ADAT and Tascam DA-88 are selling like crazy. They're an easy transition from an analog 8-track, and they allow you to produce spots of pristine clarity with much less maintenance.

MDMs, though, can develop digital glitches. You can prevent these with some routine maintenance.

Both the Tascam and Sony units, which use Hi8mm tapes, need the same treatment. The only user maintenance that

Tascam suggests is cleaning the heads with a dry cleaning tape. Manual cleaning inside the unit is not recommended.

## Cleaning questions

How often should you clean the heads? Whenever you format, and whenever the error rate becomes high.

Basically, you exercise the tape and clean the heads before and after formatting. This ensures that the format data is clean. A glitch in the format data is harder to correct than a glitch in the audio data.

Tascam recommends this procedure:  
• Start with a brand new tape. According to Tascam, 3M AHB113 Hi-8mm tape is a good choice.

• Fast forward the tape to the end and rewind to the top. This loosens the tape pack so it travels freely. It also spreads the tape lubricants more evenly.

• Press and hold the UP-ARROW and DOWN-ARROW keys at the same time, and press POWER ON. The unit will go into cleaning mode.

• Pop in an 8mm dry head-cleaning tape such as Sony V8-25CLH or Tascam HC-• The tape will clean the heads for a few seconds, then will self-eject.

• Format the tape as described in the manual.  
• Clean the heads again.

If a high error rate cannot be corrected by a dry-cleaning tape, send the unit to the

Tascam service closest to you. You might send in the unit for manual cleaning after 2,000 hours of head wear, but the error rate is what really counts. To display the hours of head wear, press PLAY and STOP when you power up.

Error message ERR 1 indicates a mechanical problem, often cleared by ejecting the tape and resetting. Other error messages are for tech repair diagnostics of the transport.

You don't need to lubricate the transport, clean the fan filter, or reseal the PC boards.

The software version can be upgraded to allow faster sync, faster cleaning, and other features. Order version 3.03 from your Tascam dealer. It is an IC chip you plug into the unit.

Phone other stations or recording studios in your area, and ask if they have a DA-88 they'd be willing to loan if your unit fails. You can offer to do the same for them.

## Alesis ADAT, Fostex RD-8

The Alesis ADAT and Fostex RD-8 need the same sort of maintenance. Both these machines use S-VHS tapes.

Clean the unit whenever the error rate seems to be unusually high. Alesis recommends the 3M Blackwatch S-VHS dry head-cleaning tape. The Sony V-25CLN is another choice. As for S-VHS tape, Sony suggests Alesis ADAT S-120 Mastering Audio Cassettes or Ampex 489 DM Digital Mastering Audio Tape.

Exercise a new tape before you use it—fast forward to the end and rewind to the top. (This is also a good practice for DAT tapes.)

Alesis will provide users a step-by-step guide to manual cleaning inside the unit. There is no need to clean the fan filter, reseal the PC boards, or lubricate the transport.

To determine the hours of head wear, push SET-LOCATE and STOP at the same time. The only error message concerning the user is ERR 7. It means one of three things: a tape dropout, dirty heads, or an out-of-alignment condition. Other error messages are for repair tech diagnostics.

There's a new software version 2.0 you can install in the BRC Master Remote Control. It offers one-touch punch-in, a bigger MMC command set, better tolerance of SMPTE inconsistencies, and faster chase time to VTRs.

If your ADAT goes down, you can contact other ADAT users on the ADAT Worldwide Network.

Whether you are using the DA-88 or ADAT format, I recommend that you always clean the heads before going on location. If you do get a glitch and the error light stays on, try turning the unit off and on. Or eject the cassette and reinsert it.

Although dry cleaning tapes are fairly non-abrasive, avoid excessive use because they can wear out the heads.

You can clean the I/O connectors with ProGold conditioning treatment, available from CAIG Labs, 16744 W. Bernardo Drive, San Diego, Calif., 92127, phone: 800-CAIG-123; fax: 619-451-2799.

Here are some vendors of dry cleaning tapes: The Tape Company (Dallas: 800-992-0336, Chicago: 800-437-2175, Twin Cities, 800-831-3031, Cincinnati, 800-437-2125); Polyline, 708-390-7744, and PolyWest, 818-969-8555. Those companies also sell Hi-8mm and S-VHS tape, and so does Total Media Inc. at 800-848-4118.

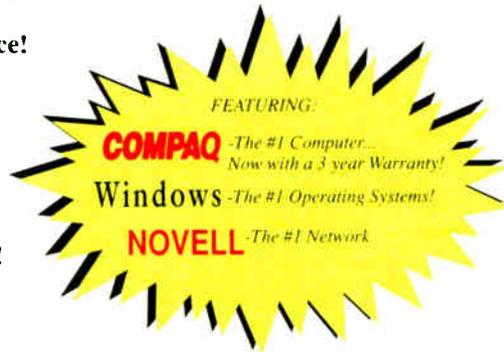
Thanks to tech support at Tascam and Alesis for their help with this article.

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Tue Mar 7, 1995 14:16:05		SYSTEM MODE: MANUAL		BLOCK FILL: ON	
09° High 70° Low 58°		RECV MODE: -ON		ACCEPT OPTOS: YES	
Block Time Event Time		DEF. SOURCE: 01		SHIFT: -001-shift 01	
00:02:04 00:04		ACTIVE SOURCES		1 2	
START	DESCRIPTION	ICARD#	SPOT-CUT	LENGTH	SYS #
14:16:09	NEBRASKALAND TIRE <GEORGE L.WILLIA	52030-04		00:00:30	606049
	NEBRASKALAND TIRE <GEORGE L.WILLIA	52030-04		00:00:30	606049
	KARLS APPLIANCE 2 <P. LHOUMET>	52060-02		00:00:59	606051
	TCI CABLE VISION <>	52020-05		00:00:19	606753
	JACKS PLACE <>	52010-04		00:00:10	606755
PL	STOP	STOPEND	SKIP	record off	
A HRSHIFELDS 00:02	B WAGON WHEEL 00:10	C A BETTER MAH 00:01	D ADDED TOUCH 00:14	E HILL TOP CAFE 00:50	
F APRIL BL OSSOM 00:16	G BAKERY CAFE 00:19	H DENNY MOGGS CH 00:21	I BOB SPADY BURC 01:00	J KARLS APPLIANC 00:50	
K BLUE SKY BONE 04:14	L KING OF PAIR 04:52	M RADIO SONG 04:00	N NOTHING'S NEWS 02:50	O DAYBREAK 03:01	
P FORDOTTEN YEAR 04:10	Q LOGGING MY RELI 04:25	R LINDAS FASHION 00:19	S L F S REAL TV 00:00	T PS PRESENTS 00:07	
U LARRY'S RV 00:31	V TCI CABLE VEB 00:10	W ADDED TOUCH 00:14	X DUDDENS 00:46	EXIT	

Control Room with Button Bar Overlay



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PRODUCT EVALUATION

## ElectroVoice Moves Boldly with RE2000

by Ty Ford

**BALTIMORE** It has been more than two years since I first saw and heard the ElectroVoice RE2000. At that point, it was in its early prototype stages and, quite frankly, I can't remember much about it other than it reminded me of a cross between a Buck Rogers space gun and a Braun shaver.

The RE2000 is out, it sounds very good, and were it not for the \$2,450 list price (including phantom supply, elastic and metal suspension bracket, cable, hard case and pop-filter), it would be positioned perfectly to become the new darling of the microphone market. Even if you agree that the phantom supply, suspension bracket and pop filter comprise \$300 of the cost, the remaining \$2,150 is still high for a single-pattern condenser in today's market.

What we've got here is a low-noise, single-pattern (cardioid) condenser—that's right, a condenser mic from EV—with a transformer output that is a good 6 to 8 dB hotter than a Neumann U87 or an AKG 414. The extra gain allows you to back your preamp gain off by 6 to 8 dB, which can be really helpful if you have noisy preamps. The RE2000 also has a bass roll-off (12 dB per octave at 130 Hz) and a 10 dB pad.

What is not typical about the RE2000 is that it's packing a heater. Somewhere in their market research, EV received enough requests for a temperature stabilizing heater element to include one. That explains the five-pin XLR on the end of the mic and the special "Y" connector cable. On one branch of the "Y" cable is a "line lump" power supply and a power cord. On the second branch of the cord is the five-pin female XLR for the mic. The third leg is terminated with a standard three-pin XLR, which routes the signal to the outside world.

Although I have heard of cases in which changing ambient temperatures and high humidity caused condenser mics to freak out, most of the time malfunctions can be attributed to rugged outdoor conditions—location recording in rainforests or recording at outdoor music venues. Because you don't encounter these conditions in the average control room and studio until the air conditioner breaks down in August, you have to ask yourself whether the heater is worth the extra expense.

Of course you can always ignore the heater and phantom supply by making up your own five-pin to three-pin mic cables and using the RE2000 as you would any other condenser mic, but that brings us back to the point that you've got a single-pattern condenser mic costing \$2,450.

To rationalize the expense, you really have to like the RE2000's remaining features, namely the sound and the look of the mic.

I predict that both the broadcast and studio markets will like the look of the RE2000. It's the same size, weight and shape of a professional device, and when inserted in the suspension mount the total system looks, well, somewhat exotic.

Product Capsule: ElectroVoice RE2000	
 <b>Thumbs Up</b>	 <b>Thumbs Down</b>
<ul style="list-style-type: none"> <li>✓ Good for voice work</li> <li>✓ solid-sounding upper bass, low midrange areas</li> <li>✓ high output</li> <li>✓ professional look</li> </ul>	<ul style="list-style-type: none"> <li>✓ price</li> <li>✓ unnecessary heater element</li> <li>✓ pop filter awkward in broadcast applications</li> </ul>
For more information, circle <b>Reader Service 109</b> ; or call ElectroVoice at 800-695-1010	

The pop filter, while satisfactory for studio recording, could be improved upon for broadcast. Its current shape takes up too much space and looks a bit fragile. Broadcasters won't be able to nuzzle as they do with a foam cover, and it also invites entanglement with a flying headphone cable, or clipping by a kamikaze lunge with a copy book or tape cart.

I like the sound of the RE2000 a lot, especially for voice work. The fact that it has a medium-sized capsule—the industry convention is that diaphragms one inch or larger be considered "large"—means that it is not quite as sensitive to very low frequencies as larger diaphragms. It also means that the RE2000 is not as susceptible to proximity effect, the phenomenon of increased bass response the closer the sound source gets to the mic. This feature makes the RE2000 a "plug-and-play" device for most voice work. Provided the room acoustics aren't horrible, you can vary

the low-end response by how closely you work the mic.

If you like the EV's dynamic champion, the RE20, for its "woofy" low end, you'll probably like the RE2000, but be prepared for a difference. I always sound like I have a head cold when I use an RE20.

The RE2000 sounds solid and remarkably detailed in the upper bass and lower midrange areas, while never sounding harsh. I also detected a slight bump in the 2-3 kHz range, which further peaks the voice frequencies.

We tried to make the RE2000 sound as much as possible like a transformerless AKG 414. Finally, after some tweaking, 4 dB were added at 50 Hz, 2 dB at 75 Hz and 4 dB were taken off at 3 kHz. Engineer/Producer Lou Mills of Flite Three in Baltimore offered several other valid comparative observations. For him, on a spectrum between the U87 and the 414, the RE2000 sits two-thirds of the way toward the U87. He also feels that the RE2000 has the edge of a Neumann U47, but not the higher frequencies of an AKG 414.

I really like the RE2000 for its sound and high output level. This mic is a brave move for a company whose reputation is based on dynamic rather than condenser microphones. With the single-pattern condenser mic market slipping below the \$1,000 list price point over the last few years, it will be quite a victory for EV if it can recalibrate the market with the RE2000.



RE2000: ElectroVoice's cardioid condenser mic

□□□

*Ty Ford can be reached on America Online at Tford1010.AOL.com. When time permits, he patrols the rec.audio.pro and rec.broadcasting.radio newsgroups for audio surfers in trouble.*

USER REPORT

## Tour Takes Neumann Mics on the Road

by Robert Scovill  
MusCanvas Specialized Audio Group Inc.

**WEST HOLLYWOOD, Calif.** Working for many years in recording studios and mixing sound on large-scale concert tours, I have witnessed an interesting phenomenon: pigeon-holing microphones as either live sound mics or studio mics. We even do this with manufacturers and engineers to a certain extent.

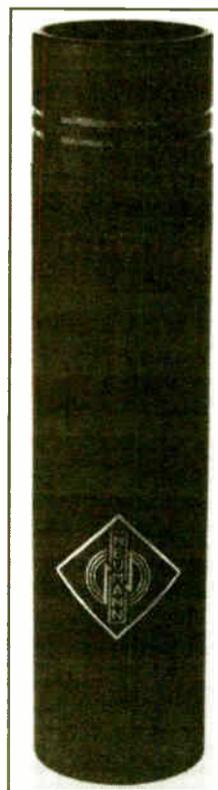
Historically, Neumann has a reputation as a studio-only microphone manufacturer. In the past, very seldom have you seen a large complement of Neumann microphones out on a major concert tour, probably due to fear of damage from the elements and the cost of repair, as well as the exorbitant cost involved in carrying spares of any one model.

### Live sound mics

When Neumann approached me a couple of years ago with the release of its first hand-held vocal mic for live applications, the KMS140 and KMS150 series, I could hardly contain my excitement.

The KMS150 was in place on my next tour, and its performance and reliability exceeded all of my expectations. This experience prompted me to reconsider my approach to microphone selection for tours to come.

With the release of the KMS140 and 150, the moderately priced TLM193 and now the KM184, Neumann has certainly attempted to challenge the mentality that studio microphones are not meant for the road.



KM184 leaves the studio.

The KM184 microphone is a stripped-down version of the KM140. It does not offer either the interchangeable capsule or the 10 dB pad, but in return you get a better noise specification on a microphone that already offers excellent noise specs. With a \$600.00 list price, the sound companies of the world, as well as the home studio owners, should be queuing up to get a handful of them.

In response to the sound companies' attitude that talk is cheap but their mic lines are not, I decided to put my own microphones on the firing line and take on tour some models that had been tested in the studio but were probably not considered "road-worthy" by the sound companies.

### Road test

On the current Tom Petty tour, I use a matched pair of U87s on the overheads of Steve Ferrones' drum kit, as well as TLM170 on the bass drum. KM184s are used for the Leslie and bass guitar microphone positions, and for recording house ambience, using the Neumann stereo microphone positioning kit.

These microphones provide wonderful results in these applications, perhaps some of the best results I have achieved to date. Obviously these microphones will not stand up to the same abuse that the SM-57 takes, but as long as they are handled with relative care, I think it is safe to say that there is no reason that we should not see this caliber of microphone on many tours to come.

During a period of approximately six months, I have tried

continued on page 106 ►

## USER REPORT

# SoundField Gets Stereo Right

by Ron Streicher  
Proprietor  
Pacific Audio-Visual Enterprises

**MONROVIA, Calif.** If you have ever wondered why it is so difficult to get stereo to sound right on the air, you are not alone. The answer is not easy, especially when you must keep both stereo and mono listeners in mind.

The real problem is simply that there is no all-purpose miking configuration. There is, however, a microphone that provides both excellent stereo and perfect mono at the same time. This mic also allows the

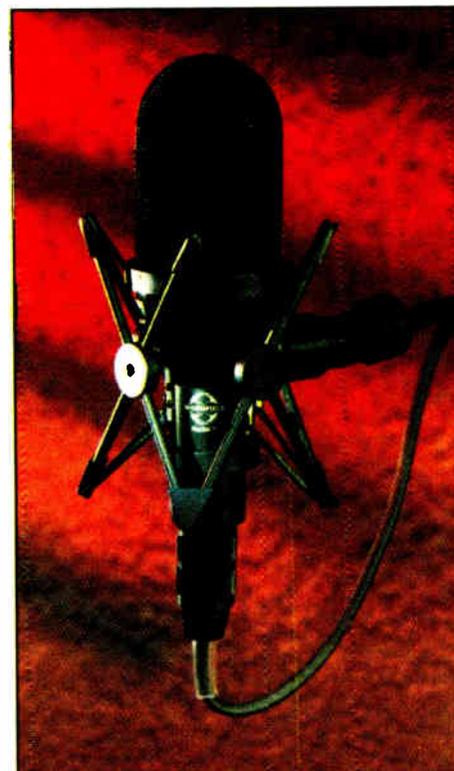
user to vary the pickup perspective over a wide range, even while it is on air.

SoundField Research Ltd., a member of the Drawmer group of companies, has two such microphones. The model ST250 is a portable, battery-operated version that provides extremely versatile control of the stereo image. The SoundField Mark V is a full-featured studio system offering even more flexible treatment of the stereo sound field. Each is comprised of a single-point stereo microphone head and a multifunctioned processor control box.

Because of the inherent nature of these systems, the physical orientation of the

microphone is less burdensome during location sound recording. Either can be placed on a stand, suspended from its cable, or even "fish-poled" for live-action pickup. Choice of "side-address" or "end-fire" orientation is easy: just press a button or two on the control box, and the left/right stereo output signals match the position of the microphone. Then all you have to do is turn two knobs to create just the right sense of reach and stereo spread.

The SoundField Mark V model offers extended features, such as the ability to pan the microphone through a full 360-degree rotation, tilt up or down by  $\pm 45$



SoundField Mark V mic

degrees, or zoom in and out. This versatility is especially beneficial in live, on-location situations where the clock never stops.

So how does the SoundField microphone do all this? Within its single housing are four discrete capsules that are electronically manipulated by the processor box to create the polar pattern, included angle and apparent position of a simulated coincident pair of microphones.

## Heart of the system

The processor box is the heart of each SoundField system. It features Capsule Solo buttons, which isolate each of the capsules inside the microphone, allowing you to confirm that all four capsules are working properly when you first set up.

The processor box also features a built-in oscillator that enables you to calibrate your recording or broadcast chain directly to the microphone.

Under the header Gain on the box are two controls that provide coarse and fine trim to optimize the gain of the microphone preamplifiers.

The End and Invert buttons allow you to tell the processor box how the microphone is positioned. Once these are set, the output signals correspond to this orientation.

The Pattern control adjusts the polar patterns of the simulated stereo pair of microphones, making possible a full range of patterns, from omnidirectional to cardioid to bidirectional.

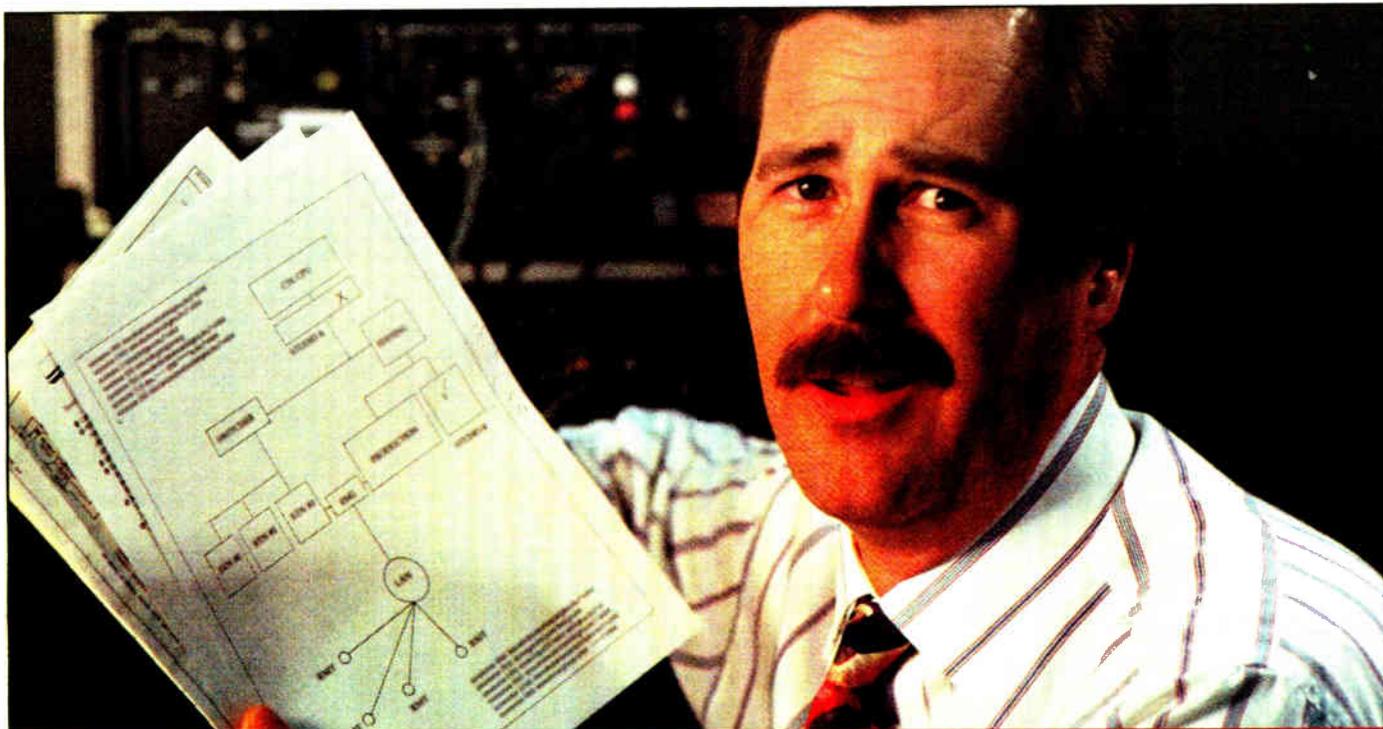
The Angle control adjusts the included angle between the two microphones of the simulated stereo pair, with range of 0 to 180 degrees. Together, the Pattern and Angle knobs offer a broad range of stereo pickup perspectives without changing the actual position of the microphone.

Of special benefit to broadcasters, the four-row Stereo Meter simultaneously displays both the left and right, as well as the sum and difference, signals produced by the microphone.

## Distinguishing features

All of these microphone controls are basic. There is another group of features that sets the Mark V apart from any conventional stereo or even mid/side microphone system. These features allow the simulated stereo pair to be rotated, tilted and adjusted fore/aft to achieve a better sonic balance, all without any physical motion of the microphone itself.

continued on page 106 ►



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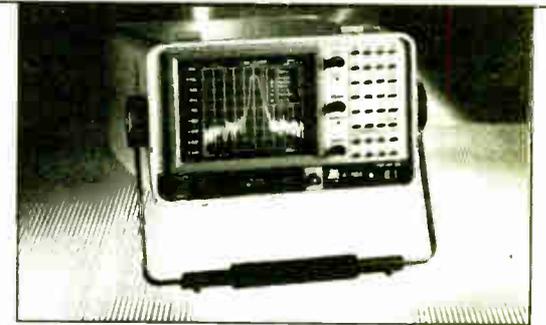
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Vol. 19, No 5 Radio's Best Read Newspaper March 8, 1995

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## SoundField Mics Deliver

► continued from page 104

The azimuth control allows the stereo pickup to be rotated through a full 360 degrees to effectively steer or pan the microphone through a full circle. This feature can be used to compensate for any minor rotation if the microphone twists on its cable while suspended.

The elevation control simulates tilting the stereo microphone system up or down by 45 degrees, allowing the microphone's pickup to be aimed critically without actually having to position it critically.

The dominance control provides an effect similar to moving the microphone forward or backward, giving the effect of zooming in or out. Together with the

azimuth and elevation controls, this feature makes recording on location much easier, especially when setup time is limited or the microphone cannot be put in just the right location.

The hi-pass filter inserts a low-frequency cut-off filter of -18 dB per octave below 40 Hz and is very useful for minimizing unwanted wind or traffic noise.

The MS button converts the stereo outputs to sum and difference signals, which allows you to record the component mid and side signals to two-track tape for subsequent matrixing to stereo.

The headphones control adjusts the level of the signal at the headphone jacks (both front and rear).

The B-format signals are available at separate outputs and represent the sonic components that define the sound field: three directional vectors (fore/aft, left/right, up/down) and absolute pressure. From these components, the sound field present at the microphone can be reconstructed later if the four signals are recorded to a multitrack.

During post production, all of these SoundField controls can be used to recreate and manipulate any sonic perspective desired.

I have been using the SoundField microphone in a variety of recording and broadcast situations for more than 10 years and consider it the most versatile tool in my microphone arsenal. I have flown it in concert halls, placed it on a stand outdoors, clamped it to a balcony railing, "boomed" it, and even hand-held

it on one occasion. Whether recording opera or a symphony orchestra, a marching band on parade, dialogue for a radio play, general background ambience, or even chasing a bagpipe player around the hall during a folk music festival, the SoundField has never let me down.

□ □ □

For information, contact QMI Pro Audio, U.S. distributor of SoundField microphones, in Massachusetts at 508-435-3666; fax: 508-435-4243; or circle Reader Service 153.

## Neumann Mics Hit The Road

► continued from page 103

the KM184 in every application I have been exposed to. I would love to try it on some orchestral recordings or live orchestral reinforcement but have not yet been afforded the opportunity.

I have, however, used the KM184 for recording instruments such as violin, flute, acoustic guitar and various horns, as well as drum overheads and percussion miking, with great success. I have also used it on percussion and drum overheads in a loud, compact environment, again with results that exceeded my expectations.

The transient response of the KM184 is superb, and its sound quality definitely carries the Neumann signature, especially in the low end and ultra-smooth midrange.

If this all sounds too good to be true, let me take a moment to discuss some potential down sides of the microphone. I say "potential" because I think it is a matter of perspective, how much bang you expect to get for your buck.

The first limiting factor of the mic is that it does not offer an interchangeable capsule, a break from tradition for this style of microphone. At the same time, however, it is an extremely incisive move on Neumann's part to cut cost, to offer a superior microphone at a very accessible price.

The second limiting factor of the microphone is that it does not offer a mic circuit pad. This may be an issue if you are attempting to close-mic drums for a drummer who plays relatively hard. The mic has a maximum SPL of 138 dB, but I have worked with drummers who have the ability to overload it.

This factor, however, has not dissuaded me from choosing and using this microphone. I just have to be a little more selective in my application. If I am set on the KM sound for toms or snare drum, for instance, I move up to the KM140, which offers the pad and interchangeable capsule. The same mentality applies when choosing between the TLM193 and the U87. In other words, if I need the pad or the pattern select, I move up to the U87; if not, I use the TLM193s and save the U87s for more demanding applications.

There are plenty of uses for the KM184 that do not require a pad or interchangeable capsule. Some might ask why Neumann doesn't offer the KM184 with a pad option. The answer is, simply, economics: You get what you pay for. With the KM184, though, you get a lot more than you pay for.

□ □ □

For information, contact Jeff Alexander in Connecticut at 203-434-5220; fax: 203-434-3148; or circle Reader Service 198.

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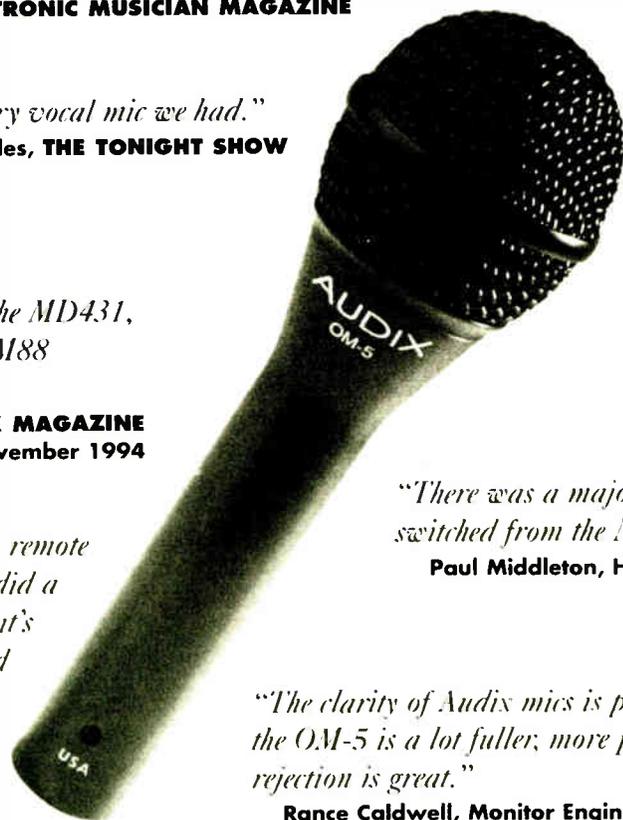
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USER REPORT

# Radio Shack Mic Holds Its Own

by Bill Clough  
Anchor, Producer  
& Religion Editor  
UPI Radio

**WASHINGTON** Both radio reporters and photographers spend most of their careers continually seeking their respective Holy Grails: the photographer always wants a better, more affordable lens, a radio reporter wants a better microphone.

For those who staff radio stations that cannot afford Neumann KM100 microphones, the choices are usually an EV635 when omnidirectional characteristics are needed—such as at a news conference where the microphone is clamped on a podium—and a Shure SM58 for directional work and for interviewing up close in a noisy environment.

With either microphone, the cost is more than \$100—even nudging \$200 for an SM58.

How about a microphone that easily holds its own for less than \$100 from Radio Shack? It's Tandy's top-of-the-line electret-condenser instrument microphone.

One test of the microphone convinced me that it is probably the best thing going for field production work when used with a Sony or Marantz cassette machine. At least one engineer at UPI Radio has tested it as a studio microphone.

Physically, the microphone is roughly the same as the EV635, but without the larger head. The condenser is powered by a single AA battery located behind the condenser housing, which unscrews to reveal the battery compartment. Because the diameter of the microphone is larger than that of the battery, a rubber washer is placed around the battery for a snug fit.

The specifications indicate an average current drain of less than 1 mA, requiring an alkaline battery life of more than 1,000 hours, which certainly approaches the shelf life of the battery itself.

The unit is turned on and off with a slide switch near the base, which requires a standard XL connector.

The microphone exhibits a reasonably strong bass boost when used too close. The frequency response curve shows a gradual (about 8 dB) rise from the bass to

**The beauty of using the microphone in the field is that it captures a great deal of the timbre and color of a voice . . .**

10 kHz, causing a good degree of brilliance in the midrange. It can make a field reporter think his cassette machine has just been equipped with Dolby. It is not, in any way, an ego-building microphone for those who wish they sounded like Edward R. Murrow.

The beauty of using the microphone in the field is that it captures a great deal of the timbre and color of a voice that is expected from a condenser microphone. The specifications indicate the frequency response is 50 to 15,000 Hz, but the catalog says it's 50 to 18,000 Hz. Academic, perhaps, if used on a cassette machine.

It's easy to over-modulate if you're not careful. The specs simply list a sensitivity of -69.5 dB. Impedance is 600 ohms.

The unit comes with a soft case, the rubber washer bat-

tery holder, a holder for a microphone stand and a 15-foot microphone cable—female XL connector to quarter-inch male phone plug.

One problem with the mic is that it is prone to popping unless used with a wind screen. Unfortunately, Radio Shack doesn't offer a wind screen that fits. No problem. Use one designed for an EV635. It works like a charm.

And, for those who are sensitive to criticism that you are not using a professional microphone, the wind screen just manages to hide the Radio Shack logo.

Now, about the microphone clamp. The problem is that the microphone, made in Japan, is slightly larger in diameter than an EV635. This means that although clamps designed for the EV635 will work, the grip is tenuous. It doesn't take much pressure to make the condenser go flying away like a squeezed watermelon seed.

The clamp that comes with the microphone works fine, except the threads that screw on a microphone stand seem to be made of plastic and are therefore easily stripped.

Like the microphone, the clamp calls for a little extra care. Radio Shack offers a three-year repair warranty for an extra charge.

Save the receipt.

I have used the microphone at news conferences at the National Press Club, for interviews at a noisy, outdoor demonstration, and in the studio. While I make no pretense of being an audio engineer, I found the results crisp, brilliant and clean, with a presence and color I have not heard from any field microphone I have previously used.

In other words, it's my field microphone—until I can afford not only a field condenser microphone that allows me to switch capsules when I need different patterns, but also a security guard to accompany me on assignments.

□ □ □

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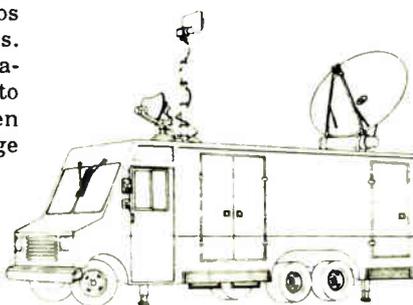
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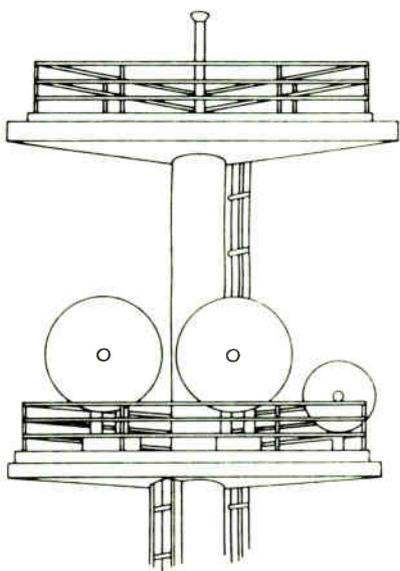
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## USER REPORT

# Wired about Sennheiser's RF System

by Terry L. Kulchar  
Senior Audio Engineer/  
System Design Engineer  
Unitel Mobile Video Inc.

**PITTSBURGH, Pa.** It was not all that long ago that using a wireless mic was a real dice roll. RF mics worked either OK or not at all.

Today's wireless mics are vastly better than the models available just a few years ago. If you prepare yourself with the right gear, the roll of the dice will always be in your favor.

Recently I had the pleasure of renting Sennheiser's newest entry into the wireless world. Scott Schachter at Scharff Weisberg Inc., an audio rental house in New York, told me that the new Sennheiser three-packs just arrived and I would have them on their first outing. I was eager to check them out under actual operating conditions.

## Elements of the system

The system I used included the SK-50/50B body pack transmitters and the new EM-203 receiver chassis fitted with three EM-1046 full diversity receiver modules each. I refer to this system as a three-pack or three-banger.

Many of us who use wireless on a regular basis usually need anywhere from two to six units or more for a project. Three systems in one chassis frame works perfectly

for most small jobs where you need to mic two people, with a spare for backup.

The SK-50 body pack transmitter is the smallest I've ever seen, yet packs 50 milliwatts RF output power. The units I rented used replaceable alkaline batteries; however, the company offers an optional rechargeable battery pack. The battery pack is quickly removable and features a nifty LED battery condition monitor.

**If you have a job to cover and only one chance to get it right, this is the system you want.**

I used Sennheiser MKE-2 lavalier microphone elements combined with the transmitters for this particular project. Other manufacturers' mics can be used with the transmitter by ordering raw plugs and doing your own wiring.

The audio front end of the transmitter seemed to handle whatever was thrown at it, from shouting to a whisper. The multiposition gain setting switch lets you optimize the system's gain structure. The transmitter also has a soft limiter that can be switched in if desired.

The transmitters are fully synthesized and frequency agile across 16 factory-determined UHF<sup>2</sup> frequency or channels, in 24 MHz increments in the 450-790 and

630-960 MHz ranges. Although VHF units could work equally well, your chances are a lot better at UHF because of the lack of congestion and enhanced RF performance at UHF frequency.

## Receiver design

In an RF mic system, the receiver design is the most important element. That's where this system really shines. The

receiver unit houses three EM-1046 full-diversity, synthesized receivers and has a self-contained universal AC power supply. The frame can also run off any 12 V DC source. A variety of antennas are available for the units. I used what I refer to as "bat wing" antennas, which get their nickname from their shape and color.

The ones I used were the GZA-2003s, which offer a 3 dB forward gain over an omni ground plane antenna. They're actually a log periodic-style antenna with an approximate 45- to 50-degree angle. Other models with different polar patterns and antennas that contain RF preamp are also available.

The receiver chassis conveniently provides switchable phantom power for running the optional antenna preamp up each coax. Receiver outputs are on an XLR connector with a switchable mic or line level output.

## Software features

The software features that each receiver's module offers are the real treat. A

bright eight-position alphanumeric display helps guide you through menu functions. The display also shows all kinds of information, such as the unit's serial number, operating frequency, transmitter battery condition (in percentages) and the name of the person who has that particular unit's transmitter on his person.

A dual bar graph display can be programmed so each side can display different parameters, such as receiver RF signal levels (calibrated in mV), modulation deviation and transmitter battery condition, or any combination you determine useful.

Two diversity LEDs show which side of the receiver is presently active. A standby switch provides audio output muting or temporary shutdown of the receiver's RF stages if programmed to do so. A monitor button allows monitoring on the receiver frame's headphone jack. The receiver's squelch can also be set manually as required.

Sennheiser's RF mics are the best units you can buy. The price, however, is not for the squeamish. But you get what you pay for, and then some with this gear. If you have a job to cover and only one chance to get it right, this is the system you want. If you need a high-end RF mic only occasionally and can't afford to buy one, you can always rent one.

The companding action in the transmitter and receiver is transparent with no signs of mistracking or breathing that some units exhibit if you listen carefully. I couldn't detect the diversity switching in the receiver.

Both RF and audio performance are flawless. You'll think you're getting the mic signal on a wire, not via RF.

I give these units high marks and recommend them to anyone who needs a truly bullet-proof RF mic system. In my opinion, Sennheiser has perfected and pushed RF mic technology to its limits.

□ □ □

For information, contact Albert Zang in Connecticut at 203-434-9190; fax: 203-434-1759; or circle Reader Service 219.

## FM Panel Antennas

Reduced  
RF Antennas

FM PENETRATOR  
Antennas

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Directional Patterns

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Rigid Transmission  
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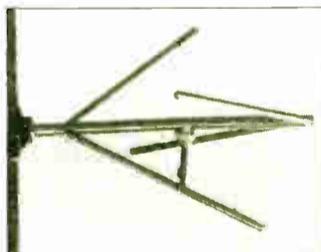
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## TECHNOLOGY UPDATE

### AIR CORP.

#### AIR Corp. Pro-Announcer Controls Voice Levels

**COPPELL, Texas** The AIR Corp. model 500 ph Pro-Announcer microphone processor controls voice levels absolutely.



Three equalizer sections with variable boost and cut are designed for easy adjustment without increasing room rumble or system hiss. A de-esser suppresses excessive sibilance without being noticeable. The de-esser also protects FM pre-emphasis curves from sibilance overshoots. The 500 ph includes phase rotators to correct voice symmetry. The result is a sound with more talk power and less compression.

Front panel selection of input levels

in four ranges, from +4 dB to -50 dB, allows for easy integration into any system. Dual outputs—mic level and line level, servo-balanced to eliminate ground loops—can feed consoles, create external mix-minus sources or return to console patch points.

The compressor/expander is close coupled for maximum punch with no noise "rush up." The compressor pro-

jects for overshoots and holds average levels to within 3 dB of nominal output. The expander reduces studio noise and room "ringing" with no apparent effect on the microphone sound.

It also comes standard with 48 V DC phantom power for condenser mics, and a front-panel headphone jack for ease of setup.

For information, contact Jim Loupas in Texas at 214-304-0455; fax: 214-304-0550.

# DIGITAL QUESTIONS

**Q** "I have two studios.  
Can I afford a really good digital system?"

**Q** "Will I have to change the way I operate?"

**Q** "Are digital systems reliable enough yet?"

**Q** "Will I have back-up?"

**Q** "What happens when my system dies...  
At 2 AM?"

**Q** "Can I network thirty studios on one system?"

**Q** "How fast can I convert to digital...  
Realistically?"

**Q** "Who can I trust?"

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**Aphex Tubessence Mic Preamp Gives Tube Sound Without Tube Limitations**

**SUN VALLEY, Calif.** The Aphex Model 107 dual-channel thermionic (tube) microphone preamplifier employs a high-performance, low-noise, matched transistor front end, coupled with the company's "Tubessence" tube circuit. This design differs from that of conventional tube preamps that use input transformers. Also, the first stage uses no overall feedback loop, a technique that results in better transient

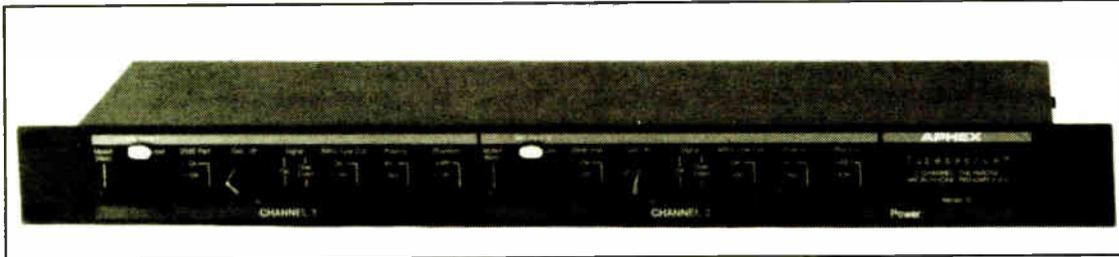
response and sonic detailing.

The Tubessence circuit overcomes tube problems like "Miller effect," high power dissipation, high-voltage power supplies and limited amplification bandwidth. However, it delivers the essential characteristics of tube amplifiers, like distortion, dynamic transient response and soft overload attributes. Tubessence therefore delivers the essence of tube sound without many of the difficulties

and limitations of conventional tube circuit designs.

In addition to Tubessence, the Model 107 features two independent channels, 64 dB of gain with level indicators, a switchable 20 dB pad, switchable +4 dBu or -10 dBV outputs, a low-cut filter and 48 V phantom power.

For information, contact the company in California at 818-767-2929; fax: 818-767-2641.



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**AUDIO-TECHNICA**

**AT4050/CM5 Features Three Switchable Patterns**

**STOW, Ohio** Expanding on the technology of its AT4033 studio capacitor mic, Audio-Technica's new large-diaphragm AT4050/CM5 features three switchable polar patterns: cardioid, omni and figure-eight.

The microphone utilizes dual vapor-deposited, gold-plated, specially-contoured diaphragms that are aged through five separate steps to ensure optimum characteristics. Floating construction elements provide isolation from noise and vibration, while symmetrical, transformerless circuitry provides exceptional transient response and clean output, even under extremely high SPL conditions. Offering consistent performance in each pattern setting, the mic is transparent and true to life without sacrificing warmth or ambiance.

The AT4050/CM5 has a frequency response of 20 Hz to 20 kHz, with a low noise floor of 17 dB SPL, typical. The mic accepts a maximum input sound level of 149 dB SPL and has a dynamic range of 132 dB. A 10 dB pad allows operation in sound fields up to 159 dB SPL. The mic also features a signal-to-noise ratio of 77 dB and an 80 Hz, 12 dB per octave hi-pass filter.

For information, contact the company in Ohio at 216-686-2600; fax: 216-688-3752.



**AUDIX**

**Sturdy Audix OM-5 Can Be Used As Professional Concert or Broadcast Mic**

**LAKE FOREST, Calif.** Although designed primarily for use as a professional concert mic, the Audix Model OM-5 hypercardioid dynamic microphone may also be used for a variety of broadcast applications. The greater than 30 dB background noise rejection, as



well as the storage pouch, makes the OM-5 ideal for remote use.

Unlike microphones that use neodymium magnets and have unnatural sound and excessive feedback, the OM-5 does not sacrifice sonic quality or feedback rejection to achieve its high levels of gain.

This mic also features gold-plated XLR connector pins and a design that provides low handling noise. Its body is sleek with a black matte finish.

The OM-5 is constructed for durability and comes with a two-year warranty.

For information, contact the company in California at 800-966-8261; fax: 714-588-8172.



**Change** ...IN RADIO, COUNT ON IT.

**Change**

**CHANGE**

**DCS IS THE ONE HARD DISK SYSTEM  
RADIO DEPENDS ON TO KEEP UP WITH IT.**

**25** Tuesday  
January

*New  
Format*

*New  
Network*

**T**hink about it. How much has changed at your station in the past year? Two years? Three years? Have you changed formats? Network and program suppliers? Switched to satellite or CD jukeboxes or back to live? Rebuilt your studios? Become part of an LMA or duopoly?

**C**hange is one reason why DCS (Digital Commercial System) from Computer Concepts is the industry's leading hard disk system, year after year. It never locks you into one way of doing things.

**D**CS accommodates every network or satellite program service currently on the air or on the way. So if you change affiliations or program suppliers, you don't have to worry about system cues or variable local insertion windows.

**A**s your studio configuration changes, so can DCS. Unlike most systems, we give you a choice of storing audio in a central database, or distributed among DCS workstations... or both. Some of our users now place all of their commercial and music inventory onto the DCS hard drives. When you're ready to go all-digital, DCS will be ready too, with AES/EBU digital inputs and outputs available, as well as analog.

**12** Monday  
December

*LMA  
Starts  
Today*

**A**nd if you're looking at a duopoly or LMA, you'll be glad to know that many DCS units are employed in such remote or multi-control arrangements.

**M**anaging change is hard enough. Shouldn't you have the hard disk system that can help you keep up with it all? Call Computer Concepts for more information and a list of hundreds of satisfied DCS customers.

**17** Friday  
June

*Move to  
New Studios*

*Satellite  
Overnight*

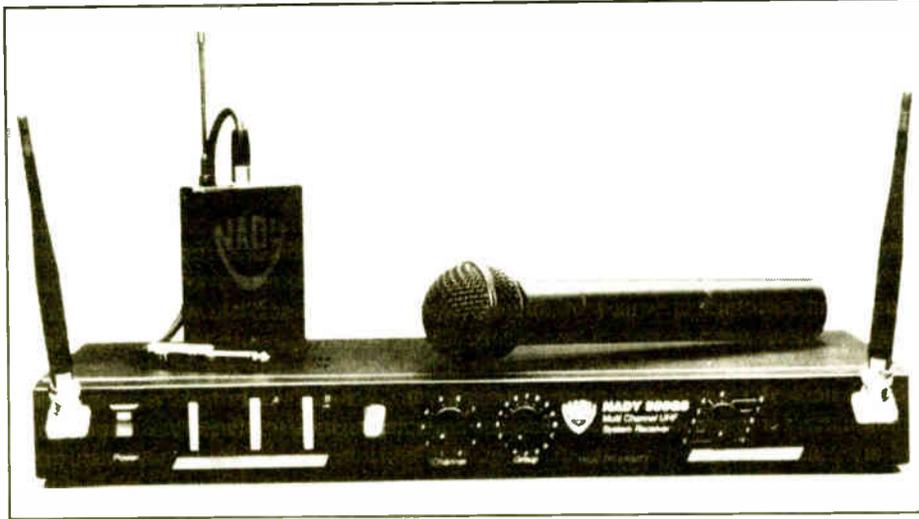
## NADY

### Nady 950GS UHF Wireless System Features Companding Noise Reduction System

**EMERYVILLE, Calif.** Designed and engineered in the U.S., the Nady 950GS UHF wireless system is available with up to 160 user-switchable channels in the 450-950 MHz range.

Nady designers spent years developing what they claim is the quietest RF link of any UHF system available—up to 20 dB quieter than other systems.

Nady's patented companding noise reduction system delivers a full 120 dB dynamic range for plenty of headroom. The 950GS comes with a versatile handheld multichannel microphone. The modular design of the mic allows the user to



change custom-installed, popular-brand mic elements in the field quickly and without soldering.

Other features include True Diversity dual-receiver, front-end reception, Tone Squelch to prevent interference from

other RF sources, hiss mute, bass boost and three-way power options.

For information, contact Nady Systems in California at 510-652-2411; fax: 510-652-5075.

## SANKEN

### Sanken CCS-5 Achieves High Directivity of Longer Conventional Shotgun Mics

**WEST HOLLYWOOD, Calif.** The performance of the Sanken CSS-5 shotgun stereo microphone is based on an array of five new directional condenser elements, with PPS (poly-phenylene-sulfide) diaphragms to provide optimum humidity and temperature stability.

For major broadcast events, it has become desirable to record targeted sounds precisely, with the added option of capturing realistic stereophonic perspectives. Stereophonic localization depends primarily on signal accuracy and channel separation in the 400 Hz to 3 kHz range.

Pattern control of the CSS-5 has been optimized in this range. Very low and very high frequency response has been optimized along the frontal axis so that the target on-axis sounds are clearly delineated. In playback, the frontal image is accentuated, with side signals positioned slightly behind.

The CSS-5, which is less than 12 inches long, achieves the high directivity of much longer conventional shotgun microphones.

In this microphone, the three-capsule line array is designed for frontal pickup. The capsules are arranged vertically along the same axis for excellent mono/stereo compatibility.

Proximity effect is virtually eliminated. Sonic characteristics do not change with the varied distances between source and microphone.

For information, contact Jim Schaller in California at 213-845-1155; fax: 213-845-1170.

### RE digital audio encoder and decoder



### RE audio codecs — full compliance with the industry standard

Buy an audio codec from just about anybody other than RE and you may get more than you bargained for—hopeless operational procedures, non-standard compression protocols and limited connectivity.

Then again, you may get less. Less bandwidth. Fewer compression options. No service.

Let's face it. There are a lot of products out there that promise you the world, yet corrupt your signal and complicate your life. You simply cannot afford non-standard audio codecs. That's why when the time comes to look at your audio transmission needs, you'll want to take a closer look at RE.

RE offers ISO/MPEG Layer II audio compression, which is the most widely used high-fidelity audio compression algorithm in the industry. We're the only company in the world that can offer you half sampling frequencies for a choice of six different sampling rates, and bandwidths up to a full 20kHz. We're also the company to provide CRC scale factors to protect your

audio from transmission errors. And when it comes to compression and compatibility, our implementation of ISO/MPEG Layer II has been thoroughly checked and tested by the IRT in Munich—part of the very team that invented the standard in the first place.

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## AKG

### AKG Offers C577 Lavalier And D230 Dynamic Mic

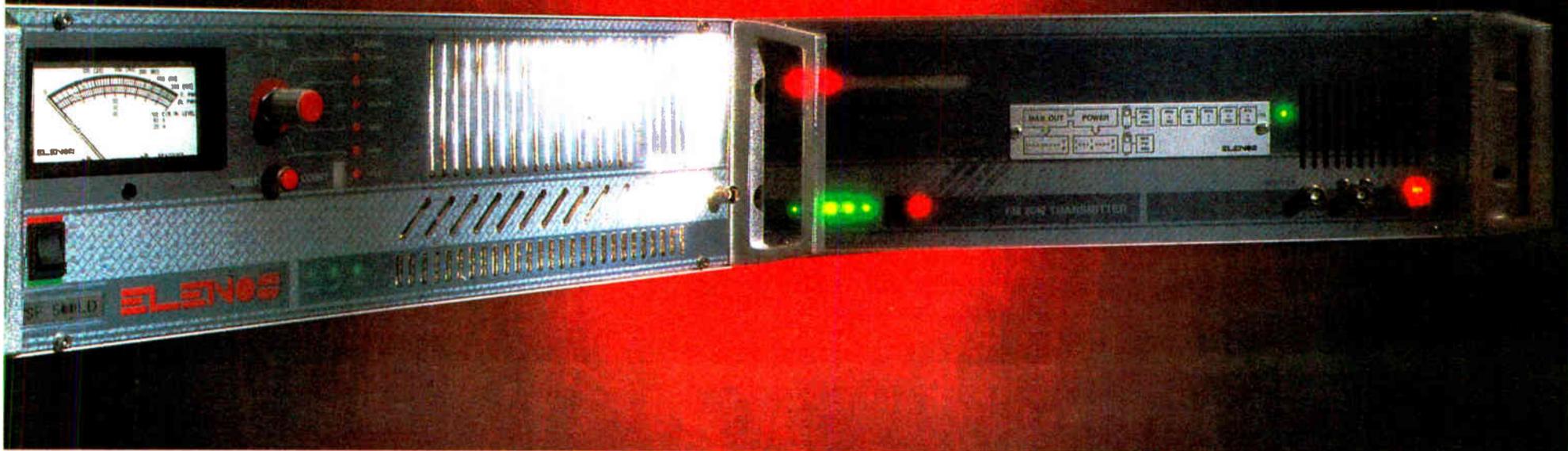
**NORTHRIDGE, Calif.** AKG offers two new microphones, the C577 and the D230, for broadcast use.

The C577 is a dual-diaphragm, miniature lavalier microphone that weighs only 0.014 ounces with a length of 0.55 inches. This mic has a frequency range of 20 to 2,000 Hz and features an omnidirectional pattern and acoustical properties, making it well-suited for vocal and speech applications.

The C577 rejects mechanical interference, such as cable and clothing noise, as its diaphragms face sideways rather than forward.

The D230 omnidirectional dynamic mic is designed to handle tough outdoor assignments. It transmits vocals free of distortion, despite wind and other noise. The D230 is a reporter's interview mic, with high sonic quality, rugged construction, low handling noise and an extended handle for longer reach. The mic's special, non-reflective gray color minimizes camera visibility. It features a three-pin XLR connector and a frequency range of 40 to 20,000 Hz.

For information, contact David Rahn in California 818-894-8850; fax: 818-830-1220.

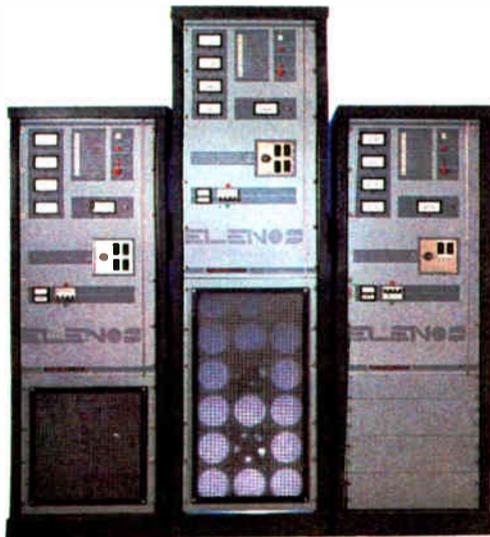


# Elenos, of course.

*E*stablished in 1977, Elenos has based its company philosophy on a precise commitment: investment in research. As a result of this commitment, Elenos is now able to offer a range of specialized products capable of providing the best possible solutions to radio broadcasting problems: • FM Power amplifiers • FM Solid State amplifiers • Exciters • Radio link • Filters • Combiners • Aerials • Remote Control RF Diagnostic. As always, Elenos guarantees quality, high-level technology, compactness, interface capabilities, energy saving, reliability and greater attention to operational problems.



RF DIAGNOSTIC REMOTE CONTROL



FM TUBE AMPLIFIERS RACK SERIES

*C*reada en 1977, Elenos ha basado la propia filosofía empresarial en un preciso empeño; invertir en la búsqueda. Dicho compromiso permite hoy en día a Elenos de ofrecer una gama de productos especializados en condiciones de resolver de la mejor manera las problemáticas broadcastin: • FM Power amplifiers • FM Solid State amplifiers • Exciters • Radio enlace • Filters • Combiners • Antennas • Remote Control RF Diagnostic. Elenos desde siempre es una garantía de calidad, tecnología, compacidad, interfazabilidad, ahorro de energía y fiabilidad otorgando una mayor atención a los problemas operativos.

# ELENOS

BROADCASTING EQUIPMENT COMPANY

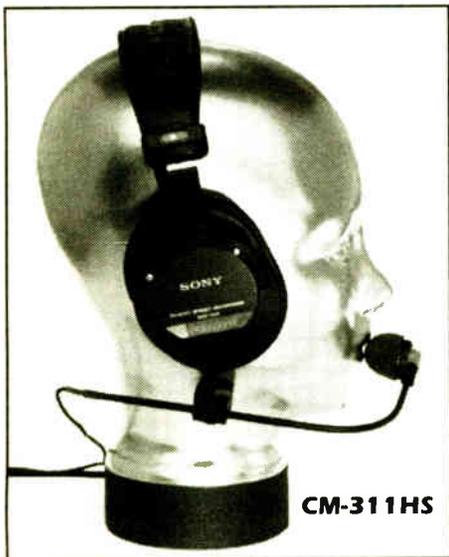
Via G. Amendola, 9 44028 Poggiorenatico Ferrara Italia Tel. 39/532 829965 Fax 39/532 829177  
73 Oak Street Plymouth MA 02560 USA Ph. (508) 890-0448 Fax (508) 747-4696

CROWN

**CM-311HS and CM-312HS  
Mics from Crown Mount on  
Sony Headphones**

**ELKHART, Ind.** The Crown CM-311HS is a headworn, noise-cancelling mic that mounts on a Sony MDR-7506 or MDR-V6 headphone. Worn with lips touching the mic, the CM-311HS provides outstanding isolation from ambient noise. It works well in traffic-copters or at sporting events with high noise levels, yet the sound is high-fidelity, natural and smooth. A cardioid condenser design, the mic adjusts to fit any user. Response is 50 Hz to 15 kHz. A belt-pack provides battery or phantom powering, a mute button and a balanced low-Z output.

The Crown CM-312HS, a lightweight



CM-311HS



CM-312HS

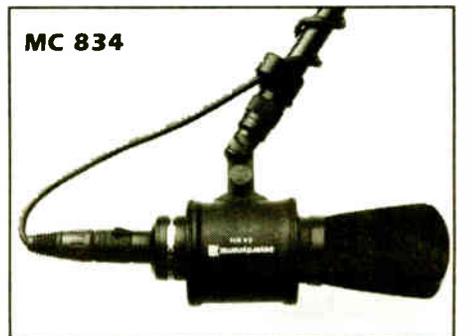
hypercardioid condenser mic, is similar to the CM-311HS, except that the mic is worn to the side of the mouth. Although it has slightly less isolation than the CM-311HS, the CM-312HS is more comfortable and less conspicuous, making it a good choice for radio talk-show hosts who move around the studio.

For information, contact Crown Audio in Indiana at 219-294-8000; fax: 219-294-8329.

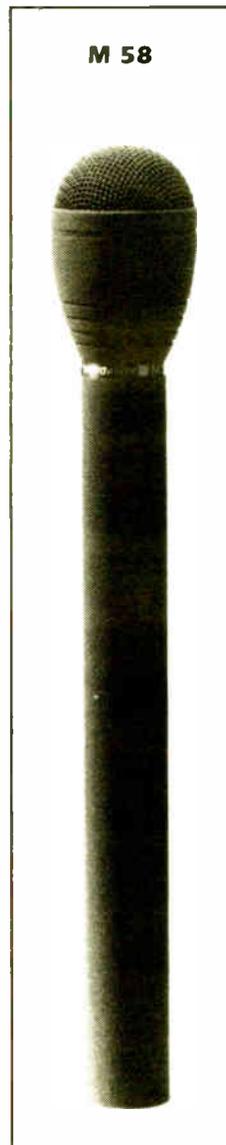
BEYERDYNAMIC

**beyerdynamic Offers  
MC 834 For Digital  
Recording, M 58 for  
ENG and EFP Use**

**FARMINGDALE, N.Y.** beyerdynamic has reduced the price of its MC 834 condenser microphone. This universal mic can be used for digital recording,



MC 834



M 58

both lead and backup vocals, voice-overs and miking of pianos, strings and brass instruments. It is also suited for home recording artists.

The MC 834 features a wide-range, natural frequency response, high SPL capability, transformerless output and a large-diameter, gold vaporized membrane element.

beyerdynamic also offers the M 58 moving coil dynamic microphone. Its omnidirectional polar pattern captures the full, natural ambience of the acoustic environment, while accurately reproducing the sound. An internal shock mount system reduces hand-held or stand-borne noise and vibration. The M 58's frequency range has a subtle upper

frequency rise that enhances vocal and speech clarity.

The M 58 is specifically designed to satisfy the demands of ENG and EFP applications: its rugged construction enables it to withstand the physical and environmental conditions typical of field production operations.

For information, contact the company in New York state at 516-293-3200; fax: 516-293-3288.

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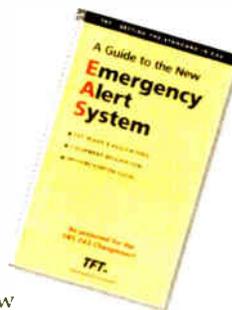


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## The Radio of the Future at your Fingertip



### The AEQ MAR System

- ▶ Transmission control is simplified and can even be totally automated or partially (i.e. at night time, when the benefits from an automatic or telecommanded transmission are obvious).
- ▶ A Touch-screen interface and a proper graphics environment allows to carry out each and every function with a fingertip. Virtual keys "on screen" invites to operate the System in an intuitive and friendly way.

### Specifications and requirements:

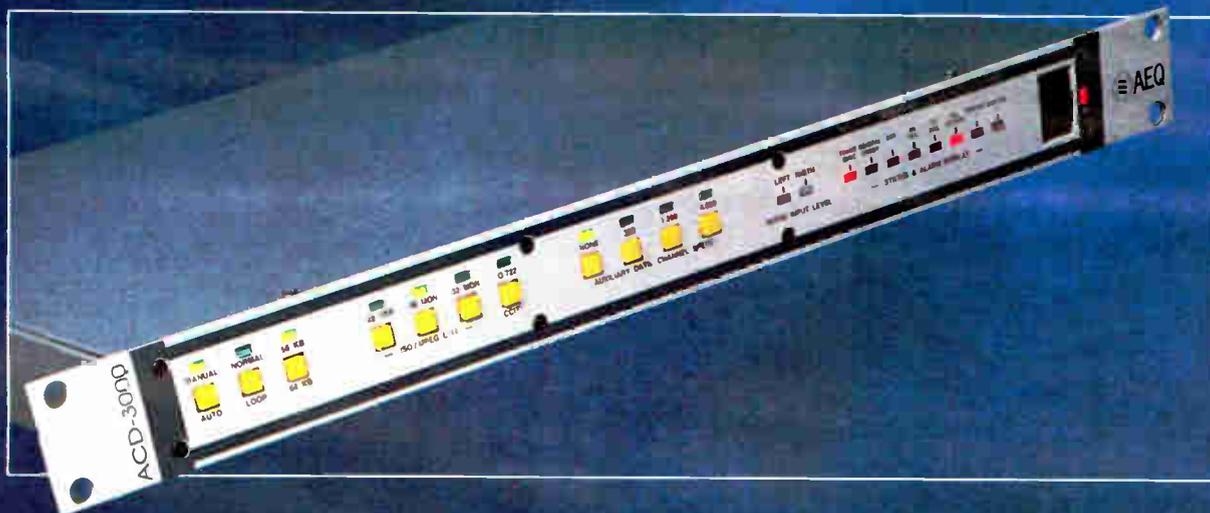
- ▶ Audio coding and decoding in conformity with ISO/MPEG Layer II.
- ▶ Versions for DTMF or Continuous Data Channel telecommand.
- ▶ Automatic News Recording System activated by DTMF.
- ▶ Runs on PC 386 DX 33 or higher, with 2 Mb RAM minimum, requiring DOS 5.0 or higher.
- ▶ Also operates under many popular LAN's O.S. like NOVELL 3.11, Personal Netware, Lantastic, etc.
- ▶ Drivers for Touch-screen, mouse or track-ball included.
- ▶ 16 bits A/D and D/A conversion.
- ▶ AES-EBU format digital inputs and outputs.
- ▶ 31.25 seconds of stereo audio per each Mbyte, at 48 MHz and 256 Kbits/sec.
- ▶ Storage capacity from 5 to 80 hours of stereo audio on hard disk.
- ▶ Unlimited storage on optical rewritable disks (capacity for 6 hours of stereo audio each).

### Features:

- ▶ Language selection.
- ▶ Access selection by groups of users.
- ▶ Selectable file sort criteria.
- ▶ Password assignment for remote users (journalists or stations) of the Automatic News Recording System.
- ▶ Automatic News Recording remote controlled by users or journalists.
- ▶ Automatic news edition.
- ▶ Audio file management and edition.
- ▶ Manual and automatic play lists.
- ▶ Multiple templates with up to 24 simultaneous immediate access keys.
- ▶ Printable transmitted advertisement log lists.
- ▶ All work station associated to the System are multitask, enabling the management of the transmission, recording, play list and template edition and automatic transmission from any of these.
- ▶ The System can be expanded from a single basic configuration, incorporating more work stations.
- ▶ The software is PC compatible and also LAN standard, proportioning a maximum flexibility and adaptability of software and hardware.
- ▶ Audio resources are stored in a common server for all users, enabling real time access to any audio file from any work station, even from various of these simultaneously.

## Transmitting Digital Audio was Never so Easy and Accurate

The  
Audio Codec  
selected  
for the  
transmission



of the  
World's  
Greatest  
Sports event  
of 1994

### AEQ ACD-3000 Digital Audio Codec

- ▶ The ACD-3000 is a full-duplex coder and decoder offering up to 13 KHz of analog bandwidth simultaneously in both received and transmitted signals, depending on the selected mode of operation.
- ▶ The equipment uses CCITT G.722 and ISO/MPEG Layer II compression algorithms in a wide range of operating modes and combinations.

### Operating modes:

- ▶ The ACD-3000 offers the flexibility of user defined operating modes. The selection is made on the front panel keyboard, and is fully indicated by LEDs, as well as the communication status and alarms.
- ▶ 24 STEREO, 48 MONO, 32 MONO and G.722 modes are available.

### Features:

- ▶ Input / output bit rate selectable at 56 or 64 Kbits, with any of the operating modes.
- ▶ Manual and automatic synchronization. Last synchro. configuration is stored in memory, for a fast resynchronization, in the event of a power failure.
- ▶ Auxiliary Data Channel available when the ISO/MPEG Layer II algorithm is selected.
- ▶ LOOP and TEST modes available.
- ▶ Error alarms for digital audio port, synchro status, bit stream, equipment, etc.

### Specifications:

- ▶ Two analog inputs (transformer coupled).
- ▶ Two analog outputs (transformer coupled).
- ▶ Digital interfaces V.35 and X.21 / RS-422.
- ▶ RS-232 interface for Auxiliary Data Channel.
- ▶ 16 bits Sigma-Delta A/D and D/A converters.



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## INDUSTRY ROUNDUP

# Broadcasters Turn to High-quality Mics

by Whitney Pinion

**WASHINGTON** As the quality of transmitted audio continues to improve, broadcasters are becoming more particular about their sound and the equipment used to achieve this sound. Increasingly, they are turning toward microphones that offer higher sonic quality, and determining how they can fit these better mics into their budgets.

In the studio, says Mike Solomon of beyerdynamic, engineers are reevaluating the traditional choices of older-style dynamic microphones used by on-air

talent. "Engineers are definitely taking a closer look at condenser mics," he says. "They offer quality and sensitivity beyond the scope of standard mics used for decades."

Ken Reichel of Audio-Technica says that he's seeing more and more condenser mics in the studio in place of dynamic mics, the cheaper, more rugged standby. "With the advent in broadcast of Surround Sound and better transmission, talent and engineers are getting more critical of on-air sound," he says.

Broadcasters still depend on dynamic microphones for work in the field, but

even that's starting to change, according to Reichel. Many headworn microphones now use condensers for better overall performance. Another benefit of condenser microphones is size. "You can do more with a small-size condenser than with a dynamic mic of the same size," he says.

The trend in microphones, says Uwe Sattler of Neumann, is certainly toward more accurate units. Another trend, in direct contradiction to the first, is cost efficiency.

One of the biggest drawbacks of condenser microphones for broadcasters is

price. Incorporated in the steep price of condensers are multiple patterns and various features that make these microphones more flexible. Although broadcasters want the sonic quality of condenser mics, they do not always need the extra features.

Whereas recording orchestras or other musical performances requires multipattern microphones, an announcer simply needs a mic that can accurately reproduce his or her voice. "An announcer can get away with a not-so-fancy mic," Sattler says.

Manufacturers of high-end microphones have responded to this dilemma by offering scaled-down versions of their condenser mics priced lower than their full-featured counterparts. Broadcasters may have fewer options, but in exchange, they get high acoustic quality for less money.

Leaving out some of the extra features, Sattler says, sometimes even improves a microphone. "By leaving switchers out, we have a better sound floor," he says.

There are, however, applications in which dynamic mics are more appropriate than condensers. Because dynamics are less fragile, they are particularly well-suited for live broadcasting, or for music tours, where equipment might not be treated delicately.

**Although broadcasters want the sonic quality of condenser mics, they do not always need the extra features.**

Some manufacturers are offering dynamic microphones that feature improved rejection characteristics and high sonic quality, even at intense volumes. The aim, says Cliff Castle of Audix, is to offer "a good blend of technology"—a combination of features of live mics and studio mics.

Solomon says that radio news and sports reporters are going out into the field with better-quality dynamic microphones, microphones similar to those being used by their counterparts in television.

Ty Ford, an independent producer, predicts that, as broadcasters become more accustomed to a particular sound from a microphone, microphones will be sold as part of a system. "A little understood phenomenon is the interaction of the electrical properties of the mic, cable and mic preamp," he says. The sound produced by the microphone can vary widely depending on the type of cable used and the preamp. A mic, cable and preamp system, Ford says, would eliminate this variation for a consistent sound.

Jim Schaller of Sanken says that he sees this trend mainly in the wireless business, where users "want to buy what is wired and has the right modifications."

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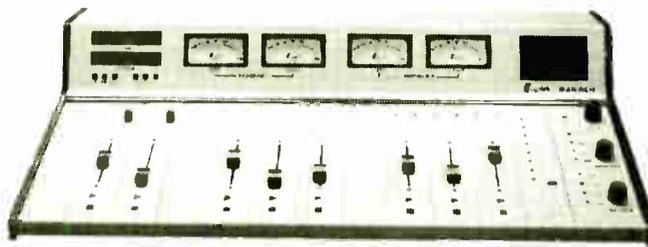
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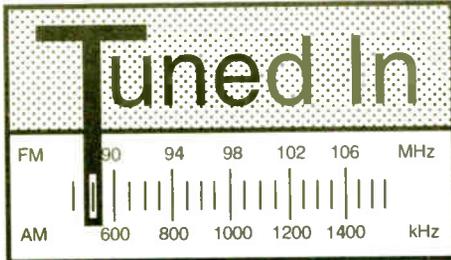
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### People, Promotions and Appointments

James T. Stenberg was named president of **Jampro RF Systems Inc.**, which began operation in November 1994. The company designs and manufactures passive RF components and systems for broadcasters.

**Varian Associates Inc.** named **James J. Commendatore** vice president and general manager of its Microwave Equipment Products (MEP) business unit.

**Nancy Carter** was promoted to director of human resources at **Microwave Networks Inc.** She is responsible for all human resources functions and policies, including salary and benefits administration and employee relations.



**Steven J. Spradlin** was promoted to sales application engineer for **Harris Corp.'s Broadcast Division (Harris Allied)**, Quincy, Ill. In this position, Spradlin provides worldwide sales and marketing support for Harris' AM radio transmission product line.

**Mike Donovan** joined **Vallie Consulting**, a Washington, D.C.-based consultancy.

**Anthony Rao** of **Narda Microwave Corp.** was promoted to cellular sales manager, focusing on wireless operating companies and support sales activities. Rao was most recently regional sales manager for the company.

In a major restructuring of its marketing and sales operations, **Fairlight ESP Pty Ltd.** announced the appointment of three key managers. **Wayne Freeman** was named CEO, **John Lancken** was appointed international marketing manager, **Nick Cook** was named director, European operations.

**Roger A. Wolski** was named digital editor at **Radio Spirits Inc.**, a syndicator/producer of old-time radio programs and recordings.

**Richard Gomrick** joined **Andrew Corp.** as account manager in the Earth Station Antenna and Broadcast Systems Business Unit. Gomrick will focus on the sale of ESA products and systems to mobile integrator and domestic broadcast accounts.

### Company News

**ViaSat Technology Corp.** is in the process of changing its name to **Mobile Satellite Products Corp.** The transition began last November and is expected to take six months.

The **Will-Burt Co.**, manufacturer of pneumatic and mechanical telescoping masts, received ISO-9001 certification.

**Lightwave Systems Inc.** delivered three Fibox multichannel digital audio transmission systems to NBC Sports in New York. The NBC order included one 24-channel bidirectional system and two 12-channel bidirectional systems with breakouts.

The **Texaco Metropolitan Opera International Radio Network** selected **Synergistic Technologies Inc. (STI)** to provide international transmission services. The coding and receiving equipment chosen by STI for the project is manufactured by **ComStream Corp.** Broadcasts began in December 1994.

**Neotek Corp.** announced that it now offers outboard, rack-mount microphone preamplifier and equalizer units. The company reached a cooperative agreement with **Sytek Audio Systems** to distribute its product through Neotek channels.

**Radio Programming and Management Inc. (RPM)** and **ENCO Systems Inc.** announced their cooperation in making RPM's music libraries available preloaded into the ENCO DAD486x digital audio delivery system.

For information, contact either Ray Lowy or Tom Krikorian of RPM at 800-621-5699 or 800-521-2537, respectively; or contact Larry Lamoray of ENCO Systems at 800-362-6797.

**California Amplifier Inc.** completed an internal reorganization of the sales and marketing departments to more effectively focus the company's efforts on its two major product lines: cable and satellite products and wireless cable products.

**LPB** appointed **Broadcom International Co. of Verwoerdburg, Republic of South Africa**, a new dealer of the company's complete line of audio consoles. **Broadcom** was also appointed LPB's exclusive distributor of transmission systems in the RSA.

Electronic components distributor **Richardson Electronics** added **Henry Engineering's** audio products to its inventory of broadcast-related components. Richardson will stock Henry's full line of audio interface products, recorders, amplifiers and workstations.

**Flash Technology Corp. of America (FTCA)**, a manufacturer of obstruction lighting beacons, announced the opening of its new service training facility. For a limited time, in conjunction with its 25th anniversary celebration, FTCA is offering reduced service seminar rates.

For information, call FTCA at 615-377-0600.

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# KISN Phones Home with Gentner

*Station Delivers Audio Feed of Record-Breaking Sports Event with an Assist from Gentner*

by Gary Smith

**SALT LAKE CITY** The night John Stockton of the Utah Jazz broke the NBA assist record, I needed an assist myself. I underestimated just how big a media event this would be.

On the afternoon of the game, I went to the Delta center and walked into this huge technical setup. It was configured to provide extensive television coverage of the record-setting event, and for all press interviews afterwards.

We were all set to capture the event for TV and satellite, but I wondered, how are we going to deliver it to radio stations? I wanted to find the easiest, fastest way to send the audio feed to several radio stations.

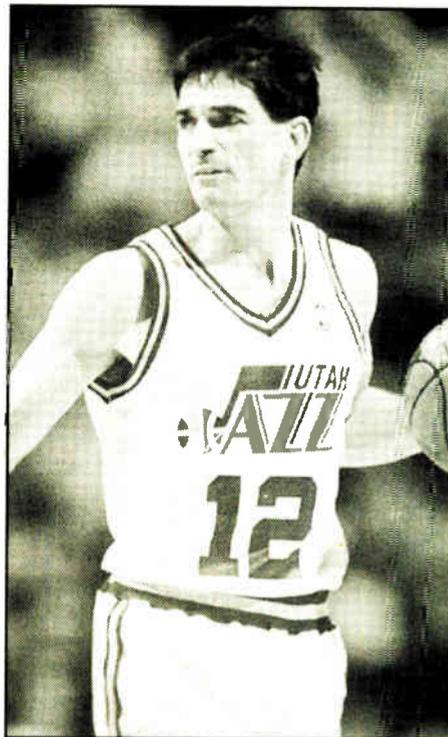
Immediately, I thought Gentner Conference Call, if it could provide a listen-only service. So I called Julie

Vigil at Gentner. She said, "No problem." I gave her the number to call to receive the source audio. I told Julie the feed should be available to as many stations as call in, and that it all needed to be set up within just a few minutes.

It was about 3 p.m. when I called Gentner. The game started at 7 p.m., and Julie had assurances back to me within 30 minutes that it would be covered.

That night stations from throughout the nation dialed Gentner Conference Call. They got the action as it happened. Some of the stations carried live right to their air from the call to Gentner. If they needed to drop off and come back later, they had that option. If they would have called our studios directly, we just wouldn't have had the personnel or phone capacity to accommodate them.

We turned to Gentner because we currently use its conference call service with every game to handle closed circuit IFB communications between our TV truck and Jazz TV and radio affiliates. With three or four master control opera-



John Stockton of the Utah Jazz

and the reliability have been very important to us.

The morning after Stockton set the new record we got e-mail and faxes from Tim Lindsay and Tom Carelli, producers of NBA radio. Here's what they wrote to NBA teams and their organizations as well as TV and radio stations throughout the country: "Regarding the Stockton Career Update, I would like to thank Gary Smith and the hardworking folks at KISN who did such a great job covering the Stockton Record Setting game last night.

"From making the phone feed available in advance for those who wished to get the highlights for their broadcasts last night, to the comprehensive feed in their mailbox, KISN did an outstanding job all the way around. I'm not quite sure whether Gary is more like The Mailman for delivering the goods or more like Stockton for hand delivering it to all the stations. Either way, nice work, KISN, and thank you."

**Conference Call cuts the clutter and takes pressure off the control operators at the affiliates.**

tors on the line with the TV producer in the truck at the same time, it cuts the clutter and takes pressure off the control operators at the affiliates.

If one particular station accidentally drops its call, it doesn't impact everyone else. No one is distracted while the call is re-established. The communications

## 63 Years Ago

Reprinted from Radio World  
March 26, 1932.

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.

### \$768,903 NET FOR RCA IN 1931; \$1.95 DIVIDEND

Gross operating income of the Radio Corporation of America for 1931, according to the annual report just placed in the hands of stockholders, was \$100,124,847, or about \$32,000,000 less than during the previous year, the net income was \$768,903 as against \$5,526,293 and the Class A preferred shares earned \$1.95, as against \$13.87 for 1931. No dividends have been paid or declared on common stock.

It is proposed to reduce the capital and surplus by \$45,258,200, and forms to this effect are in the hands of common and Class A stockholders. Treasury stock is to be retired as follows: 36,100 of Class B preferred and 30,060 of common. The capital representation of common stock is to be reduced from \$4.22 to \$2. The number of stockholders increased in 1931, so it is now over 100,000.

#### Feels Effect of Depression

"Radio was no less affected than older or more seasoned industries by the world-wide subnormal business conditions prevailing throughout the year, by the decline in price levels and by unemployment which curtailed the purchasing power of many families," James G. Harbord, chairman, and David Sarnoff, president, say in their report.

"Although your company entered the year with a compact and efficient organization and with production schedules balanced closely with sales response, expanded programs could be undertaken only along limited lines. In export activities the decline in foreign exchange adversely affected the earnings of your company. Intensive effort was directed toward the further improvement of manufacturing processes and in effecting economies in costs of distribution.

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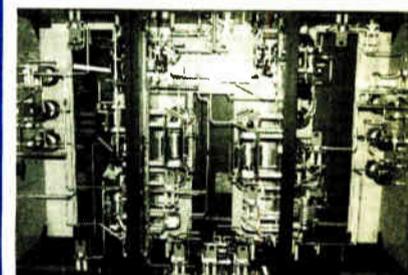
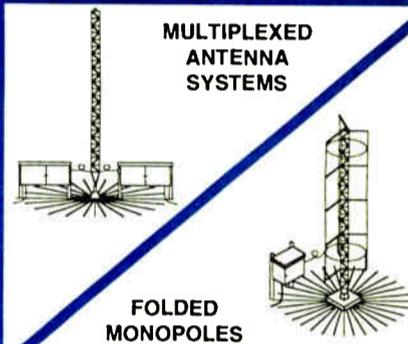
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# Making Your Own Mic Splitter

by Bruce Bartlett  
with Jenny Bartlett

**ELKHART, Ind.** When you record a pop-music concert for broadcast, three mixers are in use: recording, PA, and monitor. So you need to split each mic's signal three ways to feed the three mixers.

One way to accomplish this task is to use a transformer isolated splitter (Fig. 1). Each mic plugs into an XLR that goes to a 1:1 transformer. The splitter has three feeds: one direct and two isolated. Connected directly to the mic, the direct feed goes to the mixer that supplies phantom power.

### Isolated feeds

The two isolated feeds go to the other mixers. Because the transformer electrically isolates the three mixers, phantom power and RFI from one mixer can't get into the other mixers.

Unfortunately, good transformers cost a lot. You can make a splitter without transformers that works well. Simply Y or parallel the mic output into three mixer inputs. This works, but it creates some problems.

First, the three mixers load down the mic. The mic-input impedance of a typical mixer is 1500 ohms. The paralleled input impedance of three mixers would be only 500 ohms. This is too small a value for many mics. With this load, some condenser mics distort, and dynamics tend to lose some bass.

Another problem is that the Y connects the three mixer grounds together. This can create ground loops and hum.

### Adding resistors

Figure 2 shows a solution. The mic signal runs through two 270-ohm resistors before splitting. The resistors prevent the mic from loading down. Each mic sees about

1040 ohms, which is usually high enough to prevent distortion and tonal changes.

With the resistors, the loss is only 3 dB compared to a three-way Y splitter. Each mixer sees a source impedance of about 384 ohms, which is low enough to keep the noise down.

To prevent ground loops, only one feed is grounded to the mic-cable shield. This feed goes to the mixer that supplies the phantom. The pin-1 ground on the other two mixer feeds is floating. Each mic cable leaving the splitter is grounded at its own mixer to drain away hum interference.

A drawback of the resistors is that they increase the high-frequency loss of the cables due to capacitive loading. But this loss may not be audible.

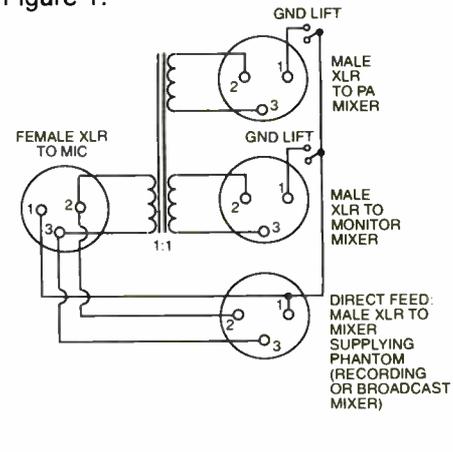
Don't ground the splitter chassis.

Why? If someone plugs in a cable connector that has its shell tied to pin 1, the mic will be grounded through the splitter chassis to more than one mixer. You'll

The transformer-isolated splitter in Figure 1 has ground-lift switches that do the same thing. You can add these switches to the passive splitter if you need more flexibility.

Does the transformer isolation prevent

Figure 1.



the mic from loading down? Nope. Each transformer winding is 1:1, so the reflected impedance that appears at the primary is the input impedance of three mixers in parallel. The mic sees about 500 ohms.

You still need to add the 270-ohm resistors to the transformer isolated splitter.

Another way to reduce loading is to use a step-down transformer. Although this loses a few dB of signal level, it raises the impedance seen by the mic.

A mic splitter can also be used as a press box—a device used at press events to feed several broadcast media from a single mic.

For more than three feeds, the best solution is an active press box, which offers the most isolation and the least loading.

□ □ □

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

## Remarkable CD-ROM

► continued from page 53  
and AES/EBU equipment.

Depending on battery configuration, the recorder can operate from 2.5 to eight hours. One 20MB memory card gives 40 minutes mono recording time and a 64MB card has the capacity for nearly two hours.

Delivery is slated for May. Prices range between about \$8,000 to \$10,000 depending on options.

★ ★ ★

Also joining the pro portable ranks is Denon, who is expected to introduce the DN80R Portable MiniDisc (MD) Recorder at NAB. This professional upgrade of the consumer music recording format is also being targeted to radio news reporters. In addition to recording and playback, it features non-destructive digital editing with 12 ms accuracy.

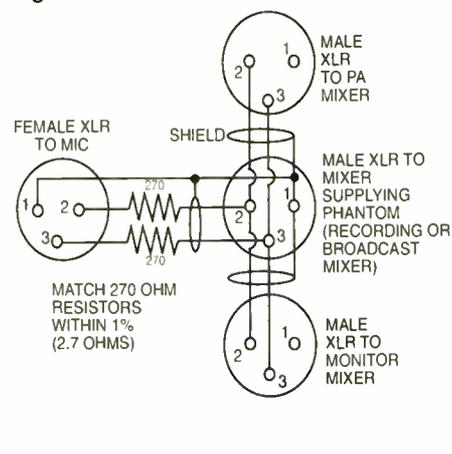
To prevent dropouts when recording, the Denon recorder uses a RAM buffer with a capacity for 40 seconds of stereo audio. In addition, the optical pickup incorporates a proprietary vibration-absorbing suspension.

The idea is to record and edit news material on the MD portable and playback in the studio on a MD cart machine, said Michael Stelts, Denon's pro audio product manager. This way, he said, first-generation audio can be preserved throughout the recording, editing and playback process and there will be no multi-generation artifacts from the format's digital compression.

Denon's recorder, which includes balanced mic inputs with limiting, an AES digital output and cue speaker, can record 148 minutes of uninterrupted mono and 74 minutes of stereo. It will be available in April at a price of about \$4,000.

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

Figure 2.



get a ground loop. Instead, use shielded mic cable inside the ungrounded chassis. Connect the shields as shown in Figure 2. Note that the shield is floating at two of the male XLRs to prevent ground loops.

## Analog EQ, No Phase Shift

► continued from page 35

library is, the more aggressively you can tweak the final processing.

Having fixed frequency and "Q" parameters, however, does limit the exactness of control the EQ3 can exert on the signal. Because four of the six controls affect frequencies below 1 kHz, and because the other two bands (2.5 kHz and "AIR") are shelving, the EQ3 lacks the fine control necessary for mid and upper frequency surgery.

The EQ3, then, is not meant to replace your existing collection of equalizers. Instead, think of it as an addition to what you already have.

Using the 10 Hz and 40 Hz controls to lessen the proximity effect of a condenser mic for close voice work worked well, and adding low frequencies with those controls also "warmed up" thin voices and instruments in subsequent tests. Raising the "AIR" band control to add some openness to a voice track also worked well.

In another test, I compared the outputs of the EQ3 with the output of another analog equalizer, feeding both with the same voice track. Using the 2.5 kHz control on both equalizers, I added about 6-8 dB. To my surprise, the EQ3 remained very open sounding on the top end compared to the other equalizer. I figured, okay, so the shelving probably lifted the upper end. But even when I tried to open the sound by raising the gain in the 12.5 kHz range, the top remained very closed with the other equalizer.

### Summary

Because part of the benefit the EQ3 offers results in something you don't hear, namely phase shift, you first have to be able to know what the effects of phase shift sound like in your existing system before you can determine that, by using the EQ3 to remove it, your audio is improved. To me, it's a tough sell, especially since we've accepted phase shift for decades.

Take your time when evaluating the EQ3. Listen for the open top end, or the lack of it in your system. Then make your decision whether it fits your application.

□ □ □

Ty Ford's book, "Advanced Audio Production Techniques," is available by calling 800 366-2665. Contact him at Tford1010@aol.com

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## USER REPORT

# Spectral Prisma Hits the Spot

by David Esch  
ESChicago Inc.

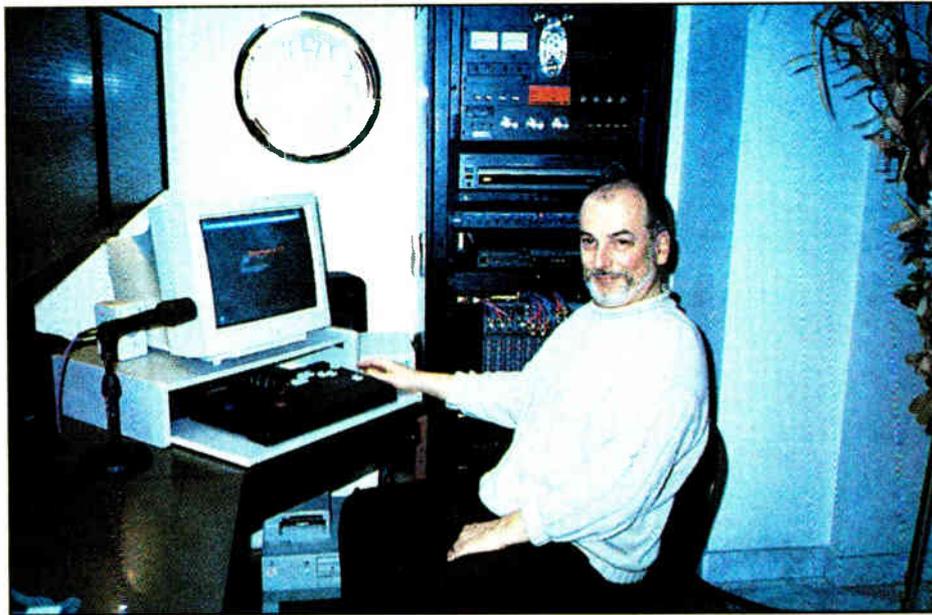
**CHICAGO** There are a lot of choices in the digital audio workstation marketplace, with a lot of qualities, tools, toys, and features. What do you need? How much recording time? Do you time squeeze a lot? EQ? Do you want a lot of effects and jingles on call? Do a lot of updates?

## Highly recommended

You need to get as many demos as you can from as many different manufacturers as you can. But make sure you include Audio Prisma by Spectral Inc. on your demo list. I ended up choosing Prisma for three reasons: low cost, high efficiency, blazing speed.

The Spectral "engine" is a plug-in card that fits into an ISA slot in your PC. The card and the Prisma software cost under \$5,000 grand, takes up no space, and because it runs on its own card (and only uses your PC for Windows) it's a lot faster than other systems I've used and demo'd. If you get a CS-10 controller, you can program function keys tailored to your own working habits, right in the "mixer."

Not only is Prisma efficient in terms of physical space, but if you think about what it would have cost 10 years ago for the same recording, editing, and mixing capability (heck, automated consoles alone were around \$500,000 back then) it's astounding. You get either two or eight inputs (depending on which AD/DA converter you choose), 12 out, two bands of EQ on each channel (more if you know how to copy tracks and use the built-in patch bay), automated mix, a playlist, extraordinarily good sounding and fast Digital Signal Processing tools (pitch shift, time compression/expansion, level normalization, etc.), way file import/exportability, and a directory that improves one's library management



David Esch produces all his spots on Spectral's DAW.

skills by default.

Several ESChicago Inc. clients are symphonic organizations. The people of these organizations usually have had extensive musical training and possess really good ears. They can be very demanding clients when it comes to musical transitions, edits, etc. for one of these clients I do an event-specific and three "image" spots per week. Often, I don't get copy until two days before air.

## Custom editing

In the case of the event-specific spot, I will usually take the featured work, record the beginning (or main theme) for about 40-45 seconds, and then about 40 seconds of the ending. With Prisma, I can take the last note of the piece and place it at :59.5 (to allow for ring-out), trim the first note to zero and then determine whether to make an edit at a percussive point, or customize a crossfade by dragging the cursor on the appropriate track(s). Try that on your reel-to-reel. If both pieces are in the same key,

you've got an approved spot. It takes about a half an hour.

(With the image spots, which are much more complex and use music from up to four different composers, what would take me about eight hours in the analog world I can put together in under two hours on the Prisma.)

## DIGITAL DOMAIN

# In Search of the Ideal DAW Controller Surface

by Mel Lambert

**LOS ANGELES** Quite often, it is the simplicity of a solution that appeals to both the creative and technical sides of our imaginations. The familiarity of a particular design—take the telephone handset, for example—often means that we are reluctant to consider alternatives.

And updates are a breeze. The "Duplicate and Move" tool will allow me to make as many copies of the completed master as I wish, insert the update vtx line, and even drop in a 60 Hz tone, five seconds before the beginning of each spot in order to identify the dubs off the reel to reel in fast rewind. This is slick.

The Prisma isn't perfect, however. I have caused myself considerable stress by trying to be too fast and attempting to go on to the next edit or function in a project before getting out of "scrub." It doesn't like that and will lock up on occasion if continually asked to do something else while in scrub. As a result, I've simply trained myself to hit "stop" when I've scrubbed to within .001 of a second of where I want to be. A small concession for the value, I think.

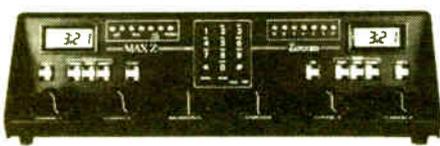
One last thing. If you get or have a DAT or Exabyte back-up drive, Prisma's archiving is painless and super fast. I think you can put up to 8 gigabytes of projects on one 4mm DAT. That's about 24 hours of mono audio. Think of all the shelf space saved by not having to store all those 1/4-inch, 3/4-inch and 1-inch analog tapes.

□□□

David Esch is principal of ESChicago Inc., a radio and video production, post production facility in Chicago. He can be reached at 312-666-6949; or email at Davesch613@AOL, 73624.3143@Cserve.

## Don't Settle for Less than the BEST!

### MAX-Z

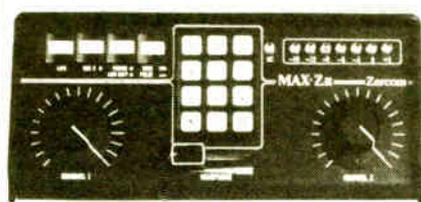


The Zercom MAX-Z is a remote broadcast console that provides MAXimum flexibility, utility, and above all, audio quality.

When it comes to convenience features that help make a remote broadcast run smoothly and sound professional, the MAX-Z has no equal.

A short list of standard features includes: carrying case, built-in rechargeable batteries and charger, clock, stopwatch/timer, V.U. meter, WIDE RANGE AUDIO INPUTS (will match almost anything), cue channels, phone line alarms, memory dialing (tone or pulse), etc.

### MAX-Z II



The Zercom MAX-Z II is an abbreviated version of the famous Zercom MAX-Z Remote Broadcasting Telephone System. High quality audio handling is maintained in the two channels of audio input. Headroom, noise performance and distortion are comparable in quality to studio consoles.

Features of the 6 lb. 8"x9.5" unit include frequency response of 200Hz to 7KHz ± 0.5 db, 90Hz to 12KHz ± 1.5 db; noise floor of -70 dbm with 0 dbm line level input, -61 dbm (mic level input); and harmonic distortion of 0.35% or less and intermodulation distortion of 0.2% or less. Head room is 16 db above 0 VU.

### Zercom Telephone Hybrid ZH-2



An interface for connecting a telephone line to a studio console. "Now with upgraded performance." It provides full duplex (simultaneous two way audio) for best results. The hybrid sends audio to a telephone line and receives audio from the line. To make up for a telephone line's inherent 15 DB send to receive level difference, it has a nulling circuit which is used to reduce the local send audio as heard back in its receive output.

Adjustable input and output gain controls are provided to accommodate almost any situation. Audio inputs and outputs are active balanced. The telephone line tip and ring connection is set up for a direct line hold configuration or capacitor isolated to prevent DC flow through the hybrid's telephone line transformer. The choice is user selectable on the rear terminals.

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

While reluctance to change should be treated with a modicum of suspicion (a sign, perchance of advancing lineage?), there is no denying that we might bear in mind the old adage: "If it ain't broke, don't fix it."

Why am I raising such a profound topic within these hallowed pages? Simply because I was talking recently with an individual from outside our industry who, for me at least, succinctly put his finger on what is wrong with the control-surface layout of a number of contemporary digital editors and workstations.

Don't get me wrong; I consider some of today's second- and third-generation systems as offering more creativity for the buck—as well as dramatically extending the types of audio-production chores we can achieve in the studio. No, what still bewilders me is that the designers of such systems—with one or two notable exceptions—miss a fundamental design aspect: They should make use of as many of our physical appendages as possible.

## Not a mouse?

I still consider it as foolishness personified to attempt to operate a complex, multitasking digital audio workstation using a mouse and a VDU; for me, the so-called "glass console" makes no sense whatsoever.

I would guess that the majority of us are anxious to retain the full use of all 10 digits, and, with a little practice, can perform reasonably complex hand-eye coordinated tasks.

I recently interviewed Chris Jenkins,

continued on next page ►

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# Ideal Control Surface

president of Todd-AO/Glen Glenn, one of Hollywood's leading sound-editorial and re-recording facilities, as well as a practicing film mixer. (Jenkins has worked on dozens of innovative films, including "Star Trek: Generations," "Star Trek V," "The Firm," "Scent of a Woman," "Robin Hood," as well as many TV and music video projects; he received Academy Awards for his work on "Last of the Mohicans" and "Out Of Africa.")

I was talking to Chris about digital consoles and workstations—new technologies that are bringing creative alternatives to the film-production community. "We're still hanging on to analog," he said. "We're ready to go with digital consoles, but we haven't seen anything that we really believe is there yet."

"A piano is still a piano, and has been for centuries, for a very good reason—the eye, hand and ear relationship. A mixing console is no different; you can achieve what you're trying to do, but you *have* to keep some of the rudimentary tools.

"It's (about) organizing information, and that's where I fall off the digital console and virtual interface bandwagon. The turn in the road to the virtual tabletop should include getting the best takes and performances out of the actors. It's about how to spend the *least* amount of time re-thinking (about) the organization of audio."

## Of great interest

For the majority of users of today's digital technology, including others like Chris Jenkins working in areas related to the radio industry, the care and attention that has been paid to the design of the corresponding work surface is of specific interest. Given the very nature of these kinds of systems—a high-speed computer designed to record, edit and process digital waveforms,—it is inevitable that manufacturers would look to offer other ways of getting the job done. Mistake No. 1, I would hazard.

The reason that on-air and production consoles look the way they do is because they have developed continuously during the past several decades, and the consensus of opinion is that they get the job done with the least amount of effort.

Just because the underlying technology transitions from analog to digital does not mean that we need to reinvent the wheel. A 20-inch color monitor is a great device for displaying information—particularly if the workstation can create high-speed displays of waveforms, editing profiles, mixing levels and other vital data.

But in my opinion, a glass console is not the best way of driving such a system. And a mouse is a mono-functional device: you can only change one thing at a time via point-and-click options. To my mind, a far better and more appropriate design approach would be to offer a control surface that features hand-sized buttons and faders that more closely mimic the way we are used to working in the analog domain, but which can take full advantage of the assignability that comes with digital, computer-controlled technologies.

There are plenty of examples of this

genre. The Roland DM-80 and new DM-800 spring to mind, with their simple and logical front-panel layouts. Consider the Studer Editech MultiDesk Assignable Console controller for the firm's Dyaxis II workstation. Designed to plug directly into the Dyaxis II processor racks and the host Apple Mac graphics display, MultiDesk provides an array of assignable moving faders, knobs, buttons and wheels for the user to provide dynamic control of the unit's mixing, editing, transport, and external machine control functions.

And the new Fostex Foundation 2000LX comes complete with a dedicated controller that offers form-panel control for all transport mode, job/shuttle

and scrub editing, plus a large touch-sensitive screen that offers software-controlled buttons for visual segment display, metering, mixing and other functions.

## Screen select

Via the screen, a user can touch-select one or all of the eight available track displays (in object-oriented or waveform mode), mixer functions (I/O, level and pan), metering (assignment and ballistics), contents of the reel library, plus various system utilities. Also available is an assignable mixer control surface for the Foundation 2000 that features moving faders and automation of all mixer/DSP settings.

Although a conventional plug-in keyboard is available for labeling tracks and other operations, no mouse is necessary to navigate through the Foundation's

screen-driven functions. From extended sessions with these types of systems, it is apparent after just a very short period of time how you come to rely on buttons and control functions being in the same place each time you need them. Sure, Mac- and PC-based systems might provide more options via pull-down menus and related user interfaces, but unless you get to use these functions repeatedly, it's all too easy to forget how to reach them, or their keyboard equivalent. You know it makes sense.

□ □ □

*Mel Lambert has been intimately involved with the production and broadcast industries on both sides of the Atlantic for more than 17 years. Now principal of Media&Marketing, a Los Angeles-based consulting service for the professional audio industry, he can be reached at 818-753-9510.*



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# Comments Filed on NPRM

► continued from page 31

would be to shut the station down.

The FCC frequently investigates interference complaints, though these are generally in services other than broadcast. Once the source of the interference is determined, the offending station is shut down. The FCC relies upon the availability of a "contact person" to shut down the station. If we wish to keep this capability, it appears that all stations are "attended" to some loose extent.

The NPRM proposed a "contact person database." This concept was supported in comments. One commenter followed up on this subject by suggesting that the designat-

ed chief operator be eliminated, because the station licensee is ultimately responsible for all aspects of station operation.

### ATS reliability

One commenter questions the reliability of ATS equipment. Power surges or lightning may, he argues, make the equipment inoperable, leaving the transmitter running without automatic control over power limits.

In the NPRM, the FCC asks what transmission system parameters should be monitored by an ATS (or, for that matter, by an operator). Most commenters did not address this issue. One commenter sug-

gested monitoring of modulation and carrier frequency measurements not be included in any ATS requirements, because existing rules do not require the station to have a modulation or frequency monitor. The commenter also questions the reliability of these monitors.

One commenter also suggests that new rules require various transmission system parameters be checked "at least once daily," which is similar to the existing tower light inspection requirement. The existing rules do not specify a parameter measurement interval, except on directional stations without approved sampling systems. Similarly, this commenter also suggests the FCC specify an equipment calibration interval.

SBE gives a list of parameters that it suggests each station's ATS system moni-

tor. These include operating power, directional array parameters (for DA stations), tower lights and modulation, but not including carrier frequency.

Another commenter explains in detail that the frequency of broadcast transmitters in years past was determined by a crystal ("a piece of tuned rock"). He goes on to explain that today's transmitters use highly stable PLL or AFC circuits, not mentioning that the reference for these circuits is, once again, a "tuned rock." This commenter also explains that adequate protection against overpower operation is provided by automatic power control circuits in transmitters and by the overload shutdown circuitry in the transmitters.

Further, he states, overmodulation can be prevented by utilizing existing audio processing devices to limit the audio level driving the transmitter.

### Existing operations

One commenter points out that the proposed rules would impose an automatic alarm requirement on stations that do not take advantage of the unattended or unlicensed operator provisions of the new rules. He suggests that such a requirement not be imposed but that a maximum interval between successive observations of transmitter parameters be imposed (similar to the old 30-minute or three-hour logging requirements).

Another commenter finds the "Regulatory Flexibility Analysis" very inadequate. The RFA states that "taking advantage of the flexibility provided by the new rules is entirely optional. Licensees may continue to operate as they currently do if they so desire." The commenter does not find this to be the case. This is probably because the existing rules are quite vague, allowing wide latitude in interpretation.

The FCC, in attempting to "clarify" the rules, narrows that interpretation considerably, making what appears compliant today not compliant under the proposed rules.

The proposed 73.1580(b) appears to impose a maintenance log requirement on stations.

Under the proposed rules, directional stations would need to be shut down or reduced in power within three minutes of discovering an out-of-tolerance monitor point reading. This three-minute limit would require stations to purchase two-way radio equipment. This commenter suggests two hours of such operation to allow the station to be notified.

### FM translators

According to one commenter, the existing rules allow FM translators to run unattended if various conditions are met, one of which being that "the transmitter site cannot be reached promptly at all hours and in all seasons...." The commenter states that it makes little sense to not allow unattended operation of translators that are not inaccessible while allowing unattended operation of inaccessible translators and full-power stations, regardless of their locations. This commenter also suggests that any requirements that ATS systems adjust modulation or power not be imposed on translators.

□ □ □

Harold Hallikainen is president of Hallikainen and Friends, a manufacturer of transmitter control and telemetry systems. He also teaches electronics at Cuesta College, San Luis Obispo. He can be reached at 805-541-0200; fax: 805-541-0201. He can also be reached on Internet at ap621@cleveland.freenet.edu.

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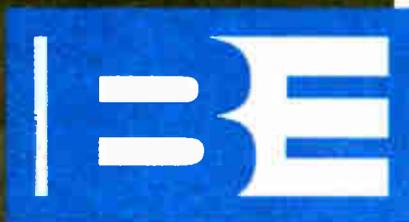


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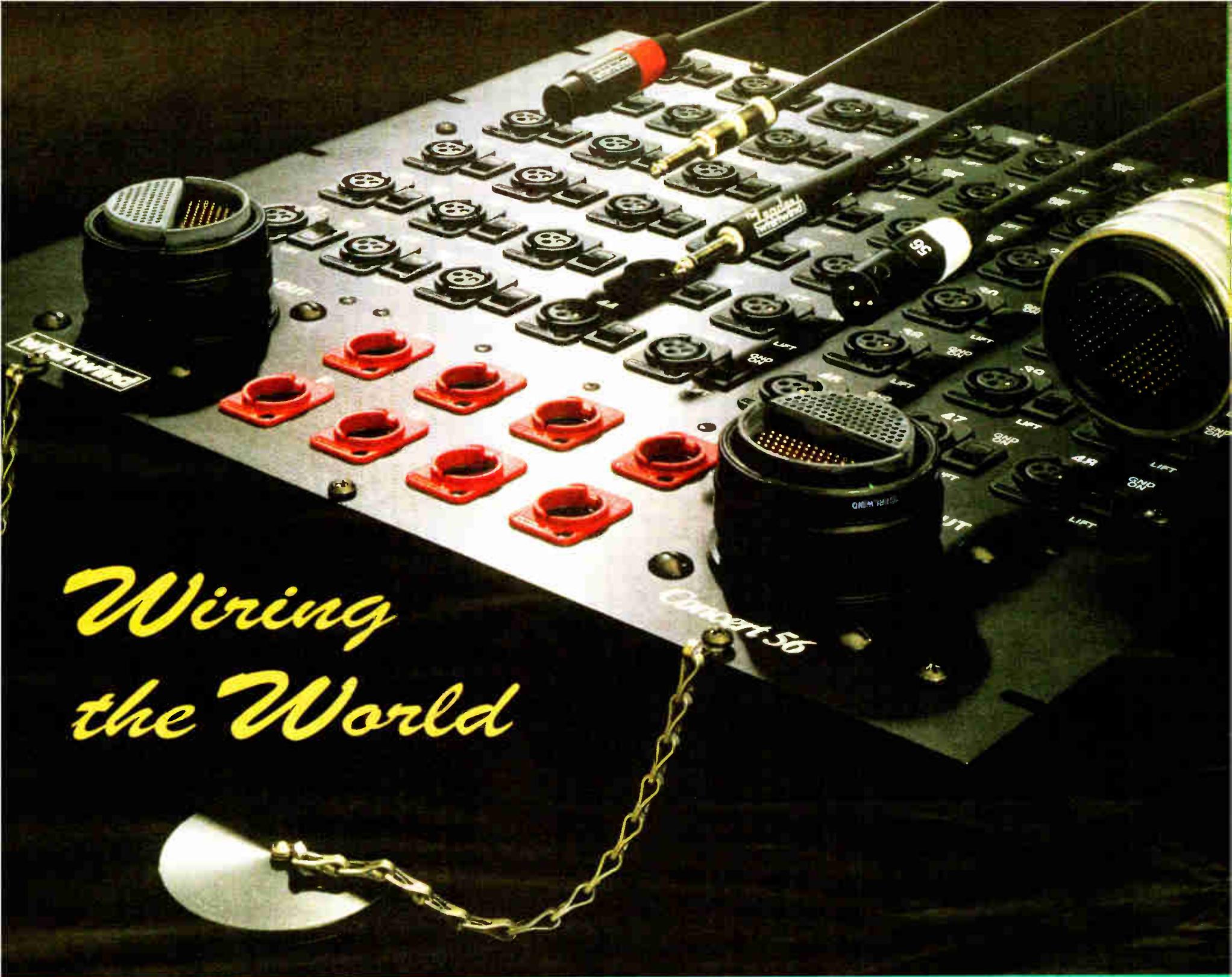
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# WORKBENCH

## Rehabilitating Old Gates RF Gear Transmitter

by John Bisset

**SPRINGFIELD, Va.** Jon Sandidge is the studio/satellite operations supervisor at the University of Alabama's Center for Public Television. Jon recently purchased a CONEX UM-33 cue amplifier for local audio monitoring of the VTRs in the University's "Distance Learning Studio" control room.

The noise of the control room pointed out the device's only flaw—the internal 3-inch speakers and their two watt amplifiers bottom out on low frequencies. This made it difficult to hear clean audio above the din of the control room. When it was quiet (almost never), the UM-33 worked great monitoring the three VTRs and routing switcher output.

Given its location in the rack, adding external speakers to the UM-33 was an option Jon wanted to avoid. Looking at the schematic, a good place was found to roll off the low end, before the amplifiers. Jon was careful to make the modification after the VU meters so the frequency response of the LED display would not be affected.

Jon calculated a 6 dB/octave high pass filter consisting of a 0.015MFD 100 Volt Paper capacitor. The capacitor was placed in the left and right lines that go to the stereo/mono switch. (See Figure 1.) The front panel stereo/mono switch (S-4) sends audio to the volume controls (R-20 and R-21). With this size capacitor, the audio is 3.5 dB down at 200 Hz. The audio is 9 dB down at 100 Hz, and 15dB down at 50Hz. The addition of the capacitors rolls off the frequencies that only waste power, yet keeps the cue amp from sounding too "tinny." Plug P-2 is an excellent location for the caps.

Call Jon Sandidge at 205-348-6210.

★ ★ ★

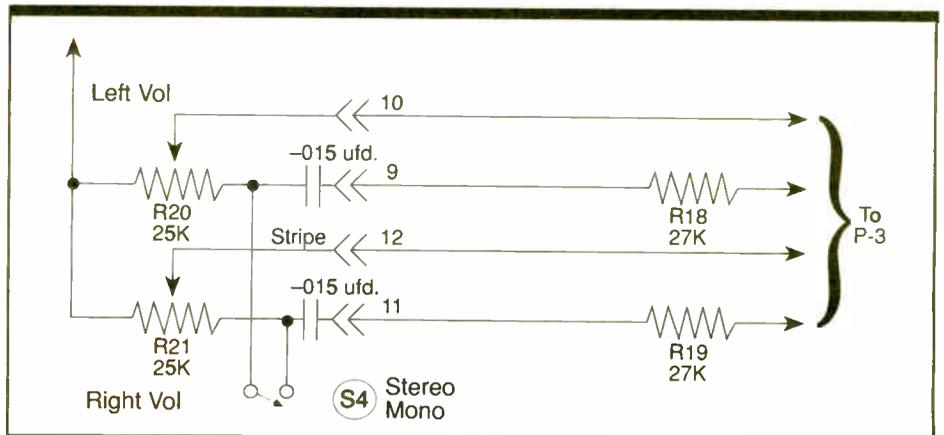
If you're new to surfing the Internet, access FTP at FCC.GOV. The FCC has placed a substantial part of its license information here. It covers primarily frequencies below 805 MHz. Thanks to Jon Banks, CE at WARW-FM and frequency coordinator for Washington for passing on the news. In larger markets, you may want to check and see if your frequency coordinator handles wireless mic frequencies. It helps to call your coordinator before you buy the mics, to insure a clear, legal frequency. Jon points out that there are eight VHF wireless mic frequencies available to the general users in Part 90. This is where bands, sound reinforcement, and other users, not eligible under Part 74, should be operating. The frequencies are between 169 and 172 MHz.

★ ★ ★

Fred Shetler is the chief engineer for WCCS(AM)-WOKW-FM in Indiana, Pa. He recently faxed a request on behalf of some friends trying to rehabilitate an old Gates BC-250GY transmitter.

Fred is interested in the ramifications of replacing the 810 modulators and modulation transformer with a solid state audio amplifier, providing about 125 to 150 watts to a new modulation transformer. If you have any ideas, either fax them to me or contact Fred directly at 412-479-1160.

John Bisset is a principal with Multiphase, a contract engineering and special projects company based in Washington. He can be reached at 703-323-7180. Fax submissions for the Workbench column to 703-764-0751. Printed submissions qualify for SBE Certification credit.



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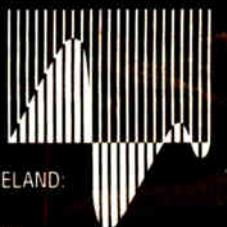
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# Las Vegas Offers Wealth of Fun

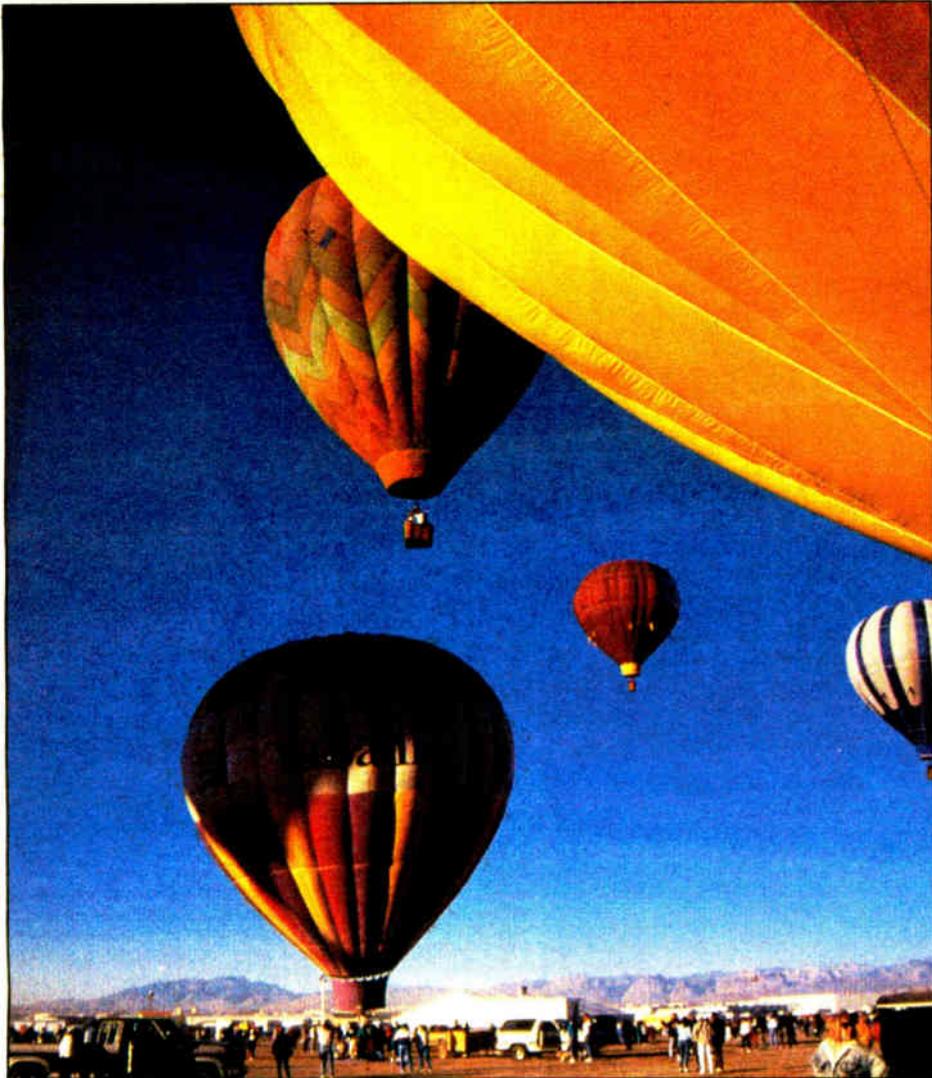
by Jennifer Milliken

**LAS VEGAS** When not walking the floor during this year's NAB to view the latest in audio technology and offerings, take time out to enjoy the many sights and sounds of Las Vegas.

Labeled an "entertainment capital" with its glitz and bright lights, the city offers travelers an extravagant night life of expansive gambling casinos, clubs, con-

guests a plentiful supply of activities and attractions. However, there is much to see and do outside these resorts as well.

Just 34 miles from Las Vegas, a visit to the Hoover Dam is a must. It is an arch-gravity dam 726 feet high and 660 feet thick. A 35-minute tour costing \$3 takes visitors deep inside the monolith for a complete explanation of its history, purpose and inner workings. Don't forget your camera!



Vegas offers a variety of fun, including an annual balloon festival.

certs, performances and shows. And Las Vegas showrooms, capable of seating more than 1,000 guests, feature million-dollar productions that are known for luxurious costumes, dancers, choreography and special effects.

## Outdoor lure

While world famous for its night life, Las Vegas also invites visitors to enjoy the sun and outdoors. Venturing outside during the day is a welcoming balance to nights spent in town. During the day, if you are not heading back to the casino to juggle dice or spin the wheels of chance (or getting a marriage license on the spur of the moment!), Southern Nevada provides an abundance of daytime activities.

And if luck is not on your side when gambling, there's no need to worry when taking day excursions. With an annual temperature of 66 degrees and 211 clear days each year, the weather has a way of luring people outside. Amusement centers feature miniature golf, batting cages, bumper cars, rafting and water slides—always a fun option to the convention floor. Plus, the picturesque, mountainous landscape is a perfect setting for hiking, horseback riding or picnicking.

As a premiere resort destination, Las Vegas has a number of hotels offering

Lake Mead National Recreation Area is only 25 miles from the city. With more than 550 miles of shoreline, visitors flock here to take advantage of camping, boating, water skiing and fishing. Marinas at the lake rent houseboats, ski boats and fishing boats. A little further, about an hour drive from Las Vegas, is Mt. Charleston, part of the Spring Mountain Range, at an elevation of 11,918 feet above sea level.

## Getting your feet wet

Although not nearly as tall as Mt. Charleston, the Bomb Bay water slide at the Wet 'n' Wild water theme park is 76 feet high. Here, the daring can coast down this slide to the bottom. Aside from water attractions and slides, many enjoy surfing, swimming and rafting. The park will be open from 10 a.m. to 6 p.m. during the NAB convention in April.

Once the home of ancient Indian tribes, Red Rock Canyon is 15 miles to the west of Las Vegas. This 3,000-foot cliff was formed by a thrust fault, a fracture in the earth's crust where one rock plate is thrust horizontally over another. It is now home to wild horses and burros, as well as various species of wildlife including desert bighorn sheep and antelope. This scenic area of rock formations and desert provides visitors with a taste of history as well

as an escape from the bright city lights.

If you can manage to pull yourself away from the convention for a longer period of time, a visit to Grand Canyon National Park in Arizona should be on your agenda. Although it's just an hour and a half by plane from Vegas, the park is 300 miles away. As a day drive, this may not be an option for some NAB attendees unless you're planning to see more of the Southwest before or after the conference.

One of the most popular tourist attractions in Nevada is the Liberace Museum, just a couple miles east of the Strip near the home where Liberace once lived. On display are Liberace's pianos and his extravagant stage wardrobe of dazzling costumes.

The Nevada State Museum and Historical Society has numerous exhibits on anthropology and the natural history of Nevada on display. The museum is dedicated to the preservation of prehistoric animal and human dwellers of Southern Nevada. However, there is also a display explaining how and why neon is used in Las Vegas.

If you've had enough of the area's history, the Guinness World of Records Museum houses a vast collection of interesting world records covering everything from the tallest to the fastest-talking humans.

After dining in Las Vegas, try to save room for a little dessert. The Ethel M Chocolate Factory and Cactus Garden can bring out the kid in anyone, as visitors watch the making of such candy as the Mars bar, M & Ms and Milky Way. All this watching can be quite tantalizing; luckily, a free sample of candy comes with the tour. Outside the factory is a botanical garden featuring at least a hundred different varieties of cacti. And if you visit the chocolate factory, you might as

well visit the Kidd & Co. Marshmallow factory, where once again you will benefit from a tasty treat.

In Las Vegas, a little money goes a long way when it comes to eating out. From the Vegas Strip to the neon lights downtown, most hotels offer inexpensive dining for visitors. A good buy is the Las Vegas buffet, which offers the most food for the best price. Some hotels offer 45 different food selections per meal. Prices vary from an average of about \$3 per person for breakfast, \$4 to \$5 for lunch and \$5 to \$7 for dinner.

## Shopper's mecca

Within walking distance of all major resort hotels, shoppers will find vast malls displaying a wide range of goods—brand names, casual and fine attire, domestic and imported merchandise, fine art, diamonds and gold.

At The Forum Shops, located between the opulence of Caesars Palace and the nearby Mirage Hotel-Casino, shoppers may wonder if they are visiting Rome and not Las Vegas. Visitors can stroll through a replica of the ancient streets of Rome to view treasures displayed by international houses of fashion. For a break, take time out to rest near an ornate fountain representing Zeus and feel the cool Mediterranean breezes beneath a changing sky in a temperature-controlled environment.

After packed days, you can only hope luck is on your side in the evening. Casinos statewide win more than \$6 billion a year. Card and dice games, race and sports books, slot machines, cashless slot machines, high-tech electronic gambling devices and international games of chance imported from Europe and Asia present a wide variety of gaming fun. However, with all the recreation and attractions, aside from NAB '95 itself, you will need a lot of luck on your trip just to be able to see and do everything.

## Antenna Products at NAB

► continued from page 85

directional couplers.

**Lectrosanics Inc.** will introduce the all new UDR200 synthesized UHF receiver retaining the renowned Lectrosanics helical resonator front-end design.

Lectrosanics will also be displaying the new UMC190 and UMC195 antenna multicouplers for compact UHF receivers along with the A-GPU UHF ground plane antenna and A-Y3U UHF Y AGI antennas.

Also on display will be several series of UHF and VHF wireless microphones for ENG/EFP as well as studio applications.

**Jampro Antennas Inc.** will introduce an FM switchless combiner system, JIDC and JIDF interdigital combiners and filters for low power FM applications, Frequency Match Tower, rigid coaxial transmission line and all related components, and a complete line of Passive RF components.

Jampro will also display the Penetrator series sidemount antenna, JCPD circularly polarized flat panel antenna and JAHD arrowhead dipole antenna, and the JBC and JBPC combinator systems.

**Flash Technology** will introduce a series of dual beacon for medium- and high-light intensity, and Antenna lighting.

Flash Technology will also introduce the ElectroFlash FTB 312 Medium Intensity Dual Beacon, ElectroFlash FTB 224 and 225 High Intensity Dual Beacons, as well as the ElectroFlash AOL 302-D Dual Antenna Obstruction Light.

Also on display will be the SMART Obstruction Lighting Hardware—System Monitoring and Reporting Telemetry, the EAGLE Obstruction Lighting Software, the ElectroFlash FTB 310 Medium Intensity White Beacon, as well as the ElectroFlash FTB 205 High Intensity White Beacon.

**Cortana Corp.** will display its Stat-Cat lightning prevention system.

**Comtech Antenna Systems Inc.** will introduce its EC8 microprocessor control system with optional IBM-compatible software and the "C" or "Ku" fly-away antenna for SNG-type applications.

The company will also show a complete line of satellite antenna systems from 35 inches to 7.3 meters; Offsat antenna, for SCPC uplink requirements, and a fleet of transportable systems.

# RadioWorld

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

### RADIO RESOURCES

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NRSC Splitter Measurements are coming again! Call early to reserve your rental of the Tektronix Spectrum Analyzer. We also have Potomac field strength meters (AM & FM), and a Delta impedance bridge plus receiver/generator for rent.

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1-410-783-4635 (FAX)

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### AMPLIFIERS

#### Want To Sell

Phase Linear 4000 autocorrelation pre-amp, 2 front chan/2 rear chan outputs, 2 tape outputs, aux outputs, 2 tape/2 phono/tuner and aux inputs, \$50/BO; JVC FX-330 AM/FM computer controlled tuner w/quartz lock, LCD multi-mode display, up to 16 preselecs, \$100/BO, both units \$125/BO, all plus shipping. E Helvey, Summit Prod, 461 Layside Dr Ste 100, Winchester VA 22602. 703-877-2717.

### ACOUSTICS

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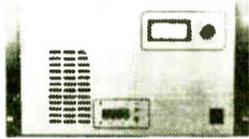
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### AMPLIFIERS

#### Want To Sell

Belar RFA 1 FM RF amp, \$200;  
AudioMetrics DA, 8x2, \$200. J Maples,  
WMYU, 8419 Kingstor Pike, Knoxville  
TN 37919. 615-693-1020.



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#### Want To Buy

McIntosh MI-200 rackmount tube amp. 212-343-0265.

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Phelps-Dodge 2 bay w/brackets, 97.7. Vern, POB 1340, Oroville CA 95965. 916-533-1340.

ERI 8-bay low pwr rototiller, 2 yo, BO; ERI high pwr isocoupler, 2 yo, 3" ETA connectors, BO; Cablewave 250', 300', 3" air coax cable, ea w/EIA flange connectors, 2 yo, removed to upgrade, BO. J Hackman, WATW, 2320 Ellis Ave, Ashland WI, 715-682-2727.

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### AUDIO PRODUCTION

#### Want To Sell

360 Systems 16x16 audio router expansion (only) unite \$350; Shure ST-3000 telephone interface/teleconference system w/mics, speaker, control unit and keypad, \$195. G Wachter, KFYI, 602-258-6161.

Allison Gain Brains (4), fair cond, \$50/ea; Dolby CAT22 (2) A type NR cards for Dolby 361 mainframe, \$100/ea; dbx K9-22 (2) type I NR cards for Dolby 361, \$100/ea. B Kennedy, EMC Prod. 300 York Ave, St Paul MN 55101. 612-771-1555.

dbx 118 compressor/expander, dbx 124 noise red unit, exc cond, both w/manuals, can be used together in series or individually, \$125/ea, \$250/both + shpg. D Fields, Legacy Prod, POB 194, Avoca AR 72711-0194. 501-451-8803.

Goldline digital RTA, \$300; dbx 140A type II NR, \$150; J Maples, WMYU, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

Altec 1592A mixer w/1588, 1579, 15095 modules, \$150; 1599 B Mixers (2) w/1588/15095 Modules, \$90/ea; 351-C 50W pwr amp, \$90; Shure SE 20 Pro Phono Preamp, \$50; Russco 442B dist amp, \$75; Altec 1567 tube mixers, near mint to parts, sell or trade for tube gear, vintage mics. W Kremer, 301 SW 16th St, Ft Lauderdale FL 33315. 305-524-5652.

Apex Expressor, signal processor, mint/new cond, \$350; Symetrix 528 voice processor, exc cond, \$400/bo. R Crabtree, 313-848-6453.

BBE 422A sonic maximizer, \$100+shpg; Radio Shack 42-2115 3-input, 3-output matrix switch cntrl cntr for 3 audio decks (2), \$15/ea+shpg; Radio Shack 15-1956 4-input stereo audio & video selector switch, \$10+shpg. G Rynn, N CA News, 5383 Willow Lake Ct, Byron CA 94514. 510-516-0299.

BOGEN Tech-craft TCE-2000 1/3 octave graphic EQ, w/high & low freq rolloff sliders, \$75; Altec 9018-A passive octave band filter (EQ), 8 10-position rotary cntrls, \$75; Delta Lab Effectrons digital delays, model ADM 256, \$150, model ADM 1024, \$199; ADC Std Pro Patch Mark II patch bays, 2 x 24 array, normals out, lk new, \$150/ea; UREI 533 graphic EQ, 10 section octave band, 12 dB boost or cut, rack mount, \$250. R Sumner, CAVU Corp, 44632-112 Guilford Dr, Ashburn VA 22011. 703-450-2288.



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MXR digital time delay, chorus, flanger, \$100. P Lenz, WWSW, One Allegheny Sq, Pittsburgh PA 15212. 412-323-5300.

ADC 1/4" patchbays and cords, NEW, UNDER HALF PRICE, ADC TT patchbays, \$129 up, NEW cords, \$9.95. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Good used studio tape 1/2" \$15, 1" \$30, 2" \$55. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

UREI 1122 solid state stereo transcription preamp, \$75. R Sumner, 44632 Guilford Dr, Ashburn VA 22011. 703-450-2288.

UREI LA4 mint pr, \$1095; Lexicon Alex, \$295; bulk eraser, \$49; Stewart direct boxes mono, \$50; 4 Ch, \$95; Cue command decoder, \$125; ABC Network decoder, \$125; NEW Tascam midizer MTS1000, \$750; Dyna stereo 120 rack mt amp, \$229; Sherwood FM tuner, new tubes, \$49; Infonics 7" reel copier 3 copies, \$125 ea; Crown & Furman elec crossovers, \$95. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Technics SH-9010 stereo parabolic EQ, rk mt, 2 chnl, 5 bands/chnl, adj freq/bandwidth each bane, +/- 12 dB/band, unbal in/out, \$225/BO. E Helvey, Summit Prod, 461 Layside Dr, Ste 100, Winchester VA 22602. 703-877-2717.

#### Want To Buy

Collins audio equip, 122, 2122, 116 F-1, also any Collins bdcnt lit, catalogs or manuals. J Stiltzinger, 23800 Via Irena, Valencia CA 91355. 805-259-2011.

dbx 120 X-DS, R Burton, 213-874-1000.

Marshall Electronics AR 300 delay unit; Burwen DNF 1100 stereo noise filter; UREI 565 ST Little Dipper filter set; Ampex SA10 amplifier. P McManus, Paul's Remote, 4011 Orchard Ave, San Diego CA 92107. 619-223-1730

Teltronics LA2, LA3, UREI 1176, dbx 160; Fairchild or Neve B Ore, Clockwork, 606 Mamaroneck Ave, Mamaroneck NY 10543

Marantz Model 1 audio ccsnolette pre-amplifier, single or pair; Model 6 stereo adapter. P Chance, Imperial Analog, 925 Clinton St, Philadelphia PA 19107. 215-590-4895.

Ampex tube mixers, plug-in mic pre-amp modules for PR10's. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

### AUTOMATION EQUIPMENT

#### Want To Sell

25 Hz tone generator, gd cond J Gelo, J & H Programming, POB 1697, Marco Island, FL 33969. 813-642-6899.

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CBS/Audiomax 4450A Stereo AGC -	REBUILT	\$ 195
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World Radio History

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SMC 350 RSB 24 tray Carousels in excellent condition installed in complete SMC rack unit. \$600/4 pieces. B Christie, Grande Radio Group, POB 907, La Grande OR 97850. 503-963-4121.

Cetec Schafer 902 1/2, 902 sequential thumbwheel unit, 2000 even RASMOS controller, Audiofile IIA (2), multitrack units, VEL Decoder w/Extel AF11R printer; sell as unit or as individual pieces. lots of parts too. B Spitzer, WLC Communications, Box 460, Rapid City SD 57709. 605-343-6986.

## CART MACHINES

### Want To Sell

Audi-Cord DLRS stereo cart recorder, less than 3 years old, \$650; ITC SP Series triple deck playback cart mach. \$500. ITC SP series single pak playback cart machine, \$250; Abco cart rack carousel plus 350 Fidelipac carts, 3 years old, \$250. B Lacy, 407-773-1962.

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ITC ESL-IV splice finder eraser, \$400. J Maples, WMYU, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

Pacific Recorders Tom Cat (12) PB, Tom Cat (4) R-P, Micromax (2) R-P, in use, well maintained, will inc good stock of spare parts, we want to sell them all. C Murray, KMGE, 503-484-9400.

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

Sono-mag Corporation 350 Carousel (3) 24 tray, stereo, good cond, plus spare parts, all \$750+shpg. Larry, WXL, Davenport IA, 319-326-2541.

Audi-Cord PB only cart machine, vgc, \$500. J Leutzinger, KOCD, 3001 W 13, Joplin MO 64801. 417-624-1230.

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Tapecaster X-701 (2), mono PB, gd cond, very clean, w/manuals, \$295 ea; Beaucart 12-123 stereo record, stereo PB, gd cond, very clean, w/manual, \$295. K Lamson, 510-447-7405.

### Want To Buy

Fidelipac ESD10 cart eraser/splice finder or similar. J Steele, WKBX, 111 N Grove, Kingsland GA 31548. 912-729-6000.

ITC, BE, Fidelipac cart machines: single, triple, mono, stereo, play & record/play. Call M O'Drobinak @ 619-758-0888.

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### Want To Sell

Ampex 350 series plybk only deck, mono, 4-tube amp, works great, BO. S Smith, KBFW, 360-734-8555.

Ampex 440-B (2) 1/4" 7.5 ips, full track, good condition, \$700/ea; Ampex 351 1/4", 7.5 ips, full track recorder with Inovonics 361 electronics, working condition, \$500. B Kennedy, EMC Prod, 300 York Ave, St Paul MN 55101. 612-771-1555.

Antique wire & tape rcdrs, Ampex 400, vry early, Brush sound mirrors 403, 401, Webcor, Pentron electrocordr ekotape, sell or trade, SASE for list. W Kremer, 301 SW 16th St, Ft Lauderdale FL 33315. 305-524-5652.

Fostex R8 8-trk 1/4", nvr used, \$1800. J Davis, 706-655-2145.

Cetec/Gauss 1250B cassette tape quality control machine, working cond, \$300. B Kennedy, EMC Prod, 300 York Ave, St Paul MN 55101. 612-771-1555.

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Panasonic port DAT mach, low hrs, all accessories, incl fact svc manual, fresh batt, \$800. P Carson, Carson Conslts, Rt 32 Box 73, W Friendship MD 21794-0073. 202-288-6332.

Revox B-77 1/4-trk 3 3/4x7 1/2 ips, \$450. G Grassie, RNTC Bdcng, POB 146, Dexter NM 88230-0146. 505-734-5565.

Studer A710 stereo cass deck, \$595. R Sumner, CAVU Corp, 44632-112 Guilford Dr, Ashburn VA 22011. 703-450-2288.

Tascam TSR-8 8 trk, mint, less than 10 hrs, inc remote. \$1950/BO. R Crabtree, 313-848-6453.

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Teac 3440 4-trk rcd, \$700; Ampex 601 1/2-trk rcd, \$100, Ampex 440B full-trk rcd w/roll-about cart, \$600. P Lenz, WWSW, One Allegheny Sq, Pittsburgh PA 15212. 412-323-5300.

Ampex AG-350 w/2 trk R/P heads, Inovonics 3 spd elect, 3 spd reversible Beau motor, mtd in AG-440 console, \$600/BO + shpg. E Helvey, Summit Prod, 461 Layside Dr Ste 100, Winchester VA 22602. 703-877-2717.

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MCI JH110B, 2 trk roll around metal cab, gd cond. J Gelo, 813-642-6899.

VSC C-4 Soundpacer w/variable speech cntrl, AC/DC, exc cond, \$50 + shpg. E Helvey, Summit Prod, 461 Layside Dr Ste 100, Winchester VA 22602. 703-877-2717.

Ampex ATR 100 (2) 4 trk \$3500 ea, 2 trk 1/2" \$4000, (2) 2 trk 1/4" \$2500 ea. 212-343-0265.

Otari Mark II-IV 1/2" 4-trk, multi-track, mint, less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

Otari 5050-SHD 8 trk 1/2" newly rebuilt, heads have full, life left, \$1800. W Gunn 619-320-0728.

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Uher CR134 cassette, \$195; DAT decks w/new heads \$550, Tascam ATR 60 8 trk w/stand, remote, \$3250; Otari 5050-8 no hrs on hds, \$1595, Ampex 440B-8, \$2450; Tascam 25-2, \$695; Ampex ATR700, \$695; Scully 16 trk 2", \$3450; Tascam 52 top of line, \$950; M79-24 fully rebuilt, \$11,500; Tascam locator for 85-16, \$495; Fostex E22 1/2" timecode deck, \$1400; Fostex A80 8 trk w/450 mixer, \$1350; Tascam 5, \$450; Nagra 10" reel adaptor, \$950. W Gunn, POB 2902, Palm Springs, CA 92263. 619-320-0728.

### Want To Buy

Nagra 4.2 rcdrs, 16mm Arriflex-S & Bolex equip, Sync sound motors for Arriflex & any 35mm Lecias for studio prod. Henry, 914-949-5920.

Ampex 300 tube two-track with half-inch heads. Other Ampex tube electronics. 907-456-3419.

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

## CD PLAYERS

### Want To Sell

Cybox 50' keyboard and monitor extender for mono/CGA/EGA, \$85. G Wachter, KFYI, 602-258-6161.

Studer A727 (3), \$300/ea. J Maples, WMYU, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

Denon DN950FA in fine shape, recently factory repaired, \$750. J Leutzinger, KIXQ, 2620 Dogwood Rd, Joplin MO 64801. 417-624-1310.

## CONSOLES

### Want To Sell

Bdct Electronics BE4M50A 4 pot, mono, new, nvr on line, all manuals, \$625. G Grassie, RNTC Bdcng, POB 146, Dexter NM 88230-0146. 505-734-5565.

Collins port 808A-1 console with dual turntable, mono, \$300+shipping. Larry, WXL, Davenport IA, 319-326-2541.

Collins 2125-1, good condition, with manual, \$250. J Stitzinger, 23800 Via Irana, Valencia CA 91355. 805-259-2011.

Shure M67 (2), \$100/ea. J Maples, WMYU, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

Shure 675 remote production master, \$100/BO. P Lenz, WWSW, One Allegheny Sq, Pittsburgh PA 15212. 412-323-5300.

Wheatstone SP-5A 8-track, used for 6 yrs, good condition, 2 mic-10 line inputs, \$8000. R Scott, WHFS, 8201 Corporate Dr, Landover MD 20785. 301-306-0991.

Gates 4 chnl mono, \$125. M Van Ouse, WTLR, 2020 Cato Ave, State College PA 16801. 814-237-9857.

Ramko DC-8MS 8 mixer pos/18 inputs, stereo, solid state, full documentation, rebuilt, \$900. J Cunningham, KEOR, RT2 Box 113B, Stonewall OK 74871. 405-265-4496.

Mackie 1604, \$575; Soundcraft Spirit 24x24, \$3950; Ramsa 820 20x8x16 with meter bridge, \$1950; Quantum 23x16x24 as used by LA Philharmonic, \$4950. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

### Want To Buy

Western Electric 23-A any WE-23 Series console or associated equipment. S Horner, KMRD, 2310 Ponderosa, Camarillo CA 93010. 619-535-1210.

Neve/API 12 to 24 inputs, anc condition, willing to purchase EQs and mic pre, sep. B Ore, Clockwork, 606 Mamaroneck Ave, Mamaroneck NY 10543. 914-381-0661.

Neve console, any type and parts. 212-343-0265.

## DISCO-PRO SOUND EQUIPMENT

### Want To Sell

Crown D-75 monitor amplifier, \$250. J Maples, WMYU, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

Quad 8 RV-10 spring reverb, good condition, \$50. B Kennedy, EMC Prod, 300 York Ave, St Paul MN 55101. 612-771-1555.

Yamaha 4115 PA speakers with 15" & horn, \$400/Best Offer; Cerwin-Vega PD-3 speakers 15" 3-way, \$300/Best Offer. P Lenz, WWSW, One Allegheny Sq, Pittsburgh PA 15212. 412-323-5300.

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## LIMITERS

### Want To Sell

Ashley SC-50 (4) peak limiter compressors, \$50/ea. J Maples, WMYU, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

Symetrix 421 AGC/leveler, mint, \$375/bo. R Crabtree, 313-848-6453.

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Harris CPU-MSP95 stereo audio processor w/stereo gen, \$500. J Leutzinger, KIXQ, 2620 Dogwood Rd, Joplin MO 64801. 417-624-1310.

Orban Optimod 8000, currently on air, \$1100; Texar Prism (2), recent factory check, \$1600/pr. A Williams, Charlottesville Bdcng, 501 E Main St, Charlottesville VA 22902. 804-977-3030.

McMartin subcarrier monitor, nds wrk, SCA/freq mod mon, \$200. J Leutzinger, KIXQ, 2620 Dogwood Rd, Joplin MO 64801. 417-624-1310.

### Want To Buy

Fairchild 670 or 660 tube compressor/limiter, Teletronics LA-2A tube compressor/limiter or UREI LA-3A solid state compressor/limiter, call after 3PM CST. 214-271-7625.

## MICROPHONES

### Want To Sell

RCA 77 DX, 77 D TV grey, near mint, Altec 670 Bs, Altec M-21s w/pwr splys, RCA BK 5, 74 JR, Shue 300 in box, Scott 410-C, Tube Sound lvl meter, sell or trade for other mics & tube gear, SASE for list. W Kremer, 301 SW 16th St, Ft Lauderdale FL 33315. 305-524-5652.

Shure SM-7 (2), exc cond, \$275/ea. B Kennedy, EMC Prod, 300 York Ave, St Paul MN 55101. 612-771-1555.

EV RE20's, \$275-325; Sony ECM377 large dia. cond mic, \$495; RCA 44BX matched set of 3, \$3950; Shure new SM7, \$395; AKG new D112, \$295; Crown GLM200 lavalier like new, \$125. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Summit Audio TPA200B dual tube mic preamp, phase reverse, pad, phantom pwr, in box, mint, must sell, \$1100. B Ore, Clockwork, 606 Mamaroneck Ave, Mamaroneck NY 10543. 914-381-0561.

RCA 44BX will trade for condenser mic from 1920's or 30's. J Steele, WKBX, 111 N Grove, Kingsland GA 31548. 912-729-6000.

Electro-Voice 635A dynamic omni directional mic, gd cond, \$50. M Winsick, Glad Productions, POB 1120, N Collins NY 14111. 716-337-0065.

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**Want To Buy**

B&O mics: RCA BK-11A or 74B pair; Stellavox ABR; Nagra QGB. R Brown, 203-677-4828.

77-DX's, 44-BX's, WE KU-3A's On-Air lights, recording lights & audition lights. Top price paid. Fast response. Bill Bryant Mgmt, 2601 Hillsboro Rd, G12, Nashville TN 37212. 615-269-6131, FAX: 615-292-3434.

RCA ribbons, AKG 451's, Neumann KM84's, EV 635A, W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

RCA 77DXs/44BXs ribbon, chrome/TV grey, gd cond, BO, R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

**MISCELLANEOUS**

**Want To Sell**

Sony 48V phantom pwr sup, as new cond. \$50. B Kennedy, EMC Prod. 300 York Ave, St Paul MN 55101. 612-771-1555.

Topaz 15 kVA true UPS w/batteries, 3 phase in, 1 and 3 phase output, \$1995. G Wachter, KFYI, 602-258-6161.

Collectors item, news machine tele-type printer; RCA 1 kW xmtr w/tubes circa 1948, inc tubes. Vern, POB 1340, Oroville CA 95965. 916-533-1340.

Gentner 2000, remote control. \$2050. S Ross, Quinn Bldg, 733 N Green St, Brownsburg IN 46112. 317-852-9119.

**Rotron Blowers** for Elcom, Harris, CCA, CSI, McMartin, rebuilt & new Goodrich Enterprises Inc. 11435 Monderson St, Omaha, NE 68164 402 493 1886 FAX 402 493 6821

High voltage xmtr, 208-220 input (3 taps), 2900-3000 V at 600 mA output, \$180 + shpg; high voltage choke, 10H, 10 kV, \$80 + shpg; capacitors (2) 5 ufd at 7.5 kV, 20 ufd @ 2 kV, 10 ufd at 2 kV, no PCBs. K Lamson, 510-447-7405.

Phasemaster T-12000 rotary single phase to 3 phase convertor, gd conc, BO. B Faulkner, KRKX, Billings MT. 406-652-8400.

Zercom Telephone Interface 1989 model, \$150. J Leutzinger, KIXQ. 2620 Dogwood Rd, Joplin MO 64801. 417-624-1310.

**Want To Buy**

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

**MONITORS**

**Want To Sell**

Belar SCM-1 SCA modulation monitor, \$900. M Persons, WJJY, 40 Front St, Brainerd MN 56401. 218-829-1326.

Belar SCM-1. SCA monitor, \$150 Midland 23-148 voltage regulator, \$50. J Maples, WMYU, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

**RECEIVERS & TRANSCEIVERS**

**Want To Sell**

Racal RA6790/GM tunes 500 kHz to 3C MHz, synth, AM, FM, CW, SSB, twc LCDs, 5 filters, \$1450; ICOM IC-H2 VHF handy-talky, 2-chnl, more than 2.5 W output, w/drop-in desk chgr, new NiCad batt pack & antenna, manual, commercial band, \$125/ea. R Sumner, CAVU Corp, 44632-112 Guilford Dr, Ashburn VA 22011. 703-450-2288.

**GE Superadio III**, custom modified w/noise free SCA w/improved selectivity & sensitivity, \$95. Other modifications avail. Performance guaranteed **800-944-0630**.

Scott 800-B in Chippendale console & spare chassis set, Collins 51-J-4, Communications rcvr, BO; Zenith 3000-1 recapped, vry nice, \$150/BO; sell or trade for tube bcdt gear, vintage mics, SASE for list, W Kremer, 301 SW 16th St, Ft Lauderdale FL 33315. 305-524-5652.

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Sony ICF 9660 AM-FM-TV sound rcvrs (2), \$25/ea+shpg. G Runn, N CA News, 5383 Willow Lake Ct, Byron CA 94514. 510-516-0299.

Yaesu FRG-7 communications rcvr, AM/SSB/CW .53-30 Mhz, \$150+shpg. M Saady, 1st City Rec. 213-05 75 Ave. #2L, Bayside NY 11364.

JVC FM-330 AM/FM computer cntrled tuner w/quartz lock, LCD multimode display, up to 16 preselecs, VGC, \$100/BO + shipping. E Helvey, Summit Prod, 461 Layside Dr Ste 100, Winchester VA 22602. 703-877-2717.

**REMOTE & MICROWAVE EQUIPMENT**

**Want To Sell**

Gentner VRC-1000 and VRC-2000, dial-up remote cntrls. M Persons, WJJY, 40 Front St, Brainerd MN 56401. 218-829-1326.

Moseley TPR-2 STL rcvr transfer panel, \$75. J Maples, WMYU, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

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Zephyrus 300 series satellite rcvr, tuned to CNN news. \$550. Mr Stone, 800-538-4977.

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Mosley PBR-15 remote cntrl, both ends, \$100. P Lenz, WWSW, One Allegheny Sq, Pittsburgh PA 15212. 412-323-5300.

Burk TC-8 remote control 110 kHz sub-carrier cards installed, no relay panel, \$1250. J Leutzinger, KIXQ. 2620 Dogwood Rd, Joplin MO 64801. 417-624-1310.

Gentner EFT-900A and one Gentner EFT-100, one pr of freq extenders, power cables, manuals, inc, like new, less than 50 hrs svce. B Mann Prods, 618-920-8989.

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**Want To Sell**

Ariel DATS/SEDAT receiver with 1 DATS card, 1 SEDAT card, 6 months old, still under warranty. D Robinson, WGTT, POB 584, Alavaster AL 35007.

Colorado Magnetics Satcuc 500, audio switching unit. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

**SOFTWARE/DATABASES**

**Want To Sell**

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**STEREO GENERATORS**

**Want To Sell**

CRL SG 800A with manual, CRL SMP 850, stereo processor, with manual. Vern, POB 1340, Oroville CA 95965. 916-533-1340.

**STUDIOS**

**Want To Sell**

Pacific Recorders AMX-18 with 11 stereo, 9 stereo EQ, and 2 mic-modules, logic interfaces, digital time, custom dex with 28" equipment turret, 2 TT return, overhead equipment, return, good condition, \$22K/BO; Otari MX-5050 1/4" 2 tracks, 2 on wheels, 2 with rack ears; Otari 1/4" 4 tracks (2); Otari 1/2", 4 track. Greg, ACT Radio, 130 W 42nd St, NY NY 10036. 212-840-0220.

**TAPES/CARTS/REELS & CD'S**

**Want To Sell**

Pams Jingles ref tapes, 1951-1976, BO. R Kaufman, Pams Prods, POB 4622247, Garland TX 75046. 214-271-7625.

Ampex 456 one carton of 10 on hubs, new, \$100 + shping. M Saady, 1st City Rec, 213-05 75 Ave, #2L, Bayside NY 11364.

RCA & TapeCaster cart players, \$75-\$150; Ampro cart recorder, like new, \$300; Spotmaster cart winder/timer, including 4 hubs of new cart tape, \$150. P Lenz, WWSW, One Allegheny Sq, Pittsburgh PA 15212. 412-323-5300.

Scotch, Classic rock library and logged classical music on 7 and 10.5" reels, BO. D Pulwers, 703-751-9346.

Records 78 rpm, jazz, big band, 1916-40, excellent condition, make offer. D Fields, Legacy Productions, POB 194, Avoca AR 72711-0194. 501-451-8803.

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JVC ST120	6.49	ST-160	8.99	HI-6-120	5.99	DAT-120	6.49			

Scotchcart II's, 380 between :20 & 9:30, excellent condition, \$1.25 ea; 96 slot wire Carousel, \$75. Stu, First Take Recording, 16128 Orchard Grove Rd, Gaithersburg MD 20878. 301-963-7758.

LP's (1000+), Big Band, MOR, rock and roll, contemp; 45's (1000+); complete Big Band/MOR on metal reels, recd on Ampex 456; Contemporary oldies mix on Ampex 456 metal reels. J Gelo, 813-642-6899.

Ampex Grand Master 456/3M 226, 1/4" R-R tape for sale, some cut, some not, metal & plastic 10 1/2" tape, excellent recording condition, \$10 metal, \$7.50 plastic. Glen, 205-672-7200.

**Want To Buy**

Fidelipac/Audiopak Mastercart II gold or AA-4 light blue in 2:30 through 4:00 lengths, must be in very good condition, call after 3PM CST. 214-271-7625.

Commercial pre-recorded open reel tapes by RCA, Mercury, Livingston, Westminster, etc, 2 track only, inline or stacked heads. P Chance, Imperial Analog, 925 Clinton St, Philadelphia PA 19107. 215-590-4895.

Records 1949-69 45 rpm LPs, R&R, R&B, Doo-wop, EZL, prefer promo material on vinyl, will consider polystyrene D Fields, Legacy Prod, POB 194, Avoca AR 72711-0194. 501-451-8803.

**TAX DEDUCTIBLE**

**Want To Sell**

Wanted, donation of used radio station/audio equipment for elementary school radio training program, audio boards, microphones, nothing too old. R Jeranek, Washington Elem, Washington Ave, Union NJ, 908-851-6460.

**TEST EQUIPMENT**

**Want To Sell**

Fluke 8120A digital VOM, \$75; Tektronix 529 video waveform monit, \$100; Tequipment TLD-54 25MB/auto trigger, dual trace scope, \$200. P Lenz, WWSW, One Allegheny Sq, Pittsburgh PA 15212. 412-323-5300.

Fluke 8520A precision 5 1/2 digit digital multimeter, 2 and 4 wire measurements, math capabilities, IEEE 488 interface, \$485; Hewlett Packard 5006 digital signature analyzer with probe & pods, \$195; Tektronix Polaroid C-30A scope camera, \$95. G Wachter, KFYI, 602-258-6161.

Hewlett Packard 332A distortion analyzer with AM detector, \$595; 333A DA, \$695; 334A DA with AM detector, \$795. R Sumner, 44632 Guildford Dr, Ashburn VA 22011. 703-450-2288.

Tektronix 475A solid state port dual trace 250 MHz oscilloscope, like new, with manua' & probe, \$1050. R Sumner, CAVU Corp, 44632-112 Guilford Dr, Ashburn VA 22011. 703-450-2288.

Tektronix 400 MHz 4 trace 7834 storage oscilloscope frame, \$400; 7A13 differential comparator, \$200; 7A24 400 MHz dual trace amps (2), \$200/ea; 7B92A Dual time base, \$250; all for \$895. G Wachter, KFYI, 602-258-6161.

Tektronix C-4 oscilloscope/spectrum analyzer camera, \$90. M Persons, WJYY, 40 Front St, Brainerd MN 56401. 218-829-1326.

Boonton 42B microwattmeter with power detector 4B, \$850; Telonic 2003 Sweep/Signal generator 0-15 MHz, \$550/Best Offer. RL Promotions 4343 NW 4th Ave, Pompano Beach FL 33064. 305-943-8639.

Coaxial Dynamics Watchman 81071 rack-mounted wattmeter with Forward and Reflected power alarms. Includes dual socket 3-1/8" flanged line section and your choice of two elements. Brand new, not needed in recent turnkey project. \$1700. Call Darrin @ 404-964-3530.

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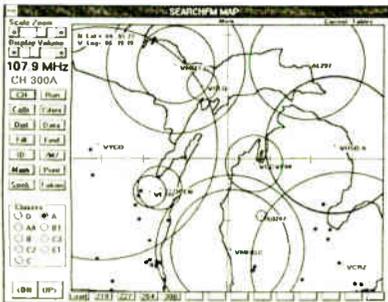
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#### Want To Sell

Collins 20V-3, exc cond, compl w/ spare parts, \$3500. J Stitzinger, 23800 Via Irena, Valencia CA 91355. 805-259-2011.

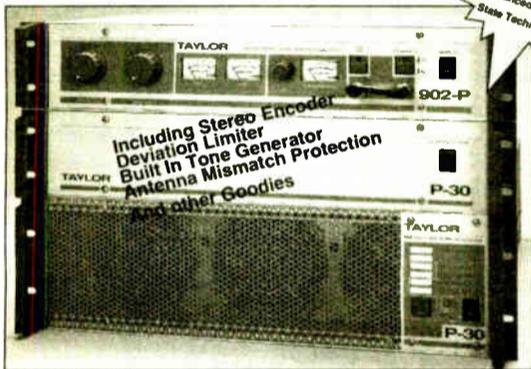
Energy Onix MK22, 22 kW FM w/ exciter, less than 2 yrs old. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

Harris HT 3.5 FM xfr. PLT. 817 1604-001, choke filter (2) filter 5 HY 2A, will trade for prod studio equip or \$1500. B Carr, WYHK, 1201 Fremont Pike, Woodville OH 43469. 419-837-9696.

Cunningham CM 30-50, PSSA-PSRA authorized, AM xmtr/power output adjusts 5-36 W instatin as desired, 19" rack mt, X8-3/4" set to your freq, \$600. J Cunningham, KEOR, RT2 Box 1133, Stonewall OK 74871. 405-265-4496.

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Elcom Bauer 701BHF 1KW shortwave, 3-10 MHz, new. (915) 595-1048.

New McMartin 20 W, BIM-8000 FM exciter, New McMartin IBM1005D FM relay/rebroadcast rcvrs; also some used McMartin B910 exciter 15W. Goodrich Enter., 11435 Manderson St., Omaha, NE 68164. 402-493-1886 fax 402-493-6821

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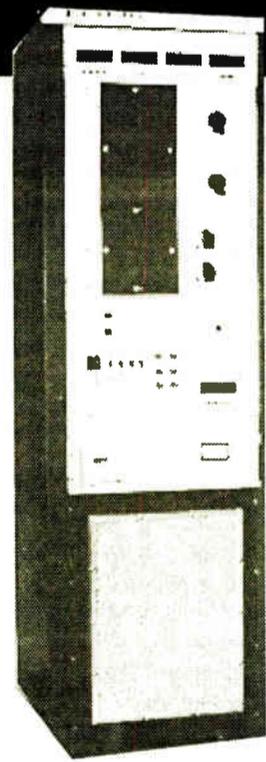
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Table with 4 columns: Page No., Advertiser, Reader Service No., and Advertiser. Lists various companies and their corresponding page numbers and reader service numbers.

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Technics SP-15 w/Micro-trak tonearm, \$200/BO. P Lenz, WWSW, One Allegheny Sq, Pittsburgh PA 15212. 412-323-5300.

Technics SL-1800 (2), direct drive, working. \$50/ea. B Kennedy, EMC Prod. 300 York Ave, St Paul MN 55101. 612-771-1555.

Russco FMSB preamps (4), \$25/ea; Technics SP-15 TT/Russco tonearm, \$175. J Maples, WMYU, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

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