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Radio World



Studio Sessions
 See pp. 15-24

Vol 18, No 24

Radio's Best Read Newspaper

November 30, 1994

RBOCs Ready to Roll Out ISDN

by Thomas Pear

MORRISTOWN, N.J. Bellcore, the research center for the regional Bell operating companies (RBOCs), reports that many regional Bell and other phone companies are now offering Integrated Service Digital Network (ISDN) hookups from anywhere within their territories, creating enhanced audio remote opportunities throughout the radio industry.

Pacific Bell, Ameritech, Bell South, Bell Atlantic are among the companies promising 100 percent ISDN access, said Bill Sohl, a technical staff member of Bellcore. Southwestern Bell reports that it is developing a similar plan to make ISDN available everywhere in its territory.

"That is our strategy," said Jim Brooks, a

Southwestern Bell area manager.

In addition to the Bell companies, several regional GTE companies are also offering



WXTR's Jack Alix (l), Bob Rich, Peggy Castle and Bobby Bennet (r) on remote from the Watergate Hotel

100 percent ISDN access, including certain cities in Florida, North Carolina, Indiana,

Ohio, Illinois, Kentucky, Pennsylvania and Michigan.

ISDN will even be available if a customer's nearest local phone company office does not have an ISDN-compatible phone switch. The companies would run the customer an ISDN line to the nearest office within their territories that does have a ISDN-compatible switch, sometime giving customers an out-of-town ISDN phone number.

In the not-too-distant future, though, running additional ISDN lines to different regional offices will become a thing of the past. Many regional phone companies are increasing the number of ISDN available phone lines.

Bellcore is soon to release a set of projections that will show the number of available ISDN lines offered by local and regional phone companies by the end of 1996 (see chart, page 24).

GTE said that about 50 percent of its lines will be ISDN available by the end of next year.

At press time, Bellcore would not release the new projections, but a company official

AT PRESS TIME

FCC Finally Rules on EBS

WASHINGTON In a unanimous decision, FCC commissioners voted earlier this month to replace the current Emergency Broadcast System (EBS) with the new Emergency Alert System that will work with both new and established technologies.

EAS features a digital system architecture designed to allow broadcast, cable, satellite and other services to send and receive alerting information; have multiple source monitoring for emergency alerts; reduce the alerting tones down to a minimum of eight seconds; create "unobtrusive" weekly and monthly tests; feature automated and remote control options; have the ability to issue

continued on page 2 ▶

did acknowledge there will be a significant increase in the number of available ISDN lines in 1996 from 1995, although GTE independently reported that 54 percent of its lines will be ISDN available by the end of 1996.

"They are definitely going up," said Royce Hazard-Leonard who is packaging the new Bellcore figures for public release.

About 76 percent of Southwestern Bell's customer will be able to get an ISDN hookup by the end of 1996, according to the company.

Besides becoming geographically available, ISDN is quickly becoming economically available. Many regional phone companies offer ISDN rates that are reasonable when compared to other types of enhanced voice carrying technology.

In the case of Bell Atlantic, ISDN cost \$131 to install. The system is then treated as business line hookup. A monthly ISDN fee of about \$20 is added to the standard business line monthly cost. ISDN users then pay about five cents per minute per bearer channel, which adds up to 10 cents a minute because broadcasters normally use two channels known as B channels.

To further reduce ISDN costs, Bell Atlantic offers bulk rates, which in some cases can lower the usage fee to four cents per minute for both bearer channels.

In Michigan, customers using two channels pay a \$147 one-time fee and a monthly fee of \$27.21. Ameritech, the Bell company servicing Michigan, then charges 8.2 cents per call for local calls and 8.4 cents per call for regional calls to places outside the caller's locality but within the regional telephone company's territory. In comparison per minute for both bearer channels.

In Michigan, customers using two

continued on page 24 ▶

Antenna Farm Exceeds ANSI RFR Standards

by Alan Haber

WASHINGTON It goes without saying that exposure to too much RF radiation at antenna sites is a hazard well worth guarding against. One would think that, as a matter of course, the necessary precautions are automatically taken to insure that RF levels are kept within the limits outlined in the 1982 ANSI standard titled "American National Standard Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz."

This has not been the case at the Black Mountain antenna farm, located about 11 miles southeast of downtown Las Vegas in Henderson, Nev., according to the FCC. There are 11 radio stations at the site: KCEP, KILA, KUNV, KXTZ, KWNR, KKLZ, KLUC, KMZQ, KFMS, KEDG, KRLV. In addition, KEYV-FM has an auxiliary antenna there.

Television stations, and a variety of other users, including digital paging and cellular telephone companies, are also resident at the site. The FCC has been aware of problems with RF levels on Black Mountain since 1991. Steps are currently being undertaken to bring RF radiation levels down to comply with the ANSI standard.

On Dec. 5, 1991, Advanced Mobile-Comm of Nevada Inc. (AMI), the owner of four broadcast towers at the Black Mountain site, notified the FCC that high RF radiation levels were in evidence there, and there was the potential for physical harm to personnel authorized to access the site due to exposure.

In the letter to the commission, AMI referenced a report issued by the engineering firm Richard Tell Associates Inc. which said that KXTZ-FM "is the largest source

continued on page 8 ▶



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NEWSWATCH

► continued from page 1

alerts in other languages and make provisions for the hearing impaired; prohibit the false use of the codes and the alert signal and mandate a standard protocol for sending messages.

Broadcasting radio stations and television stations will be required to replace EBS equipment with EAS equipment by July 1, 1996. Cable systems, which are being included for the first time in EBS—soon to be EAS, will have until July 1, 1997 to replace their equipment.

Also, existing EBS equipment must be capable of decoding the shortened eight second version of the two-toned alerting

signal by July 1, 1995. At that time stations will be allowed to transmit the attention signals for not less than eight seconds and not more than 25 seconds. Then, after July 1, 1997, stations will only be allowed to broadcast the new eight-second signal when announcing the monthly test or an actual emergency.

In an effort to encourage rapid manufacturing and deployment of the new EAS equipment, broadcasters are allowed to purchase and install the new equipment in advance of the timetable deadlines.

The FCC will approve early replacement of current technical and operating procedures on a state or local basis,

allowing the use of the shortened signal and allowing stations to replace their EBS equipment.

The FCC will also grant authorization for early deployment of EAS in a given area as long as all the stations in that area have installed the necessary equipment, demonstrated the inclusion of cable in their local areas and have complied with other EBS/EAS rules.

Varian Selling Electron Devices Branch

PALO ALTO, Calif. Varian Associates Inc. recently announced it is selling its Electron Devices operations. The investment banking firm of Morgan Stanley and Co. has been retained to identify potential buyers and assist with the sale.

The business up for sale has assets of \$150 million, posted sales of \$275 million in fiscal '94 and made pretax earnings of \$18 million, noted Varian Chairman and Chief Executive J. Tracy O'Rourke.

Although the bulk of the sale proceeds would be earmarked for the repurchase of additional Varian shares, some of the funds could also be used for selected acquisitions to expand three core Varian businesses that will remain after the sale, O'Rourke said.

Varian's Electron Devices business produces vacuum tubes power supplies, amplifiers and other products mostly for communications, medical, and defense markets.

NAB to Move, Temporarily

WASHINGTON The National Association of Broadcasters (NAB) will be moving to temporary quarters in February, located at 2001 Pennsylvania Ave.

The move allows the powerful lobbying organization to rid NAB headquarters, located at 1771 N Street N.W., of asbestos, plus make a few renovations on the side.

Despite the move, broadcasters should realize little change because the NAB's phone number and mailing address will remain the same. ☺

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.

The PHANTOM Digital Audio Automation

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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Index

STUDIO SESSIONS

- Desk-size Digital Mixer from Yamaha**
by Ty Ford 15
- New Crop of PDAs Useful Audio Tools**
by Frank Beacham 16
- 'Best Buy' Mackie Excels
On Remote and in Studio**
by Frank Beacham 18
- Setting Up for Live Recording**
by Mike Joseph 23
- Aphex Combines 'Tube' Sound, Low Cost**
by John Diamantis 24

FEATURES

- Interface Box a Simple But
Important Item**
by Jim Murphy 30
- Workbench**
by John Bisset 31
- Testing Some New Network Software**
by Richard Mertz 32

BUYERS GUIDE

- DN-650F Offers Professional Features**
by John Bisset 34
- USER REPORTS**
- Pioneer 300-Disc Changer Boosts
Efficiency at KWJJ**
by Michael Kelly 34
- Show Banks on Sony MiniDisc**
by Craig Crossman 36
- WACO Enters Digital Era with
Scott Studios**
by John Elliot 38

TECHNOLOGY UPDATES

- Tascam 41
- Fidelipac 41
- Harris Allied 41
- NSM 41
- Panasonic 43
- Broadcast Electronics 43
- HHB 43
- ITC 43
- Fostex 43
- Otari 44
- Radio Systems 44
- Technics 44

FM Pioneer T. Mitchell Hastings Dies

by Lynn Christian

LOS ANGELES The year was 1962. There was excitement in radio. Rock 'n' roll had saved AM radio when long-form network programming died in the 1950s. Now it was a technological breakthrough: FM multiplex stereo—and nearly 1,000 FM stations were gearing up or

into building and marketing FM or FM/AM receivers for the home or auto, and promote the "second coming of FM" after its disastrous start in the 1940s.

On Sept. 27, 1994, at the age of 84, Mitch Hastings passed on, following a serious bout with cancer. An infinitesimal percentage of today's FM broadcasters have ever heard his name. Mitch sold

duced a vest-pocket FM receiver.

His group of FM stations in New York, Boston, Hartford, Conn. and Providence, R.I., the Concert Network, were ground breakers in providing listeners classical music, in stereo, in the early '60s.

Some of the names of early members in the NAFMB who worked with Mitch in FM's infancy include John Lawrence in Cincinnati, Bill Buckley in Santa Barbara, William Boeing in south Florida and Hank Slavick in Memphis. There was even a NAFMB board member representing Canada, a young fellow from Toronto named Ted Rogers. We all remember him as a person with ideas and energy, an entrepreneur. If you have kept up with Canadian cable growth in the past 25 years, you know that the Ted Rogers' story rivals the Ted Turner story in the U.S.

Working with a group of Harvard graduate students, Mitch delivered a keynote address to the annual NAFMB convention on March 30, 1963—a speech titled "The Future Is FM." This was the beginning of the end for AM radio dominance in the U.S. In his talk, Mitch revealed, step by step, a new Harvard Business School FM study. For those of us who knew Mitch, we were aware that his study would be challenged and questioned by the advertising community and

broadcasters.

These forecasts were described as "pie in the sky" and "outrageous." They included major growth in set sales, new FM stations and advertising revenues. There were rumors that this was not an official Harvard-sanctioned study, and we will never know for sure. However, its 10-year projections, 1964-1974, eventually proved accurate to within a few percentage points. For those of us who planned our personal future on FM radio's growth, we are forever grateful.

Mitch Hastings was one of a kind. His dedication to Major Armstrong's discovery, his work in preserving the Armstrong name and heritage through the Columbia University Foundation, were mostly done without financial rewards. He was the right man for the job, from the beginning until his final hours as he planned the next Armstrong Awards mailings. He never lost his vision, his sense of humor or his respect for other people's ideas.

Thanks, Mitch, from all of your friends in radio. You made FM a lot more rewarding, and fun, for all of us.

□ □ □

Editor's Note: Lynn Christian was himself a founding member of the National Association of FM Broadcasters and a board member of the Armstrong Foundation. In addition, Christian received that foundation's first individual award for the development of FM radio.

Founders of NAFMB Get Gavel of Honor



(L to R)—T. Mitchell Hastings, Jr., WBCN, current president NAFMB; William D. Caskey, WPEN; William Tomberlin, KMLA, retiring treasurer NAFMB; Laurence Gordon, WBUF; Fred Rabell, KITT, retiring president NAFMB; Pose with gavels presented to them as founders of National Association of FM Broadcasters.

The front page of Volume 1, No. 1, of the NAFMB's Report

going on the air to transmit a signal quality which would far surpass AM at the time.

There was a band of entrepreneurial people pushing FM and FM stereo in the early 1960s, and the quiet man at the forefront was a Harvard communications engineering graduate named T. Mitchell Hastings Jr. As president of the renegade National Association of FM Broadcasters, Mitch Hastings manipulated an enthusiastic but disorganized group of engineering, programming and marketing people into believing FM radio would be the dominant radio medium by the mid-1970s.

With more than 100 stations donating spots to sell to one advertiser (Magnavox) in 1962, Mitch raised \$150,000, a cache that was carefully used to develop new FM research, press manufacturers

his Concert Network holdings more than 15 years ago.

Since that time, from his homes in the northeast, Mitch served as president of the Major Armstrong Memorial Research Foundation at Columbia University. As most devoted students of radio remember, Major Armstrong invented FM and led a tragic life, brilliantly portrayed in prose by Tom Lewis and in video by Ken Burns in his 1992 PBS special, "Empire of the Air."

In 1919, while in the fifth grade, Mitch and a group of neighborhood boys in Santa Barbara, Calif. put together a radio transmitter from a kit they bought in San Francisco. The radio bug had bitten, and he never recovered. In the early '50s with Edgar Brooks of Raytheon, he developed, manufactured and marketed the Hastings FM car radio tuner. He also pro-

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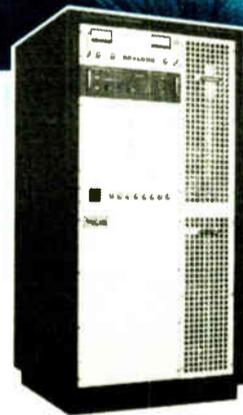
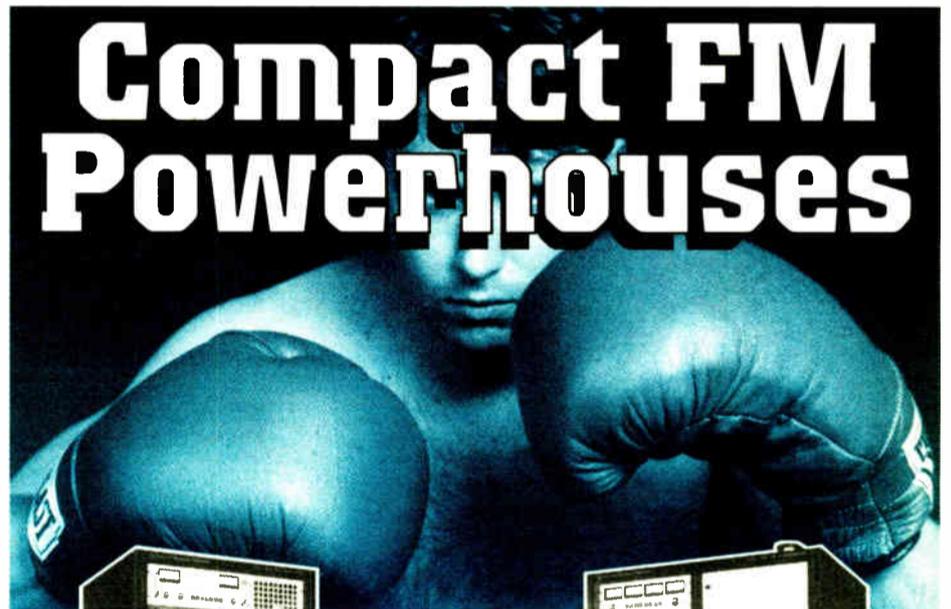
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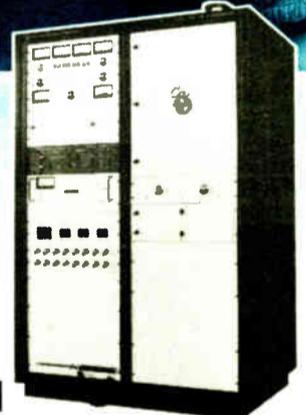
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Give the Locals a Chance

WASHINGTON Letters to the editor on the subject of the recently transacted sale of WOWO(AM) Fort Wayne, Ind., prove that passion still runs high in radio, especially when it comes to the glory days.

(Once upon a time, the land was dotted with full-service clear-channel stations, the jewels in the crown of many old-line broadcast companies...)



And as harsh as this may sound, I feel compelled to say that nostalgia is fine for a hobby, but business is business.

Back when the industry was still nascent, the original charter of the clear channels encompassed the notion that not only should urban areas be served by radio, so too should the rural ones. Thus clear-channel stations broadcast their full-service format across the nation, and in many cases, across the oceans.

Fast-forward to 1994. There are roughly 10,000 radio signals across the U.S. Not only are rural areas not underserved, but many stations have complained (on *RW*'s own opinion page) about the oversaturation of radio markets, FM Docket 80-90. Interference on the AM band—which led to the expanded band. Incentives for turning in your AM license rather than trying to sell an unprofitable signal.

All of these things are happening

around us as I write this. Yet *RW* is being lambasted for favoring the "prostitution of the band for a buck."

I say forget passion for history and think about the present and the future. Clear channels, like most stations, make the bulk of their revenue during the day. So it's not like they'll be losing money if they have to power down or alter their signal a bit at night.

Clear channels cannot serve rural or distant areas better than the local stations that are now powering down to make way for them. Yet the big guys get to blast their signal into that region, make no money at it, and deny the local station a chance to serve its community and make money doing so.

If serving the rural areas remains an important part of radio's charter, then it can best be served by letting the local stations—not the distant clear channels—operate in their own communities.

I don't think I'm calling for the prostitution of the band for a buck. I'm calling for a more equitable distribution of scarce spectrum to better serve a larger number of people. Isn't localism what radio is about?

(...And the day came when the land was bedecked with thousands of stations, each one the prize possession of its community, the only jewel in a locally-owned and operated enterprise...and, hopefully, they lived happily ever after.)

★ ★ ★

A couple of issues ago, I mentioned that BSW had been involved with the production of NBC's TV sitcom "Frasier." Eagle-eyed viewers of the show probably know that the console used by Boston's favorite expatriate is a Pacific Recorders & Engineering board, and the studio was inspired by the stunning KABC Los Angeles studios, redone last year (also featuring a PR&E console).

Jack Williams said the process began as far back as April of 1993. And if you can

Budding Radio Careers



The talkative team of Spencer Gross and Katy Cockrell made its national radio debut on Friday, October 14, during the last minutes of CBS Radio's *The Gil Gross Show*. The youngsters tagged along as their dads worked a full week of live broadcasts from CBS owned KNX(AM) and Los Angeles' *Westin Bonaventure*, during the recent NAB Radio Show.

Pictured l to r: Host Gil Gross, Katy Cockrell, Spencer Gross and producer Gregg Cockrell.

catch the original episode in reruns next summer, be sure to notice that the setup in the pilot episode gave way to the much more elegant, KABC-inspired one they use now. In fact, the setup used now is wired to work, and, said Jack, feeds the audio to the booth when tape is rolling.

★ ★ ★

And lastly, when I wrote about the Bayliss Media Roast, I mentioned it was at the Plaza Hotel. It had been for eight years, but the foundation chose the Waldorf-Astoria Hotel (a reason to visit Manhattan in and of itself) for Roast No. 9. Sorry about that.

One last item. The RAB reports that the combined national spot and local radio revenue was up 11 percent through the third quarter of this year compared to the same nine-month period in 1993. Growth was strong and consistent, said the RAB, with gains of 12 percent in national spot and 11 percent on the local front compared to 1993.



Westinghouse Electric Corp. named Bill Korn chairman and chief executive officer of Westinghouse Broadcasting (Group W). Korn succeeds Burt Stanier, who will continue as chairman and chief executive officer of The Knoll Group, a subsidiary of Westinghouse.



Lisa L. Hakim has been named director of finance, radio, Capital Cities/ABC Inc. Hakim had been associate director, administrative services business office.

Radio Advertising Bureau President Gary Fries announced Reed Bunzel will be joining the RAB as vice president of communications. Laura Morandin, who previously held the position of vice president communications becomes vice president of public affairs.

Bunzel's experience in radio includes stints at industry trade magazines, as well as the National Association of Broadcasters.

Now, Burk pushes the right buttons for clean, clear audio switching.



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Place the Burk LX-1 in your audio chain and you're getting the best mix of features, reliability, and performance. All at a price that truly pushes the right buttons for the 90s. Stow the old patch cords away. And take the first step toward putting the LX-1 to work for you. Call Burk Technology at 1-800-255-8090

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READERS FORUM

If you have comments for Radio World, call us at 800-336-3045 or send a letter to Readers Forum (Radio World, Box 1214, Falls Church, VA 22041 or MCI Mailbox #302-7776). All letters received become the property of Radio World, to be used at our discretion and as space permits.

Mic Update

Dear RW,

Your excellent article in the Aug. 10 issue of RW: "Coles Lip Mic Filters Out Noise" gives the impression that Wes Dooley's Audio Application is the sole importer to the US of Coles broadcast microphones.

Nothing could be further from the truth. I have been importing them for some time, offering both the 4104 lip mic and the 4038 studio ribbon from stock. I can personally vouch for the 4038—I have been using it on my sessions since 1960: from my Abbey Road days to the present!

To give equal time, you may publish my phone number: 212-865-3108.

Malcolm Addey
Radio/Computer marriage

Dear RW,

Judith Gross' comments on the marriage of radio and computers touch the tip of the iceberg. The ultimate realization of that integration will be far more dramatic than "aural radio reception" at your PC work station.

Through an internal "electronic umbilical cord," the computer can easily be made to function as a video display terminal for information provided by radio stations. Just that easily, we will provide radio with "visual" attributes, without having to wait out development of application-specific display devices attendant to services such as RBDS. This computer-display approach will allow broadcasters to disseminate fast-decay information to complement or supplement what is being said on the air.

Listeners for example, will be able to glance at a screen displaying road or weather conditions instead of waiting for a DJ to repeat information they missed.

The PC modem will interact with an online service operated by the radio station as a separate profit center and as a means to build direct relationships with listeners.

The integration of radio and computers is

Radio World

Vol. 18, No. 24

November 30, 1994

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Radio World (ISSN: 0274-8541) is published bi-weekly by Industrial Marketing Advisory Services, Inc., 5827 Columbia Pike, Suite 310, Falls Church, VA 22041. Phone: 703-998-7600. Fax: 703-998-2966. Second-class postage rates are paid at Falls Church VA 22046 and additional mailing offices. POSTMASTER: Send 3579 forms and address changes to Radio World, P.O. Box 1214, Falls Church VA 22041. REPRINTS: Reprints of all articles in this issue are available. Call or write Regan Deatherage, P.O. Box 1214, Falls Church, VA 22041; (703) 998-7600; Fax: (703) 998-2966. Copyright 1994 by Industrial Marketing Advisory Services, Inc. All rights reserved.

—PRINTED IN THE USA—

**Next Issue of
Radio World
December 14, 1994**

an idea whose time is long overdue, and the National Association of Broadcasters futures committee will spend its time wisely exploring the impact of such an obvious marriage.

Mark Dureneberger
CBS-Teleport
Eden Prairie, Minn.

A Fan of WOWO

Dear RW,

I have been following, with interest, the articles about the possible sale and downgrade of WOWO(AM)'s signal. As a former broadcaster and long-time DXer, I think it is criminal that the signals of so many of the "clears" have been rendered ineffective by the stacking of other nighttime signals on top of the once-dominant station.

In 1962, while on my first assignment with the Armed Forces Radio Nouasseur Air Base near Casablanca, Morocco, I could pick up WOWO on a small inexpensive radio. The signal was weak, but exceptionally clean without interference of any type. Other clears then heard by me were: WWL New Orleans, WLW Cincinnati, WSB Atlanta, one or two New York City stations whose calls I don't remember, WGY Schenectady, N.Y., and a Canadian station from Sackville, New Brunswick.

As an Iowan who cut his radio "teeth" working at local stations there during the mid-1950s, I often listened to WOWO, using its programming and air staff as examples to live up to. Listening to that station while working thousands of miles from home in North Africa was an absolute thrill. I wonder if any of the mentioned radio signals can be heard in Morocco today. I doubt it. And soon, you will not receive WOWO's nighttime signal in Iowa or most of Indiana if some persons have their way.

Norman D. Medland
Media Relations Officer
Oakland Army Base, Calif.

Stop the nonsense

Dear RW,

Your article, in the Oct. 5 issue, about KKLA-FM's trials at the hands of a Los Angeles electrical inspector brought to mind my visit to the L.A. Testing Lab back in the late 1970s, as a representative of my previous employer.

My employer at the time manufactured a certain product that required the L.A. Testing Lab's certification in order for it to be sold and used in the city (and county). I paid the lab a visit to provide them with certain information needed for the testing process. While being given a tour, I was quite surprised to see a brand new Ampex VTR (a VPR-2, if I correctly recall) on the floor, awaiting inspection. In answer to my question, I was told that the lab needed to make sure that the machine complied with its electrical safety codes. Perhaps one of your readers from the Los Angeles engineering community can corroborate this bit of ancient history, from their personal experience.

Most city/county electrical inspection departments are chartered with the author-

EASing Out of EBS

The FCC commission's unanimous decision to replace the current Emergency Broadcast System (EBS) with the Emergency Alert System is good news, if somewhat overdue.

After lingering in regulatory limbo for the better part of this year, the decision reflects the commission's desire to allow broadcasters to work within their budgets yet adhere to a better standard.

RW supports the intent of the decision to allow each individual marketplace to decide. The decision allows stations until 1996 to fully implement the new EAS (although sooner is allowed and encouraged).

And though some industry executives are calling the FCC's decision a "non-decision," RW disagrees. After spending many months in a concerted effort with industry to deal with complex economic, technological and even sociological issues (remember the field tests in Colorado and Baltimore? See RW, Aug. 11, 1993), the agency has written the rules broadly enough that stations can set up a relatively low-cost system that is still much more reliable than the current EBS.

Stations can spend as little as \$750 to upgrade to the new system. Those willing to spend more, especially FM stations gearing up for radio broadcast data service anyway, can buy a system that does things like turn on an RDS clock radio in the middle of the night.

EAS will feature a digital system architecture designed to allow broadcast, cable, satellite and other services to send and receive alerting information, as well as myriad other functions. Herein lie the possible trouble spots. Because the EAS allows for different systems to be used within a digital technology, the likelihood of compatibility problems increases.

As of this writing, the commission had not yet released the full text on the technical specs of its decision. The NAB has adopted a "wait-and-see" approach and will comment on the decision once the full text is released. Be that as it may, the NAB and the SBE should stand ready to help stations work through this transition.

A new emergency alerting system has been a long time coming. The FCC's decision should make for a quick and painless leap forward to a more efficient and important role for broadcasters during crisis situations.

—RW

ity to see to it that a building's electrical wiring and systems comply with local, state and national codes. If L.A. County's electrical inspection authority truly ends at the AC power receptacle, then it has been overstepping its bounds for some time. Perhaps your article will trigger some discussion at the L.A. SBE chapter meetings, and further actions by the stations to stop this nonsense.

Russell Murphy
The Family Channel

More on WOWO

Dear RW,

I wish to thank RW for the fine article you presented Nov. 2 "Group Opposes WOWO Downgrading." However, it failed to mention our mailing address which is:

The WOWO Listeners' Guild
P.O. Box 1183

Randolph, MA. 02368-1183

E-mail: pgeorge@lucy.wellesley.edu

I must also take exception to the Editorial in the same RW edition: "A Fighting Chance For AM." If the FCC does allow WLIB to go fulltime on 1190 kHz at the expense of WOWO's super signal, most likely there will be a literal "Fighting Chance." As WLIB gets a fulltime status and WOWO goes "local," many other "daytimers" east of the Mississippi will vie for nighttime authorization.

With all of those signals going fulltime you will have a real fight on your hands with 10, maybe even 15 stations causing a "noise level" which will rival any good regional channel.

Instead of hearing one solid signal every night, you will be treated to a dogfight of heterodynes, rendering the 1190 frequency useless. To paraphrase, once everything is said and done, there will be no turning back. So much for AM Improvement.

Sure, New York would get another nighttime signal, but anyone outside the "Big Apple" will have to scratch yet

another clean frequency off the list.

Once WOWO goes, the future of the 1190 frequency, and for that matter, the entire AM band will be etched in stone. Chances are other stations in major metropolitan areas will upstage radio operations with the misfortune of not existing in a big city.

Call it a domino effect, call it what you will, but the result will be the same: nobody will listen to a station in his or her own backyard that is laced with heterodynes in the program material. Don't say I didn't warn you.

Peter Q. George
The WOWO Listeners' Guild

Dear RW,

Your editorial in the Nov. 2 issue of RW could not be more thoughtless.

Should one assume that you have no problem with the full prostitution of the band for a buck? I do. WOWO and all other outlets of its type should be left as they are. I agree fully with Peter George of Randolph, Mass., that WOWO should be preserved.

Your position: "A Fighting Chance for AM" is hogwash.

I worked for Atlantic States Industries 30 years ago. A.S.I. was a group owner in New York City—part of McGovern/Guild, so I know New York radio.

WLIB is a niche player with a sister FM, which is also a niche player. So where is the need to compete?

Remember, AM daytimers were the ultra cash cows of the radio once upon a time. WLIB has its loyal following just as it is.

For this you condone destroying WOWO, an institution?

When AM broadcasters realize it is the software that matters, not the hardware, success will follow. For example, Rush Limbaugh is on AM and has done more to save the skin of AM people than any NAB committee.

Mike Graves
Newburyport, Mass.

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Circle (26) On Reader Service Card

Tape Prices Rise as Materials' Cost Soars

by Dee McVicker

NEW YORK Audio tape manufacturers are reeling from recent price increases of raw materials, which could lead to price increases of tape products across the board for radio stations.

At least one tape manufacturer, 3M, has already raised its prices 2.5 to 3.5 percent on nearly all its audio and video tape products because of new market demands for the petroleum-based materials used in tape manufacturing.

Price increases by manufacturers could affect all tape products, but open reel and

used in making tape. Cobalt, which is the material used in tape magnetic coating for cassette and open-reel tape, went up 67 percent; resins, which are used in the plastic cassette components, have risen 28 percent; aluminum, used for flanges on open-reel products, is up 21 percent; and polyester film, the substrate for magnetic tape, is up 7 percent.

Increased demand

The sharp rise in costs of raw materials is primarily due to a bust-and-boom economy. The materials used in tape manufacturing are also used to package and make

that time, but there have been tremendous manufacturing productivity improvements over that time." Running tape coaters at faster speeds and implementing control programs have increased tape yields over the past decade.

But given the maturity of tape manufacturing today, some tape manufacturers are forced to consider other cost-cutting alternatives. Peter Brinkman, national marketing manager for Maxell, said "All of a sudden it is clearly a seller's market (for resins), and so the prices are reflecting that."

Although Maxell is experiencing "significant strain" as a result of increased material costs, it has no plans yet to increase prices to the consumer. Maxell's strategy is to stabilize its pricing with tactical, sometimes bulk, purchases of raw materials.

"If conditions continue to change in the marketplace, pricing is something we (will) study very carefully," Brinkman said. "But at the moment, we are not making any adjustments in our pricing."

Other manufacturers, however, are having to consider increasing prices. "We're looking very closely at it," said Terry O'Kelly, director of sales and marketing for BASF, which could increase prices on many of its tape products "anywhere from 3 to 6 percent."

Ongoing concern

Kevin Kennedy of DIC Digital expressed concern that rising raw material costs could push prices up for his company's digital tape products, as did Fred Layn, product manager for Ampex's professional audio group.

"We have not raised our prices in five years. However, we are having to examine it very closely now," Layn said. Sony's Joe Tibensky, voiced the same concerns. "We have had similar pressures (to raise prices)," he said.

The end-users most likely to be affected by the price increase are the radio stations

that rely on tape almost exclusively for programming and production. "I suspect they will be hit the hardest and have the most complaints about it," said John Marino, who is with the National Association of Broadcasters (NAB).

Intensive tape

Jerry Jacob of KALW-FM, a predominantly tape-based public station in San Francisco, said he wouldn't be happy with a 2 to 5 percent hit on his annual budget for tape products. But, he said, "It's no different than the annual inflation clause in a union contract or any other price increase that you have to go through."

Jacob estimated his station spends less than \$10,000 a year on tape products for cassette, open reel and DAT in order to tape some 120 events off of satellite every week.

The price increase will not affect large station groups and program suppliers that utilize satellite and compact discs to supply programming.

According to Chris Washington of Infinity Broadcasting, a 2-5 percent increase of tape products across the board would barely affect his organization, given that Infinity delivers most of its programming by satellite and uses tape only as an archival medium.

TM Century's Tom Cusac, studio manager with the program supplier, said "We've gone more away from tape, so it affects us internally. For every single CD project we do there is an archive which exists in digital tape form as a backup. It would have affected us worse in previous years when our product was tape-based."

Although the predicted price increase isn't likely to change how most radio stations or syndicators produce and replay audio, it could encourage some to re-evaluate alternative media. The NAB's Marino said, "It will certainly provide incentive for broadcasters to look at the tapeless studios and digital workstations." 

Price increases by manufacturers could affect all tape products, but open reel and cassette are most likely to be hit the hardest.

cassette are most likely to be hit the hardest because of their reliance on the upward cost of cobalt.

On the rise

"The costs of raw materials that go into making audio and video tape products have been escalating for some time. Regretfully, we will have to pass some on to our customers," said Don Rushin, marketing director of 3M professional audio and video markets.

Prices did not increase for 3M's Digital Audio Tape (DAT) line, but price increases for its cobalt-dependent cassette tape and quarter-inch to two-inch open reel tapes went into effect Nov. 15, leading off what could be price increases by other tape manufacturers who are feeling similar pressures from high-cost commodities.

According to 3M, costs have increased markedly this year for virtually all materials

other industry goods. Recently, producers from a variety of industries have beefed up manufacturing after a sluggish economy, upping the demand for petroleum-based materials and depleting existing supplies, according to Jim Mooney of O.M. Group, a consumer and refiner of cobalt.

"The year-end supply of cobalt to the marketplace used to be 12,000 metric tons. And now it stands, in 1994, at approximately 3,500 metric tons," he said.

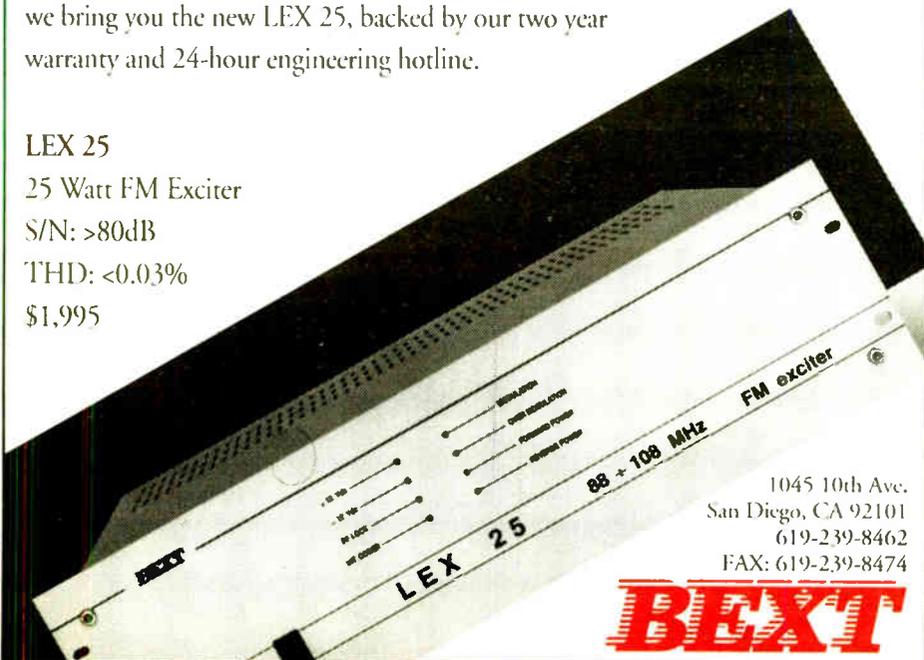
Audio tape manufacturers Maxell, DIC Digital, BASF, Sony and Ampex are feeling the impact of these new market demands to varying degrees. Previously, when confronted by a volatile commodities market, tape manufacturers have been able to offset increased material costs with increased manufacturing efficiencies.

"(3M) tape hasn't gone up for almost 14 years," Rushin said. "There have been raw material price increases obviously during

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Antenna Farm Exceeds ANSI Limits

► continued from page 1

of RF radiation and is, in and of itself, creating RF fields that exceed ANSI standards."

The letter, which also said that "certain of the FM broadcasters" on Black Mountain "when aggregated" also "emit RF radiation in excess of ANSI guidelines," noted that "if station KXTZ-FM is brought into compliance, the combined fields of those stations may not exceed ANSI standards."

Further, the letter informed the FCC that KXTZ-FM "has refused to bring its radiation pattern into compliance unless AMI bears the cost of purchasing and

installing a new antenna, an obligation that AMI is neither willing nor required by law or contract to undertake."

Sands, contract engineer for KXTZ-FM and other stations, KXTZ-FM has recently entered into an agreement with AMI

The commission has been aware of problems with RF levels on Black Mountain since 1991.

The admission in the letter that "AMI has attempted to work with KXTZ-FM to rectify this grave problem" turns out to have been prophetic. According to Joe

which will see replacement of the station's transmitter and antenna, probably by the end of the year (the new half wave spaced antenna, which produces less radi-

ation straight up and down, is the best way to solve the RF problem, according to Sands). Sands said that AMI is financing the project.

On April 28, 1992, a 30-day letter was sent by the Audio Services Division of the FCC's Mass Media Bureau requesting a statement of agreement between licensees and permittees on the Black Mountain site to comply with the FCC Office of Science and Technology (OST) Bulletin 65, "with regard to radio frequency radiation hazards affecting workers."

On the tower

(On March 8, 1993, San Francisco consulting engineering firm Hammett & Edison Inc. submitted a report to the commission that calculated on-tower power levels. On April 8, 1993, the FCC sent out a letter to licensees and permittees saying there was compliance with OST Bulletin 65 as far as on-tower levels were concerned.)

Next, the commission decided a ground level report was also needed. On May 12, 1993, a letter was sent to licensees and permittees requesting them "to further study the radio frequency radiation at ground level or any other accessible area at the Black Mountain site and submit a report detailing the procedures for ground level worker access in coordination with the on-tower procedures in order to confirm that the requirements specified in our letter dated April 8, 1993 are adequate to protect all persons having access to the site."

In the time that passed between the distribution of the April 28, 1992 letter and the March 8, 1993 Hammett & Edison report, Bob Greenberg, assistant chief of the FCC's FM Branch, said he "knew that conversations and meetings were taking place with all of the users (of the Black Mountain site), and also I knew that consulting engineers had been working together. So action was occurring. It's not like the commission didn't do anything—it was trying to give the broadcasters a chance to work this very difficult situation out."

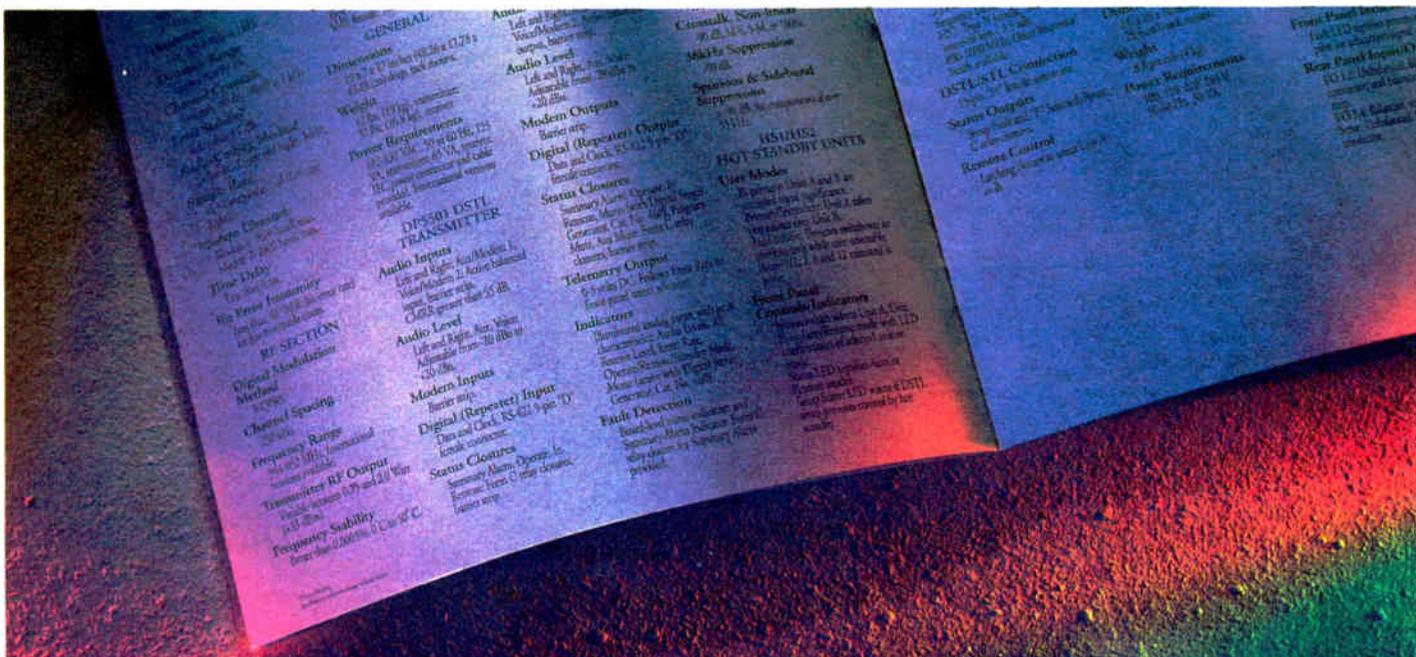
Greenberg said that the FCC felt there was a breakdown in communication between the Black Mountain site users, which prompted a letter to them that was issued on Sept. 21 of this year. The letter gave licensees and permittees who had not satisfied the requirements of the FCC's May 12, 1993 letter 20 days "to submit a report detailing the procedures for ground level worker access in coordination with the on-tower procedures, in order to confirm that the requirements specified in our letter dated April 8, 1993, are adequate to protect all persons having access to the site."

The letter further stated that "No individual license or renewal authorizations will be granted until compliance with requirements of the letter has been reached."

According to Greenberg, Advanced MobileComm responded to the FCC on Oct. 10 of this year, on behalf of the licensees at the site, with a Hammett & Edison report (dated Oct. 4, 1993) that addressed the ground level radiation. Greenberg said that the commission is currently studying this report and added he hopes to arrive at a conclusion "shortly."

The Oct. 4, 1993, report, a copy of which was obtained by RW, concluded that "portions" of the Black Mountain site "exceed 1 mW/cm² when all of the stations at the site are operating at full power. In order to limit human exposure conditions at the site

continued on page 29 ►



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World Radio History

RFR Key Factor in Renewal Process

by Thomas Pear

WASHINGTON As the next wave of license renewals begins, stations may want to take RFR (radio frequency radiation) or RF regulations into close account.

Although the FCC says it only saw a couple of RF protests from the outside—the bulk of outside protests coming from EEO violations, programming concerns and other types of violations—about 10 to 15 percent of applications were deferred by the commission internally because of insufficient RF data, said Stuart Bedell, the assistant chief of the FCC's audio services division.

"For stations that haven't demonstrated compliance, the commission has held off all authorization grants including transfers of ownership," FCC FM Branch Assistant Chief Robert Greenberg said.

A lot of stations are not sure what the FCC is looking for when it comes to RF requirements, Bedell said, and noted that most of the deferrals came to stations that provided an

insufficient amount of RF data to allow the FCC to determine whether or not the stations complied with RF rules. In other words, Bedell said, the stations were not thorough enough in their RF descriptions, so the commission put their renewals on hold until sufficient data was supplied.

"For example," Bedell said, "someone with an AM station will say 'I am in compliance with the RF requirement because I have a fence.'"

But just having a fence does not put a station in compliance with RF regulations. "Depending on the power of the station and the height of the tower that fence has to be a certain distance from the base of the tower," Bedell said, adding that failure to provide that information would result in a license renewal deferment.

New RF regulations
Making matters worse for broadcasters, the FCC is developing a new set of RF regulations, now out for public discussion as a formal rulemaking proposal, based on the ANSI/IEEE C.95.1-1992 standard that could involve two separate sets of RF rules: one for the general public and another for industry workers.

Currently, the FCC standard is set at 1,000 mW/cm² for FM and for AM it is 614 volts per meter in term of electric fields and 1.58 amps per meter in terms of magnetic fields, noted FCC senior scientist Dr. Robert Cleveland.

Under the ANSI/IEEE proposal, for FM 1,000 mW/cm² would remain as the standard for a controlled environment, while the radiation level of 200 mW/cm² would become the new standard for an uncontrolled public environment, Cleveland said.

A controlled environment is defined as an environment that has restricted access. In many cases these environments are created by placing a fence around a radiating tower. Uncontrolled environments are environments open to the general public.

For AM, the standard for a controlled environment would be 614 volts per meter in terms of electric fields and 16.3 divided by the frequency in terms of magnetic

fields, according to Cleveland. For the uncontrolled environment, in terms of electric fields, the standard would be 614 volts per meter up to 1.34 MHz and above 1.34 MHz the standard would be 823.8 divided by the frequency. In terms of magnetic fields the standard would be 16.3 divided by the frequency, he said.

Even more troublesome to broadcasters is that if the ANSI/IEEE rules are adopted, for the first time RF regulations would include induced body currents and contact currents. They would regulate them up to 100 MHz, limiting a controlled area to 100 milliamps and an uncontrolled area to 45 milliamps.

"They (the proposed rules) can have a devastating effect," said Dane Ericksen, a senior engineer at the San Francisco engineering firm of Hammett and Edison. "I feel sorry for the stations that come up for renewal right after the effective date."

The first problem is that there are no devices for measuring contact currents above 30 MHz, Ericksen noted, and there are only prototypes for measuring body currents from 30 MHz and above.

"Hopefully they would not enforce induced body currents and contact currents until there are readily available measuring instruments," Ericksen said.

Then there is a question of fairness: why should stations 100 MHz and below be held to more stringent regulations than stations above 100 MHz?

The bottom line, however, is that the regulatory burden of having to prove compliance could severely impact the industry, and already, Cleveland has been inundated with about 4,000 pages of comments, many protesting ANSI/IEEE.

Also, as of yet, the FCC has not preempted any RF rules to prevent state and local governments from adding additional regulations of their own.

Throwing another monkey wrench into the FCC adopting the ANSI/IEEE proposals is that another set of RF guidelines is being worked out by the Environmental Protection Agency (EPA). Sources say the two large federal agencies do not want to appear to contradict each other.

Previous predictions that RF rule changes will come in the middle of next year, then, may still be a little premature.

"We don't know when and if these standards will be adopted," Cleveland said.

One thing, though, is for certain. The FCC will enforce whatever standards it adopts. In cases where you have multiple towers sitting in the same geographical locations like Mount Wilson near Los Angeles or Black Mountain near Las Vegas, the entire area would have to be in compliance with RF regulations for controlled environments, Greenberg noted.

Bedell and Greenberg recommend that stations consult an engineer before filing a license renewal.

"People who are at sites like that are strongly encouraged to use a consulting engineer," Bedell said.

Despite the fact that RF regulations are getting tougher and more complicated, there is a bright spot. Bedell noted that the FCC is creating user friendly license renewal applications (See RW Nov. 16),

and as part of the "user friendly" applications a special RF checkoff sheet is being developed to help station managers and engineers determine if they have provided all of the necessary RF information.

Just trying to help

"We are in the process of putting that together now," Bedell said.

"What we are trying to do with this worksheet is basically help general management and station engineers determine whether they have a problem at their station," Greenberg said. "In the past we did not get the information we needed to do an accurate, timely and rapid turnaround

on the renewals."

As new RF standards are adopted, the worksheet, which is still subject to commission approval, would be made relevant to the new regulations, hopefully, simplifying compliance.

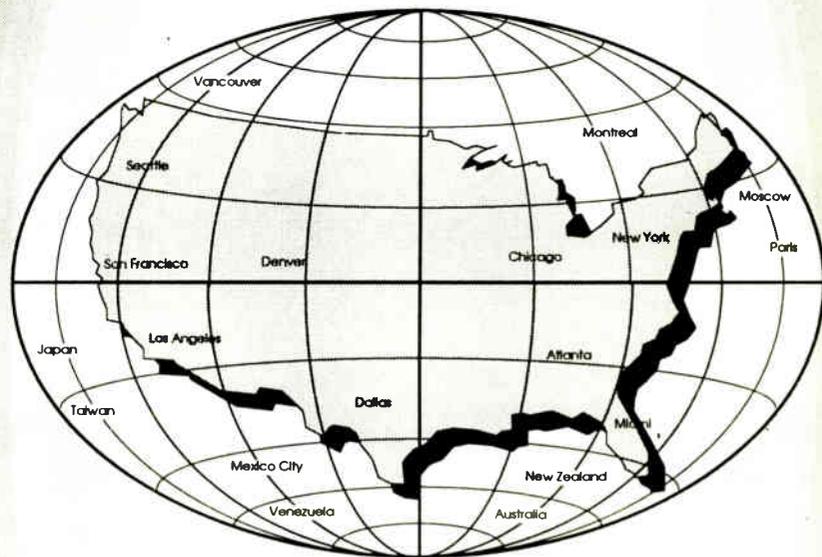
Also, Bedell said that if the RF rules are changed in the middle of the renewal process, creating the two-tier approach to radiation levels, the new rules would not be enforced retroactively. Stations with FCC approval for an overall radiation level of 1,000 mW/cm² would not immediately have to protect the radiation level outside the immediate area of their tower to 200 mW/cm².

However, stations would have to be in compliance with the new RF rules in order to be granted FCC permission for amending their facilities, Bedell said.

Failure to provide the necessary RF information will result in a license renewal deferment.

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Reader Service 87



Harris Allied (Encoder)

3712 National Road West
Richmond, Indiana 47374
Contact: Scott Beeler
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Contact: Judy Pendleton
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Reader Service 155



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Reader Service 109



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1638 153rd St. SE
Bellevue, Washington 98007
Contact: Allen Hartle
206-641-9043
Reader Service 180



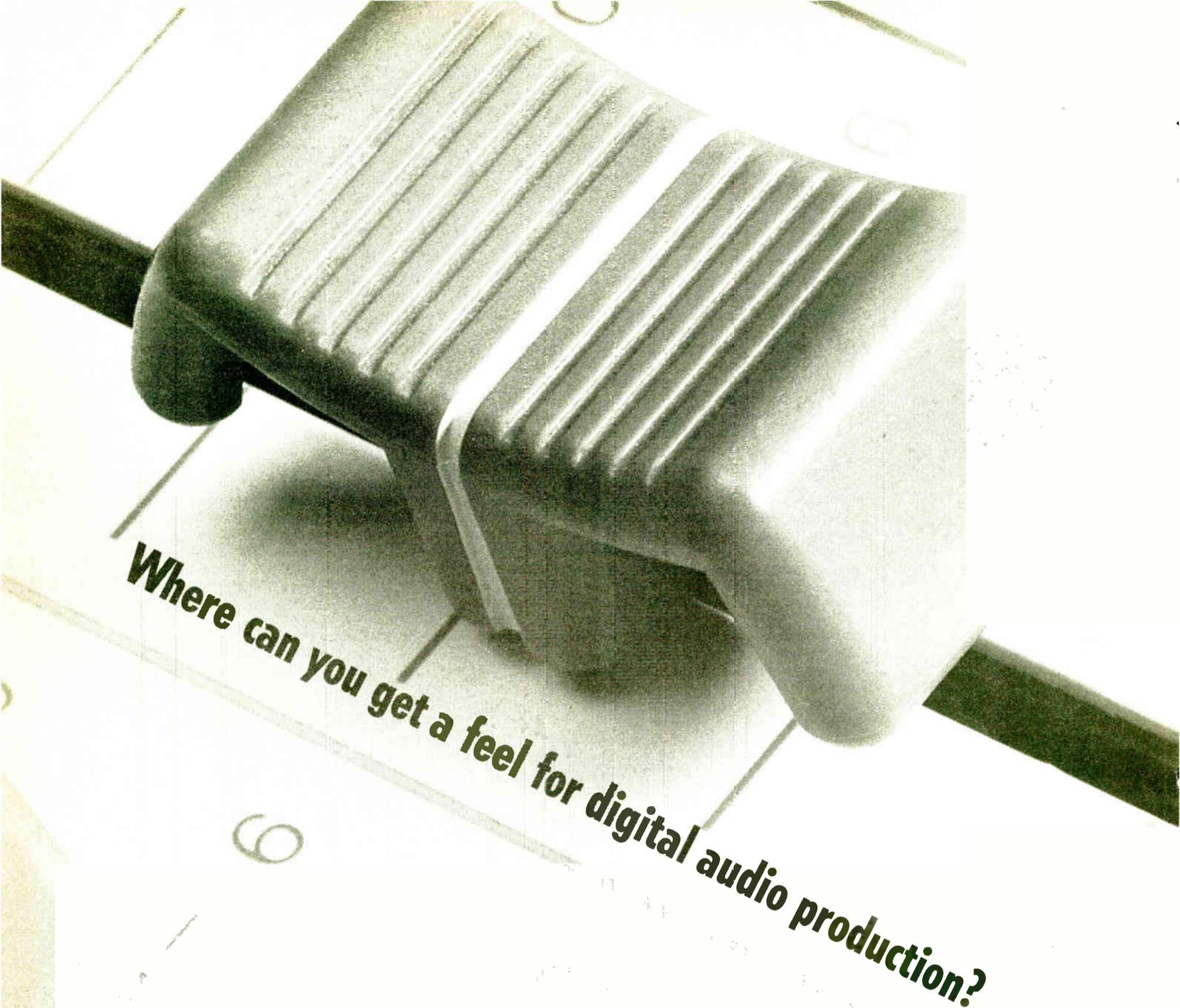
Terrapin (IVHS Services/Diff-GPS)

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Garden Grove, California 92641
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714-898-8200

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RBDS Stations

Station	Frequency	City	Station	Frequency	City	Station	Frequency	City
ALABAMA			NEW MEXICO			OKLAHOMA		
WZYP-FM	104.3	Athens	WAMC-FM	90.3	Albany	KSYE-FM	91.5	Fredrick
WKJM-FM	93.7	Gothens	WZRO-FM	102.3	Albany	KIQO-FM	98.1	Lawton
ARIZONA			NEW YORK			OREGON		
KFR-FM	92.3	Phoenix	WHITZ-FM	100.1	New York	KYTE-FM	102.7	Newport
KSLX-FM	100.7	Scottsdale	WPNW-FM	102.7	New York	KOPB-FM	91.5	Portland
CALIFORNIA			NEW YORK			OREGON		
KSIQ-FM	96.1	Brawley	WNYC-FM	94.9	New York	KKRZ-FM	100.4	Portland
KLON-FM	88.1	Long Beach	WBEE-FM	92.5	Rochester	KMCO-FM	104.5	The Dalles
KPCF-FM	89.3	Los Angeles	NEW MEXICO			PENNSYLVANIA		
KTUV-FM	94.7	Los Angeles	KKOB-FM	93.3	Albuquerque	WRIT-FM	97.1	Allentown/Bethlehem
KCRW-FM	89.9	Los Angeles	NORTH CAROLINA			PENNSYLVANIA		
KHOP-FM	104.1	Modesto	WUNC-FM	91.5	Chapel Hill	WTFE-FM	89.5	Harrisburg
KNPR-FM	88.1	Ridgely	WCXL-FM	104.1	Rail Devil Hills	WVAV-FM	97.3	Harrisburg
KSPM-FM	102.5	Sacramento	NORTH DAKOTA			PENNSYLVANIA		
KPBS-FM	89.5	San Diego	KNOK-FM	94.7	Grand Forks	WROZ-FM	101.3	Lancaster
KPLM-FM	106.1	San Diego	OHIO			PENNSYLVANIA		
KYXY-FM	96.5	San Francisco	WOOB-FM	91.3	Athens	WLEN-FM	95.7	Philadelphia
KDI-FM	102.1	San Francisco	WGUU-FM	90.9	Cincinnati	WHYY-FM	90.9	Philadelphia
KEAR-FM	106.9	San Francisco	WVXU-FM	91.7	Cincinnati	WMMR-FM	93.3	Philadelphia
KALW-FM	91.7	San Francisco	WVWK-FM	94.1	Cincinnati	WRIT-FM	90.1	Philadelphia
KKSF-FM	103.7	San Francisco	WCPN-FM	90.3	Cleveland	WFLY-FM	100.3	Philadelphia
KCIB-FM	90.1	San Luis Obispo	WUAR-FM	92.5	Cleveland	WXPB-FM	88.5	Philadelphia
COLORADO			OHIO			RHODE ISLAND		
KMJI-FM	100.3	Denver	WENZ-FM	107.9	Cleveland	WVBB	101.5	Providence
KCFR-FM	90.1	Denver	WKSU-FM	89.7	Cleveland	TENNESSEE		
CONNECTICUT			OHIO			TENNESSEE		
WSHU-FM	91.1	Hartford	WLVQ-FM	96.3	Columbus	WYDF-FM	89.3	Memphis
WTKT-FM	91.5	Hartford	TEXAS			TEXAS		
DISTRICT OF COLUMBIA			TEXAS			TEXAS		
WAMU-FM	88.5	Washington	KEAN-FM	105.1	Austin	KEAN-FM	105.1	Austin
WETA-FM	90.2	Washington	KNLF-FM	88.1	Austin	KNLF-FM	88.1	Austin
WUCO-FM	93.7	Washington	UTAH			UTAH		
WAVY-FM	95.5	Washington	KSOS-FM	106.9	Ogden	KSOS-FM	92.1	Salt Lake City
FLORIDA			UTAH			UTAH		
WQBN-FM	91.5	Dunwoody	KSOS-FM	96.7	Salt Lake City	KSOS-FM	98.3	Utah County
WFLP-FM	90.1	Fort Lauderdale	VIRGINIA			VIRGINIA		
WAOA-FM	102.1	Fort Lauderdale	WLTJ-FM	95.7	Norfolk	WLTJ-FM	95.7	Norfolk
WLRN-FM	90.3	Fort Lauderdale	WVNZ-FM	104.5	Norfolk	WVNZ-FM	104.5	Norfolk
WTOH-FM	94.1	Fort Lauderdale	WYRZ-FM	103.3	Orlando	WYRZ-FM	103.3	Orlando
WMBL-FM	90.2	Fort Lauderdale	WVPR-FM	94.7	Virginia Beach	WVPR-FM	94.7	Virginia Beach
WOCF-FM	105.9	Fort Lauderdale	WCDX-FM	92.7	Richmond	WCDX-FM	92.7	Richmond
WJBT-FM	89.1	Fort Lauderdale	WASHINGTON			WASHINGTON		
WOWW-FM	102.3	Fort Lauderdale	KEAE-FM	89.1	Richland	KEAE-FM	89.1	Richland
WFLZ-FM	93.3	Fort Lauderdale	KUOW-FM	94.9	Seattle	KUOW-FM	94.9	Seattle
GEORGIA			WASHINGTON			WASHINGTON		
WATL-FM	93.1	Atlanta	KMP5-FM	94.1	Seattle	KMP5-FM	94.1	Seattle
WAAB-FM	90.1	Atlanta	KEZE-FM	105.7	Spokane	KEZE-FM	105.7	Spokane
WCIK-FM	91.9	Atlanta	KRPM-FM	106.1	Tacoma	KRPM-FM	106.1	Tacoma
WKLS-FM	96.1	Atlanta	WISCONSIN			WISCONSIN		
ILLINOIS			WISCONSIN			WISCONSIN		
WCIL-FM	101.5	Carbondale	WFRN-FM	88.7	Madison	WFRN-FM	88.7	Madison
WLRW-FM	94.5	Chicago	WVMT-FM	92.7	Madison	WVMT-FM	92.7	Madison
WPGU-FM	102.1	Chicago	MARYLAND			MARYLAND		
WBEZ-FM	91.5	Chicago	WHEP-FM	99.1	Annapolis	WHEP-FM	99.1	Annapolis
WKRT-FM	93.1	Chicago	WFAA-FM	88.9	Baltimore	WFAA-FM	88.9	Baltimore
WLS-FM	94.7	Chicago	WYVY-FM	102.7	Baltimore	WYVY-FM	102.7	Baltimore
WNUA-FM	95.5	Chicago	WETH-FM	89.1	Hagerstown	WETH-FM	89.1	Hagerstown
WLLR-FM	101.3	East Moline	MICHIGAN			MICHIGAN		
WAAG-FM	94.9	Galesburg	WIOG-FM	102.5	Bay City	WIOG-FM	102.5	Bay City
WSWT-FM	106.9	Peoria	WLLZ-FM	98.7	Detroit	WLLZ-FM	98.7	Detroit
WDHR-FM	103.7	Springfield	WKOL-FM	95.5	Detroit	WKOL-FM	95.5	Detroit
WGFA-FM	94.1	Whitefish	WJLB-FM	97.9	Detroit	WJLB-FM	97.9	Detroit
INDIANA			MICHIGAN			MICHIGAN		
WISH-FM	99.7	Frankfort	WORS-FM	105.1	Detroit	WORS-FM	105.1	Detroit
WAKE-FM	103.9	Fort Wayne	WDJMF-FM	88.9	East Lansing	WDJMF-FM	88.9	East Lansing
WENS-FM	92.1	Indianapolis	WKR-FM	90.5	East Lansing	WKR-FM	90.5	East Lansing
WZPL-FM	99.5	Indianapolis	WLAJ-FM	96.9	Grand Rapids	WLAJ-FM	96.9	Grand Rapids
WITZ-FM	104.7	Jasper	WRRR-FM	102.7	Portage	WRRR-FM	102.7	Portage
WZVZ-FM	92.7	Kokomo	MINNESOTA			MINNESOTA		
WVXI-FM	100.5	Kokomo	KHEM-FM	88.5	Minneapolis	KHEM-FM	88.5	Minneapolis
WMBR-FM	106.9	Munton	KNOW-FM	91.1	St. Paul	KNOW-FM	91.1	St. Paul
WLEZ-FM	102.7	Terre Haute	KJNJ-FM	99.5	St. Paul	KJNJ-FM	99.5	St. Paul
IOWA			MISSOURI			MISSOURI		
KKVR-FM	106.5	Des Moines	KYYS-FM	102.3	Kansas City	KYYS-FM	102.3	Kansas City
KFAG-FM	101.3	Des Moines	NEBRASKA			NEBRASKA		
KOLL-FM	92.3	Des Moines	KEYY-FM	103.5	Omaha	KEYY-FM	103.5	Omaha
KUOO-FM	103.9	Spirit Lake	NEVADA			NEVADA		
KAYL-FM	101.5	Storm Lake	KKLZ-FM	96.3	Las Vegas	KKLZ-FM	96.3	Las Vegas
LOUISIANA			NEVADA			NEVADA		
WGGZ-FM	98.1	Baton Rouge	KNPR-FM	89.5	Las Vegas	KNPR-FM	89.5	Las Vegas
KFXV-FM	96.7	Monroe	KNPR-FM	88.7	Boulder City	KNPR-FM	88.7	Boulder City
WLMG-FM	101.9	New Orleans	KNPR-FM	91.7	Beatty	KNPR-FM	91.7	Beatty
WVYZ-FM	95.7	New Orleans	KOMP-FM	99.3	Florida Springs	KOMP-FM	99.3	Florida Springs
KCIL-FM	107.5	Houma	KNPR-FM	88.7	Indian Springs	KNPR-FM	88.7	Indian Springs
KMJJ-FM	100.1	Shreveport	KNPR-FM	89.5	Laughlin	KNPR-FM	89.5	Laughlin
MASSACHUSETTS			NEVADA			NEVADA		
WBUR-FM	90.9	Boston	KNPR-FM	88.7	McQuay Valley	KNPR-FM	88.7	McQuay Valley
WGHH-FM	89.7	Boston	KNPR-FM	88.7	Paterson	KNPR-FM	88.7	Paterson
WBOS-FM	104.9	GloUCEster	KNPR-FM	95.5	Reino	KNPR-FM	95.5	Reino
WBOS-FM	96.9	Newton	KNPR-FM	88.1	Scotts Junction	KNPR-FM	88.1	Scotts Junction
WMXJ-FM	106.7	Boston	KNPR-FM	105.1	Scottsbluff	KNPR-FM	105.1	Scottsbluff
MARYLAND			NEVADA			NEVADA		
WHEP-FM	99.1	Annapolis	KNPR-FM	98.5	Las Vegas	KNPR-FM	98.5	Las Vegas
WFAA-FM	88.9	Baltimore	KNPR-FM	101.9	Las Vegas	KNPR-FM	101.9	Las Vegas
WYVY-FM	102.7	Baltimore	KNPR-FM	94.1	Las Vegas	KNPR-FM	94.1	Las Vegas
WETH-FM	89.1	Hagerstown	KNPR-FM	105.5	Las Vegas	KNPR-FM	105.5	Las Vegas
MICHIGAN			NEVADA			NEVADA		
WIOG-FM	102.5	Bay City	KNPR-FM	92.3	Las Vegas	KNPR-FM	92.3	Las Vegas
WLLZ-FM	98.7	Detroit	KNPR-FM	103.5	Las Vegas	KNPR-FM	103.5	Las Vegas
WKOL-FM	95.5	Detroit	KNPR-FM	102.5	Las Vegas	KNPR-FM	102.5	Las Vegas
WJLB-FM	97.9	Detroit	KNPR-FM	97.1	Las Vegas	KNPR-FM	97.1	Las Vegas
WORS-FM	105.1	Detroit	KNPR-FM	91.7	Las Vegas	KNPR-FM	91.7	Las Vegas
WDJMF-FM	88.9	East Lansing	KNPR-FM	91.7	Tombay	KNPR-FM	91.7	Tombay
WKR-FM	90.5	East Lansing	KNPR-FM	103.5	Laughlin	KNPR-FM	103.5	Laughlin
WLAJ-FM	96.9	Grand Rapids	NEW JERSEY			NEW JERSEY		
WRRR-FM	102.7	Portage	WPGV-FM	96.9	Atlantic City	WPGV-FM	96.9	Atlantic City
MINNESOTA			NEW JERSEY			NEW JERSEY		
KHEM-FM	88.5	Minneapolis	WKDN-FM	106.9	Camden	WKDN-FM	106.9	Camden
KNOW-FM	91.1	St. Paul	WBCO-FM	84.9	Newark	WBCO-FM	84.9	Newark
KJNJ-FM	99.5	St. Paul	WFSH-FM	93.7	Newark	WFSH-FM	93.7	Newark
MISSOURI			NEW JERSEY			NEW JERSEY		
KYYS-FM	102.3	Kansas City	WNSJ-FM	103.7	Paterson	WNSJ-FM	103.7	Paterson
NEBRASKA			NEW JERSEY			NEW JERSEY		
KEYY-FM	103.5	Omaha	WPAT-FM	93.1	Paterson	WPAT-FM	93.1	Paterson
NEVADA			NEW JERSEY			NEW JERSEY		
KKLZ-FM	96.3	Las Vegas	WADR-FM	95.9	Paterson	WADR-FM	95.9	Paterson
KNPR-FM	89.5	Las Vegas	NEW YORK			NEW YORK		
KNPR-FM	88.7	Boulder City	WAMC-FM	90.3	Albany	WAMC-FM	90.3	Albany
KNPR-FM	91.7	Beatty	WZRO-FM	102.3	Albany	WZRO-FM	102.3	Albany
KNPR-FM	99.3	Florida Springs	WPNW-FM	102.7	New York	WPNW-FM	102.7	New York
KNPR-FM	88.7	Indian Springs	WNYC-FM	94.9	New York	WNYC-FM	94.9	New York
KNPR-FM	89.5	Laughlin	WBEE-FM	92.5	Rochester	WBEE-FM	92.5	Rochester
KNPR-FM	88.7	McQuay Valley	OHIO			OHIO		
KNPR-FM	88.7	Paterson	WOOB-FM	91.3	Athens	WOOB-FM	91.3	Athens
KNPR-FM	95.5	Reino	WGUU-FM	90.9	Cincinnati	WGUU-FM	90.9	Cincinnati
KNPR-FM	88.1	Scotts Junction	WVXU-FM	94.1	Cincinnati	WVXU-FM	94.1	Cincinnati
KNPR-FM	105.1	Scottsbluff	WCPN-FM	90.3	Cleveland	WCPN-FM	90.3	Cleveland
KNPR-FM	98.5	Las Vegas	WUAR-FM	92.5	Cleveland	WUAR-FM	92.5	Cleveland
KNPR-FM	101.9	Las Vegas	WENZ-FM	107.9	Cleveland	WENZ-FM	107.9	Cleveland
KNPR-FM	94.1	Las Vegas	WKSU-FM	89.7	Cleveland	WKSU-FM	89.7	Cleveland
KNPR-FM	105.5	Las Vegas	WTEF-FM	136.5	Columbus	WTEF-FM	136.5	Columbus
KNPR-FM	92.3	Las Vegas	TEXAS			TEXAS		
KNPR-FM	103.5	Las Vegas	KEAN-FM	105.1	Austin	KEAN-FM	105.1	Austin
KNPR-FM	102.5	Las Vegas	KNLF-FM	88.1	Austin	KNLF-FM	88.1	Austin
KNPR-FM	97.1	Las Vegas	UTAH			UTAH		
KNPR-FM	91.7	Las Vegas	KSOS-FM	106.9	Ogden	KSOS-FM	106.9	Ogden
KNPR-FM	91.7	Tombay	KSOS-FM	92.1	Salt Lake City	KSOS-FM	92.1	Salt Lake City
KNPR-FM	103.5	Laughlin	KSOS-FM	98.3	Utah County	KSOS-FM	98.3	Utah County
NEW JERSEY			UTAH			UTAH		
WPGV-FM	96.9	Atlantic City	KSOS-FM	92.1	Salt Lake City	KSOS-FM	92.1	Salt Lake City
WKDN-FM	106.9	Camden	KSOS-FM	96.7	Salt Lake City	KSOS-FM	96.7	Salt Lake City
WBCO-FM	84.9	Newark	KSOS-FM	98.3	Utah County	KSOS-FM	98.3	Utah County
WFSH-FM	93.7	Newark	VIRGINIA			VIRGINIA		



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Rates a

'Best Buy'

See p. 18

PRODUCT EVALUATION

Desk-size Digital Mixer from Yamaha

by Ty Ford

BALTIMORE Three days after delivering the Yamaha ProMix 01, my UPS guy (who also produces some very nice music for a living) knocked on my door. I noticed he had nothing for me and because I didn't have anything for him I said, "What's Up?" He said, "So how's the Yamaha mixer?" Eight years of deliveries several times a week and he has never shown up empty-handed at my door with questions about a piece of gear—except for the Yamaha ProMix. Now that's street buzz.

For a list price of \$2,000, Yamaha has loaded an impressive amount of technology into the ProMix 01. The list includes 20-bit A/D converters for the inputs, 24-bit internal processing, 36-bit internal EQ processing, 20-bit 8x stereo outputs and 18-bit 8x monitor outputs. The internal sample rate is fixed at 48 kHz, there are no digital inputs and only one digital output, a SP/DIF from the main outs. Throughput delay from input to stereo output is 3.5 milliseconds.

The ProMix 01 includes global +48VDC phantom power on balanced XLR inputs 1 through 8. Inputs 9 through 16 are balanced TRS. All 16 inputs have a 20 dB

pad and a -16 dB to -60 dB input trim control. The mic preamps sound good and are reasonably quiet.

There are two other analog auxiliary inputs on the console's backplate: a pair of stereo RCA-style, unbalanced -10 dB called "2TR IN" and a 1/4" unbalanced +4 dB pair called Stereo IN. They are connected so that when no plugs are inserted in the ST IN jacks, the 2TR IN signals are fed through the Stereo Input Channel with dedicated input fader. The phase and pan of all 16 inputs and the ST IN are individually adjustable, with the exception that phase adjustments to the ST IN apply to both channels.

The headphone circuit is powerful enough to push a pair of AKG K-240s to above-average

levels in a studio. More efficient phones may be needed for live mixing.

The ProMix 01 doesn't have direct outs from channel inputs. If you're used to using them for laying up tracks more than two at a time, you'll have to send two pre-fader through Send 3 and Send 4 and two more through the main or monitor outs. This configuration means it's tough to build a real mix while you're laying up tracks.

Wisely, Yamaha chose to include a bank

of 20 dedicated function buttons to the left of the large LCD display. Four of these buttons help you store, recall and navigate the Scene Memory directory in which you can store 50 snapshots of all mix settings. The other 16 take you directly to metering, pan, phase, dynamics, cue, effects, send and EQ screens.

Metering is viewed by hitting the dedicated metering button. The LCD display becomes a multitrack metering panel with channels 1-16 on one page and ST IN, sends and returns on the other. There is also a stereo 12-segment LED output meter visible at all times. Peak hold is available for all meters. Because input metering is pre-EQ, special attention must be given to any EQ settings that boost any frequencies, should they push the channel into distortion.

The ProMix also has two separate stereo-

return, SPX-like digital effects devices, each with 30 preset programs with adjustable parameters and room for 19 of your own programs. There are 24 three-band parametric EQ sections counting 16 inputs, both of the first two effect sends, before the analog stereo out and before the analog stereo in. The EQ section has 30 presets and 19 user-savable settings.

All 24 EQ modules are the same, offering three band +/-15 dB digital parametric EQ with selectable "Q" at 1/6, 1/4, 1/3, 1/2, 3/4, 1, 1.5, 2 and 3 octave width, as well as shelving for the top and bottom bands. Frequency ranges of the three bands (LF: 32 Hz-1 kHz, MF: 32 Hz-18 kHz, HF: 1 kHz-18 kHz) are well chosen.

You also get a graphic representation of your EQ adjustments in the LCD window as you adjust the EQ, and you can save and name 19 of your most frequently used curves along with 30 presets. The only downside of the parametric EQ is that, unlike analog parametric EQ which sweeps continuously across the frequencies, the

continued on page 19 ▶



Yamaha ProMix 01

HERE'S WHAT A DIGITAL AUDIO DELIVERY SYSTEM CAN DO FOR YOU!

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YES NO

- Powerful **Live Assist** Touchscreen flexibility, unlimited **Automation** capabilities, as well as interface to any **Satellite Programming** service, and the ability to seamlessly switch between them at any time.
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- Automatically control multiple **Network Joins** and **Breaks**, as well as **Time Shift** any elements.
- Advanced **Production** features such as **Cut & Paste Editing**, and **Montage Assembly**. Interchange digital files with many **Multitrack** Editing systems.
- Interface with all common **Scheduling** and **Billing** systems, or be able to roll your own.
- Each **User** can optimize, store, and immediately recall their own preferred layout and functionality.

YES NO

- Multiple **Inputs & Outputs**, both **Analog & Digital**.
- Intersperse **Mono & Stereo** Cuts without operator intervention. **Simulcast** with independent **Spot & ID** loads.
- Interface** with other common studio equipment such as **Consoles**, **Switchers**, **CD Players**, **DAT's**, **Tape Machines**, etc.
- A comprehensive **Security System**, limiting access to sensitive operations on a per **User** basis.
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- So **Simple** and **Intuitive** to use that the **Learning Curve** for most operators is measured in **Minutes**.

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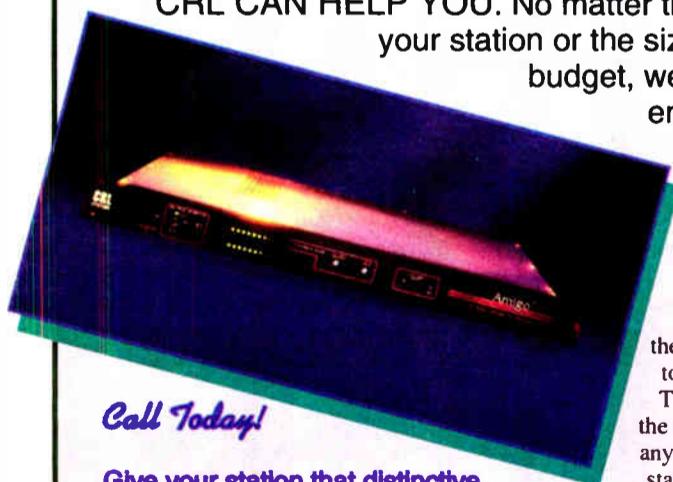
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SIGNAL-TO-NOISE

New Crop of PDAs Useful Audio Tools

by Frank Beacham

NEW YORK Forget what you've heard in the past about personal digital assistants, or PDAs, as this category of handheld computing devices is called. In my opinion, Apple's Newton, Tandy's Zoomer and AT&T's now defunct EO failed because they represented technology for technology's sake, rather than technology to serve a human need.

Sony's just-released 1.2-pound Magic Link Personal Intelligent Communicator and Motorola's about-to-be-released Envoy Personal Wireless Communicator represent the next generation in portable

computing. This time, the machines have a purpose and should be of major interest to audio professionals, broadcasters and news reporters who work in the field.

Both machines are based on General Magic's intuitive Magic Cap platform and Telescript communications language. They both offer a combination of intelligent messaging capabilities that integrate electronic mail, fax, telephone, on-line services and nationwide paging.

The Sony specializes in wireline communications while the more expensive Motorola incorporates two-way wireless messaging capabilities.

Both connect to AT&T's new PersonalLink

Services network, the first commercial service that enables subscribers to perform many routine communications activities with the help of electronic "intelligent assistants." These assistants, or agents, are mobile programs that go to places in the network to carry out their owners' instructions. Software for America Online, the computer service, is also built into ROM on both machines.

By plugging in a phone line to the modular jack and touching an icon on the screen of Sony's Magic Link, a user can easily access electronic mail from either PersonaLink or America Online. PersonaLink users have the option of sending

and receiving messages that include text, animation, brief voice recordings, music and electronic handwriting.

Reporters who want to file a script from the field can use the optional keyboard or built-in, on-screen touch keyboard for text entry or they can write a story by hand in "electronic ink." The document can then be faxed or e-mailed within seconds to one or more locations anywhere in the world.

Though these devices forgo the troubled handwriting recognition programs of the early PDAs, a new optional software application called Graffiti is available that will translate handwritten documents.

The Sony Magic Link, available now at a base price of \$995, includes an integrated 9600 bps fax and 2400 bps data modem. It can also accept an optional pager card that can receive wireless messages via the SkyTel network. The Motorola Envoy, due by year's end at a price of approximately \$1500, includes a two-way wireless packet data modem as well as a wireline fax modem. The Envoy's wireless



Sony's Magic Link

Owning a Real Neumann Just Got a Lot Easier

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Introducing the TLM 193
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communication is through RadioMail, a message routing service that is connected via the ARDIS nationwide data network. ARDIS serves more than 400 metropolitan areas of the U.S.

The user interface for both machines is extraordinarily easy to master. The Magic Cap software employs a familiar desktop metaphor, using icons such as card files, date books, telephones, notepad, file cabinets and in/out boxes. Once loaded with personal information, these devices pack a lot of communications power and convenience for those who are traveling or working on location.

In coming months the new breed of communicators will even offer field research capabilities. Mead Data Central has two new LEXIS/NEXIS products on PersonaLink. One is a daily news summary now delivered free to subscribers each morning. By year end a service called Immediate Answers will be offered that delivers information from more than 2,300 full-text news and business information sources.

The debut of Magic Cap and Telescript is, for now, limited to Sony and Motorola's new portable PDAs. Soon, however, both of these software innovations will be available for desktop PC and Macintosh computers as well as a broader line of personal devices. In the near future, don't be surprised to see Magic Cap as the controlling software of "smart" television sets that use personal agents to search hundreds of channels of program choices. And, with additional memory, devices such as the Sony and Motorola PDA could deliver high-quality audio feeds along with text from the field to the studio, said Kevin Lynch, manager of the Magic Cap Core Technology Group.

□ □ □

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

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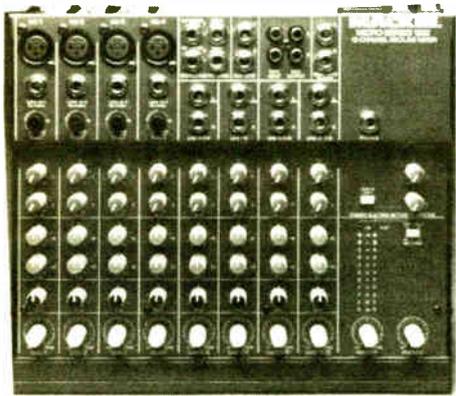
Circle (120) On Reader Service Card
World Radio History

PRODUCT EVALUATION

Best Buy Mackie Excels On Remote and in Studio

by Frank Beacham

NEW YORK Having used a Mackie MicroSeries (MS) 1202 mixer over the past year, I can say without equivocation that it has become a valued and trusted friend, a sort of audio Swiss Army knife that continues to surprise me with its utility.



Mackie 1202

At a list price of \$399 and a street price usually more than 25 percent less, one's first impression of this little 12x2 mixer is usually amazement. It's as solid as a rock and far more rugged than expected

in its all-steel case. The pots and connectors have that silken feel of quality components. And the thing's got bulk, weighing a hefty seven pounds.

Almost everyone asks the question: How can it cost so little when everything else in pro audio is so expensive? The best part comes, however, in discovering just how versatile this compact mixer really is. In a footprint that is less than one square foot, the MS 1202 offers 20 inputs, any of which can work with any level ranging from musical instrument to semi-pro -10, to professional +4. It has four mono channels with each featuring +48 volt phantom mic power through balanced Neutrik XLR input connectors, four stereo channels (each with separate left and right line inputs) and main and aux outputs for stage monitoring, effects and recording.

Features

The 1202 has two aux sends per channel with a center detent for unity gain. There are stereo aux returns with separate left and right inputs and 20 dB gain for effects, tape recorder, extra line inputs, etc. Tape recorder input and output is available through RCA phono connectors. Channel inserts on the rear panel

allow both uninterrupted and interrupted direct outputs as well as pre-fader and post-fader effect loop channel patching for outboard devices such as limiters or compressors. There's EQ at 80 Hz and 12.5 kHz, three-way, 12 LED VU meters and a very clean headphone amp with plenty of gain. Power is supplied via a heavy duty three-conductor, detachable cable. No wall-wart here.

Even with all its features the 1202's biggest strength may be its excellent

think of it, that goes for about any product I can think of.) Not only does the booklet tell what you need to know in plain, simple language with helpful illustrations, but it's written with style and humor. The manual really gives you a warm and fuzzy feeling about the people at Mackie.

Numerous uses

Because of its quality and utility, the 1202 is a highly personal mixer that can provide dozens of uses for its owner. More commercial recordings have been made with it than you can count. Radio stations use it on and off the air, especially for remotes, and Mackie's client list for the 1202 includes names ranging from corporate giants like CBS, AT&T, Sony, Philips, IBM to entertainers like the Gatlin Brothers and "Click & Clack," the Car Talk brothers on National Public Radio.

In a recent ad, Mackie even recommends a commercial recording that demonstrates the sound of the MS 1202's mic preamps. It is a CD by acoustic guitarist Edward Gerhard titled "Luna," on the Virtue label (VRD 1921). According to Mackie, it was recorded direct to DAT via a MS 1202 and a stereo pair of Neumann KM 140 microphones.

Some pro audio folks may think the unit could not be that good for the price. The price defies logic and past experience. How can a \$399 mixer be good enough for digital recording? I don't know. It's just one of life's mysteries. But get past

continued on page 33 ►

Product Capsule: Mackie Micro Series 1202



Thumbs Up

- ✓ outstanding audio
- ✓ sturdy construction
- ✓ versatile features



Thumbs Down

- ✓ only runs on AC

For more information, circle **Reader Service 92** or contact Mackie at 800-898-3211.

sonic quality. For such a low price, one does not expect top level performance. But this mixer delivers it. The 1202 has a working signal-to-noise ratio of 90 dB, distortion below 0.009 percent across the entire audio spectrum and 116 dB internal dynamic range. The mic preamps are top notch: -129 dBm @ 150 ohms, and a virtually flat 20 Hz-20 kHz frequency response.

Learning the mixer's functions is a piece of cake, thanks to an outstanding owner's manual. Hands down it is the best written and illustrated manual I've ever read for an audio product. (Come to

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Desk-Size Digital Mixer from Yamaha

► continued from page 15

ProMix 01 doesn't sweep, it steps. If you can't get the center frequency you need, you have to work around it.

There are three stereo dynamics processors that can be used as compressors/limiters, gates or duckers, but only one at a time per dynamics processor. You cannot split the stereo channels and operate them as two independent channels. They can be assigned, one to a channel (or pair of channels), to any of the inputs after the EQ, pre- or post-fader for send 3 and send 4, or the stereo outputs. Specs for the three dynamics modules are identical and are as follows: compressor/limiter threshold: -40 dB to +18 dB, ratio: 1:1 to infinity, in nine selectable increments, attack: 0 to 120 milliseconds, release: 0.1 seconds to 6 seconds and output gain: +/-18 dB.

The gate and ducker work extremely well. Specs are: threshold -50 dB to +10 dB, attack: up to

120 milliseconds, hold: 3 milliseconds to 341 milliseconds, decay: 85 milliseconds to 10.9 seconds and range: -80 dB to 0 dB.

However, don't toss out your existing compressors or limiters. I was never happy with the compressor and limiter settings. Even modest settings of 9 ms attack, 1.0 second release, a 2:1 ratio with a +12 dB threshold produced pumping and stair-step volume changes.

Yamaha gets points for graphically representing EQ curves and for X/Y graphs of these dynamics functions. These are great learning tools for the entry-level person and allow the more experienced person to know at a glance what's going on, without having to refer to the numeric values.

Users with MIDI sequencers will have fun with the ProMix because there are 531 controllable mix parameters and 1536 control changes. This means, in addition to ON/OFF and mix levels, you also can record dynamic changes in pans, EQ changes and effects parameters. Editing the recorded MIDI stream was possible with Opcode's Vision 1.4 MIDI software, even without specific data to plug into the MIDI setup document.

According to Yamaha, the major MIDI software companies are already working on software to better accommodate the ProMix 01. If you're already running a beefy MIDI rig and pushing lots of data, you may have to expand your system capacity if you plan to rely heavily on mix automation.

During automated mixing, I was bothered at first by the sound the motorized faders made as they moved and the jerky motion when they moved slowly. I turned up the monitors to mask the noise and, finding that the jerky motion did not cause jerky volume changes, ignored them.

The utility menu contains assignments and adjustment for the 100 Hz, 1 kHz, 10 kHz, pink noise generator, send 3 and 4 configuration, output compressor patch point, memory protect and RAM battery

checking.

The group menu allows the input channels and the ST IN fader to be grouped in up to four groups. The pair menu is used to link adjacent channels in pairs for stereo operation. When a link is made, phase, EQ, compressor patch, ON/OFF, cue, send 1-4 data is combined. When channels using a dynamics processor are paired, a message appears on the LCD screen and the compressor patch is cancelled. When grouped channels are paired, they are removed from the group. To reassign them to a group, you have to go back to the Group Menu.

The two-page meter menu shows inputs 1-16 on the first page and ST IN, return 1 and 2, sends 3 and 4. Peak hold reset is available on both pages. There are a number of built-in shortcuts for traversing the menus. Hitting any of the 1-16 input "SEL" (select) buttons while in the meter menu brings the 1-16 page to view.

Pressing the ST IN, RTN/SND or ST OUT SEL buttons changes the meter menu to the second page where those readings may be seen.

The pan and phase menu is configured like the meter menu. The first page provides pan adjustments for 1-16, showing a two-pot concentric control for linked channels. The second page shows the ST IN, RTN1, RTN2, sends 3-4 and ST OUT adjustments. There are 16 steps from center to hard panned. On the third page, the phase of each channel can be set to normal or reverse. Paired channels will both be changed as will the unbalanced ST IN channels.

Good news for broadcasters and anyone who needs cueing. The extensive cueing system and separate monitor output bus will allow the ProMix 01 to easily cover the cueing chores normally required in a production studio. You will, however, have to build a speaker mute relay for open mic/combo operations. Mix cue routes all inputs to the monitor out, last cue selects individual or paired inputs only and routes them to the monitor out. In ST FIX, the cue follows the main stereo out.

When the group mode is selected, and mix or last cue are selected, you can listen to a post-fader mix of all channels in the selected group via cue, thus balancing the individual faders in the group. The cue mode also brings a lot of channel, routing, send, and effects status information to the LCD display.

In conclusion, Yamaha has made a nice sounding digital box with lots of features that should make anyone looking to upgrade from a 16-track analog setup or less to break out the checkbook. The more than 150 pages of documentation get a "B+."

In my view, the early adopters will buy it just to say they own a ProMix. The more cautious will likely wait to see how well the third-party developers respond with ProMix 01-oriented products, and how committed Yamaha is to continuing development based on user input.

Product Capsule: Yamaha ProMix 01 Digital Mixer



Thumbs Up

- ✓ price
- ✓ digital effects
- ✓ moving fader automation



Thumbs Down

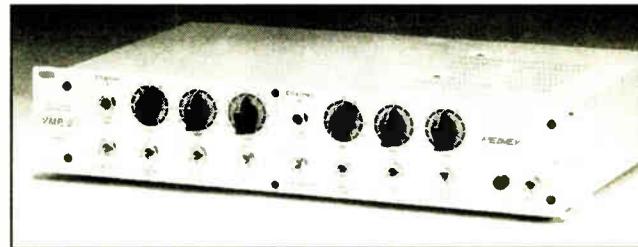
- ✓ no digital input
- ✓ only one SP/DIF digital output
- ✓ single sample rate (48 kHz)

For more information, circle **Reader Service 138**, or contact Yamaha of America at 714-522-9011.

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

Peavey VMP 2 Microphone Preamp



Peavey has introduced a tube-based, dual-channel mic preamp, the VMP 2, with no solid stage stages in the audio path.

The preamp uses three 12AX7s in the input and a 12AT7 in the output stage. Frequency response is rated from 10 Hz to 40 kHz plus 0, minus 3 dB. Other features include phantom power, EQ, -20 dB input pad and low fre-

quency cutoff.

For more information, contact Peavey at 601-483-5365; or circle **Reader Service 185**.

Pacific Recorders ADX Ensemble

Pacific Recorders ADX Ensemble is a digital audio work station combined with on-board, automated mixing surface.

The ADX workstation include 8-track recorder editor, 2.4GB hard drive (standard), moving fader automated control surface and transport/editor control panel. The most frequently used functions are accomplished by push buttons and control knobs.

For more information, contact Pacific Recorders at 619-438-3911; or circle **Reader Service 176**.



Mackie LM-3204 Line Mixer

For those who have audio tasks that are input intensive, the LM-3204 may have been designed for you. The 16-stereo input mixer (32 in mono) has electronically balanced inputs, two stereo aux sends per channel, three-band EQ, which is identical to the acclaimed CR-1604 console's EQ section, a control room monitor section, tape inputs and rugged construction.

For more information, contact Mackie at 800-898-3211; or circle **Reader Service 144**.

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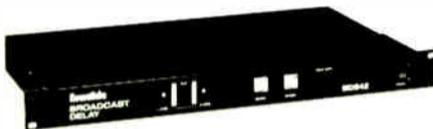
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DH1



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MP10

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112MKII

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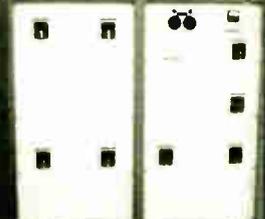
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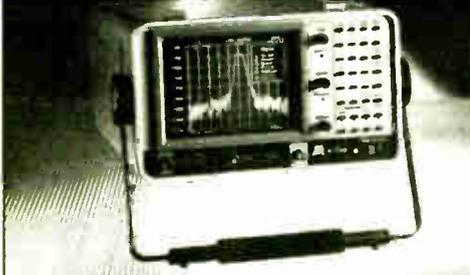


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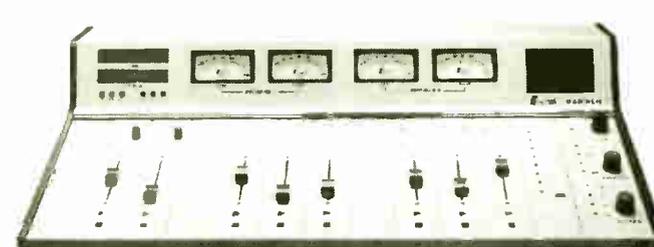
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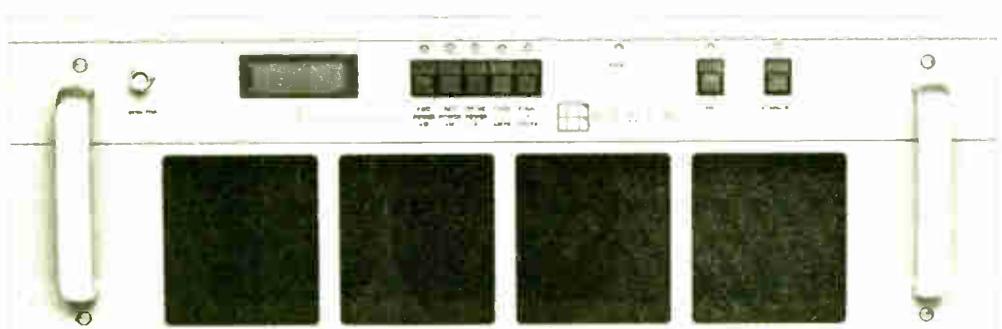
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Setting Up for Live Recording

Part II of III

by Mike Joseph

LEXENA, Kan. I previously discussed the general issues surrounding the presentation and capture of live music events for broadcast. This time, I'll concentrate on the meat of the matter: loading a truck full of gear and going on-site to grab it live for later broadcast.

I'll assume the scenario to be your capturing a musical group with singers, drums, electric and acoustic instruments. They are playing in a medium-sized semi-enclosed shed at an outdoor regional festival. The promoter has hired a professional sound company to provide sound reinforcement for the expected 3,000 audience members.

Several of the station's sponsors have underwritten your production costs, and the sales and marketing department has had the production director up until mid-

is on stage, making big noise in the room. How well can you hear what you are doing inside a tiny, tinny RV, six feet away from a ferris wheel's diesel genera-

possible to capture something on tape. You can try one of the following options below.

I'll assume an eight-track tape deck of

The first order of business should be the group decision of whether the music goes out live or is captured to tape.

tor, right behind the left PA stack, where there's more bass inside the van than in the bass player's lap?

- Catch it live to stereo on tape (DAT), for easy sequence editing later, allowing the removal of dead air, bad jokes and musician's expletives.

- Do an FOH console output split to the input channels of a multitrack tape deck or Alesis ADAT/Tascam DA-88/Fostex RD-8 digital stack, and worry about mix-

your choice for all these following examples. If you've got more tracks, congratulations. Ignore the first section. I'll also assume that you are the one calling the shots on the mixing consoles, whether it is the sound reinforcement console's bus routing (option 1), or your own mixing console on its own feed off an active or transformer coupled mic splitter (option 2).

Option 1 is cheap and dirty. First, lay out the eight-track signal feeds on paper. Decide whether you want to compromise toward discrete control of individual instruments (even if the outcome will be more mono-like), or whether you'd be happier with stereo spreads. This will depend greatly on your monitoring situation: can you hear what you are doing?

The band has two guitars, stereo keys, bass, drum (percussion) machine, real drums and two vocals. You could assign individual tracks to the guitars, bass, mono keyboard, each vocal, percussion box and mono drums. Not good? How about a stereo mix of guitars and keys, and then bass and percussion box on a third track (they may be separable later), each vocal to a track, and kick, snare and toms/overheads to three tracks. Or maybe put the percussion on its own track and do all the drums on two in stereo.

Good luck

This exercise will be as much a function of your confidence in the mix balance and quality as a straight logistics problem. And remember, once you've combined, "there ain't no goin' back."

On a four-bus board, route the instruments you want grouped in stereo to the respective two pairs of busses. Feed the remaining four tape tracks from the console's direct or insert outputs on the individual channels, such as the vocals or bass. If you have access to good compressor/limiters, use them. They should go in line before the tape deck, or in the group insert loops if you want them to be grouped pre-fader. Use the board's controls to combine the groups to the stereo bus and your house mix, if it's the FOH console.

On an eight-bus board, just go ahead and assign the instruments in stereo pairs (or not) to your groups as you normally would. Run the bus and/or direct outputs to the tape inputs (maybe by way of the compressors) and away you go. Again, combine the groups to the stereo bus and your house mix, if it's the FOH console. Get your hands on a Tascam, Roland or Fostex 8x2 stereo mixer with built-in headphone amp, and you'll even be able to monitor tape feeds on cans, sort of.

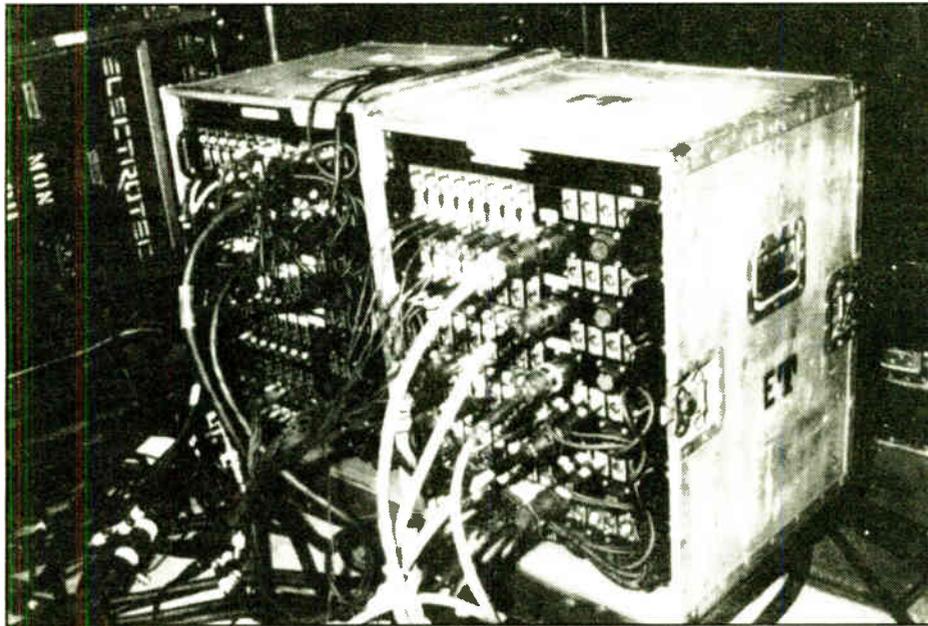
Remember, if you are taking your feeds from the sound reinforcement system while "mixing" out front, your recording monitors are really the house mains, and what you are hearing at FOH is PA plus stage, so what you have on tape is, uh...

play it back later and find out. By then, of course, it is too late to do anything but gate, expand, compress and EQ the individual tape tracks, salvaging the sticky parts. Good luck.

In Part 3, I'll discuss the technically ultimate approach to capturing live music for broadcast, the financially dreaded Option 2.

□ □ □

Mike Joseph is the owner of Rabbit Run Productions, Kansas City, specializing in live music capture. He is the former director of sales and marketing at Valley Audio Products and marketing manager for Electro-Voice professional products, past editor of R•E•P (Recording Engineer/Producer) and Live Sound magazines, and a long-time West Coast record producer/recording engineer.



Recording for broadcast has to take into account the live setup.

night all week creating inserts and pre-production segments for the projected two-hour show.

The first order of business should be the group decision of whether the music goes out live (a "hot mix" fed to phone lines or a microwave studio link), or is captured to multitrack or stereo tape for later editing and broadcast.

Of course, the sales department wants it concurrent with the live show so that the advertisers can capitalize on event excitement and promotional tie-ins. The show producer wants it recorded to multitrack tape, so that a "quality" program, properly edited, mixed and assembled, can be created later representing the highest standard of production capabilities.

Spread the word

As the expert, you cover the options for everybody:

- Go live to air, whether mixed by you in a truck or some back room, or picked up as a feed off the sound reinforcement system. Of course this will leave you at the mercy of the gods. Will the guitarist break a string? There are five minutes of dead air and dumb stage banter. Is the band late getting to the stage? Some announcer has to fill in. The pressure is on the emcee and the show producer to cover all the unexpected possibilities.

And then there are the vagaries of monitoring your separate mix while the band

ing it later when you can hear what you're doing.

- Bring a recording studio to the field, mixing to multitrack tape in a controlled and well-processed environment. Again, the music can be mixed and edited later, then combined with other segments and inserts for later broadcast.

Making the decisions

The choice will be philosophical as well as financial: for broadcast live or later. Taking the PA mix output in stereo to DAT is cheap, if not free. Well-balanced phone lines are more. Properly creating your own mix on site, whether live-to-stereo or spun to multitrack is more again, and multitrack has posting costs.

There are also a number of pure technical considerations: If you throw a Left/Right FOH PA console program split at a DAT machine and roll some 120s, or feed that signal directly to air via a matched stereo pair of phone lines, you will probably end up with the inverse of what you would hear out in the audience, such as reduced guitar, distorted vocal blend, bass not even close to the stage/room sound, in fidelity or level; and more leakage than you know what to do with.

If you've decided to record multitrack, and the chances of doing it really right aren't even a glimmer on the fuzzy horizon, don't despair or just say no. It is



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PRODUCT EVALUATION

Aphex Combines 'Tube' Sound, Low Cost

by John Diamantis

WASHINGTON One day, a few weeks ago, I thought I had it made. I finally got caught up on that mountain of paperwork on my desk. I was making a sizable dent in my to-do lists. I was finished with this months' *Tube Talk* a week early. Man, it looked like "Miller Time."

Then, the calls started coming. First, by voice mail. They were from John Gatski, **RW's** managing editor. That was on a Monday in late October. I decided to stay home that day and nurse a cold. I ignored

all calls.

By Thursday morning, I finally felt well



Aphex Model 107 Mic Preamp

enough to go back to work, and before I could set foot out the door, the phone rang. "John? This is John Gatski! Where have you been? I've got this hot, brand new inexpensive tube microphone preamp from Aphex and if you can test it, listen to it,

and write the column and have it by Monday we'll scoop everyone and... So much for taking it easy.

I unpacked the Aphex Model 107 Dual Channel Thermionic Microphone Preamplifier (whew!) with "Tubessence" (more on that later), and went to work. Besides the tube design, the Model 107 packs a lot of features for \$599. It has two completely discrete solid state, vacuum tube preamp channels in a single rack space chassis. The input jacks are located on the front panel, and are XLR type, while the outputs are on the rear and are 1/4-inch TRS phone jacks.

Front panel controls include a switchable 20 dB pad, a gain control, low cut filter, 48 volt phantom supply on/off, and a signal polarity switch. Front panel indicators include an "OK" green LED for normal signal level, and an "OVERLOAD" LED to warn of impending clipping.

The Aphex Model 107 is transformerless at both input and output. The input is balanced, the output is not. The unit is powered via a detachable wall mount transformer which not only helps keep costs down, but keeps AC induced noise down as well. The rear panel, in addition to the output jacks, has a switch selectable output range: either +4 dB or -10 dB. Also included is an input for a footswitch.

Inside the unit, parts quality is good, with a liberal amount of 1 percent metal film resistors, OK caps, average, though socketed ICs, this unit was a pre-production prototype, and a single, 12AT7 dual-triode vacuum tube.

So what is this "Tubessence?" "The combining of new and old technologies for state of the art performance," as the manual states." According to Aphex, "[T]he Model 107's innovative preamp circuitry (patent pending) delivers the best characteristics typically associated with vacuum

continued on page 25 ▶

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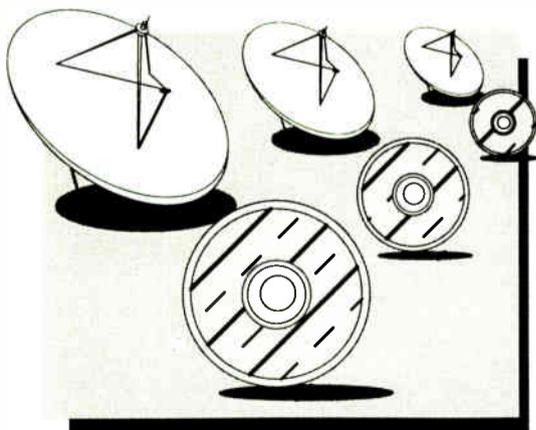
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ISDN: Accessible All Over RBOC Territory

▶ continued from page 1

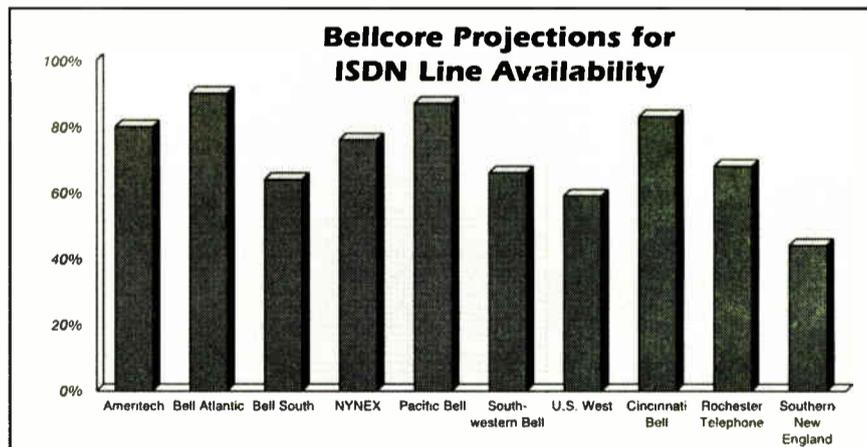
channels pay a \$147 one-time fee and a monthly fee of \$27.21. Ameritech, the Bell company servicing Michigan, then charges 8.2 cents per call for local calls.

In comparison, analog or equalized radio loops do offer a flat rate monthly usage fee, but some consideration must be given to the high installation cost which can reach \$2,000 per line. Also, the quality of analog is not nearly as good as digital when considering higher frequencies.

In Indiana, the ISDN usage fee is also billed at a flat rate, which is \$84.21 a month for both voice channels. But the ISDN start-up cost in the state that nationally broadcasts Notre Dame football and Indiana University basketball is a mere \$139.

ISDN lines use a higher bandwidth than normal phone lines to rapidly transfer vast amounts of information. In some cases data, video, photos and graphics can be transferred 53 time faster through ISDN lines than ordinary lines. The main difference between ISDN lines and analog lines is that ISDN lines are carrying digital information instead of analog signals.

"We use the same piece of copper, put electronics on each end of it and send 0's



and 1's instead of analog signals," said Pat D'Innocenzo, who is Bell Atlantic's ISDN product and applications manager.

Three channels are incorporated in an ISDN line: the two 64 kbps B channels and a data D channel, which is a 16 kbps channel used for inter-device communication.

For radio, the biggest benefit of ISDN is its 15 kHz or more audio bandwidth, and the ensuing enhanced audio quality provided by the B channels.

Washington, D.C.-based oldies station WXTR, for example, harnesses ISDN for a live morning show from the infamous Watergate Hotel.

"This is a better system from a state-of-the-art point of view," WXTR Station Manager Bob Rich said. "And cheaper."

With two Telos \$4,000 Zephyr ISDN codecs, WXTR broadcasts a remote that sounds as though it is coming directly from its studio, eliminating hollow, phone-receiver type of analog sound effect sometimes found in phone remotes.

Aphex 107 Goes for 'Tube' Sound

► continued from page 24

tube signal processing, while retaining the transient "quickness" and low distortion that solid state circuits are known for.

Let me say right up front that fine folks at Aphex have come up with some ground breaking products in the last 10 years. But, shoving a vacuum tube in between a couple of op-amps does not a tube preamp make, at least, not from a purist's point of view. Although a schematic wasn't supplied, it was easy to determine that the folks at Aphex are trying to produce a preamp that sounds "tubey." To some folks, that's the sound of vintage tube gear: Warm bass. Rolled-off highs. The smo-o-o-th sound.

While the Model 107's characteristics aren't that exaggerated, they do exist to some degree. I guess you could say they captured the "tube's essence."

The single triode stage per preamp is run

Product Capsule: Aphex Model 107 Tube Microphone Preamp

Thumbs Up	Thumbs Down
<ul style="list-style-type: none"> ✓ good sound ✓ features ✓ great price 	<ul style="list-style-type: none"> ✓ not really a true tube design

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at a plate voltage of 48 volts. At this voltage, it appears that the tube would be current-starved, and distort with minimum input level. Additionally, the tube seems to be set up as a follower, or buffer, seemingly supplying no gain, but loaded with a very low impedance, again, to initiate distortion prematurely. (*Editor's Note: According to Aphex, however, there is actually 20 dB of gain inside the tube stage. This patent-pending circuit is said to be achieved through elimination of plate resistance.*)

Because I did not have a schematic, I did not spend much more time tracing the rest of the circuit, in operation, the characteristics of this box substantiated my findings. Distortion was higher than typical, even for tube-based circuitry, but was mostly low order in nature. When driven into clipping, the waveform, as viewed on an oscilloscope appeared somewhat like a tube circuit, in that it wasn't an abrupt clip, but a gradual flattening of the negative part of the waveform first, then the positive. A soft clip, if you please.

Interestingly enough, after all of my assumptions about its design, I auditioned the Model 107, and you know, it's a pretty good sounding preamp. I don't know if it's because of the single tube stage, or in spite of it, but it lacks the typical bleached out solid-state sound that passes for hi-fi these days.

The resultant sound utilizing Neuman U-87 and TLM 193 microphones was quite natural. What really drew my attention to this was listening to our production director at WBIG talk off-mic while I was setting up the preamp. It was uncanny how real he sounded through the electronics. Talk about your A/B comparison. Headphones on. Headphones off. Is it live, or Aphex? I quickly switched back to the internal preamps in our production room console, and the magic was gone.

I then let the production director try it. First the console preamps. Then the Aphex 107. It was no contest. "Put those preamps

back, please." were the last sounds I heard from him as I dashed out the door. I returned later to test, compare, and record my results on DAT. No matter who or what other preamp I tried, the Aphex 107 bested the console preamps.

Those of you who have been following *Tube Talk* since its beginning might wonder the inevitable, "How does the Aphex Model 107 compare to the highly-acclaimed D. W. Fearn VT-1, an all-tube microphone preamp you reviewed in *Tube Talk* No. 2?"

In going over my notes, the VT-1 was a more refined overall, and cleaner in the highs than the Aphex, but this is like comparing apples and oranges, as the VT-1

costs five times what the 107 costs, and was built as a no-holds barred, state-of-the-art preamp. The Aphex 107 was designed for the everyman, so he too may enjoy the benefits of "vacuum tube" technology.

Test results were interesting. The THD readings were constant throughout the audio bandpass, averaging around 0.15 percent for 60 dB worth of gain, and +10 dBm output. The THD increased to 0.4 percent at about +18 dBm out. Clipping occurred at +22 dBm, and was asymmetrical, typical for current-starved tube operation. SMPTE IMD was a bit high at 0.4 percent at +10 dBm, and a little lower at lower outputs. Noise was -68 dB down for 60 dB of gain, meeting spec for -128 dBu

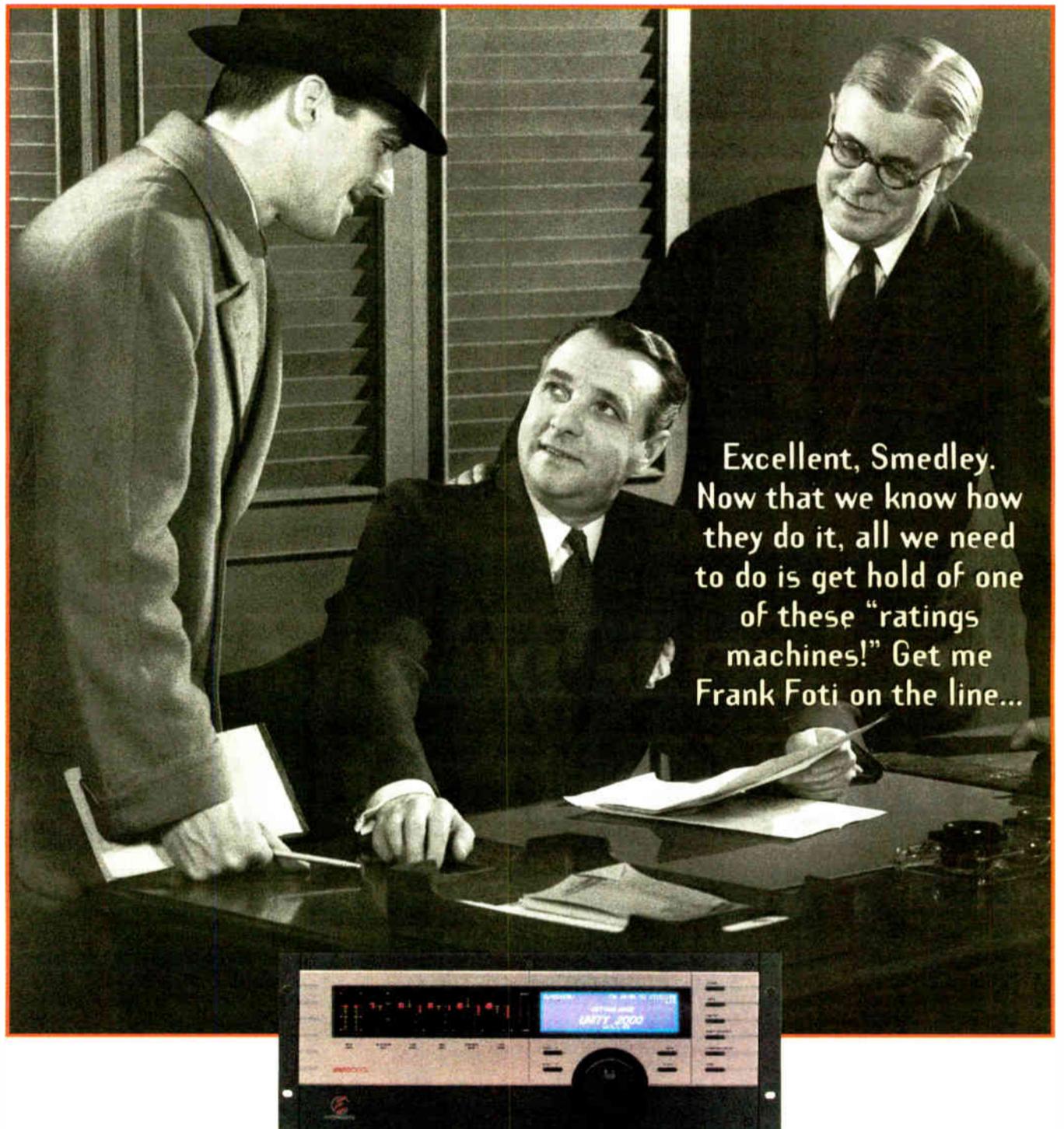
worst case equivalent noise. A 10 kHz squarewave at +10 dBm out showed no overshoot and was ever so slightly rounded at the corners; quite respectable performance. Frequency response was reasonably flat to 60 kHz.

So, is the Aphex Model 107 a product truly worthy of the status we've afforded to other products utilizing vacuum tubes? Or, is it an attempt to capitalize on the vacuum tube "craze," with trick circuitry and catchy nomenclature? Yes to the first question, maybe just a little to the second.

In summary, I say go try it. The price is right, and the performance is certainly better than your typical console preamp. And it sounds good, too.

□ □ □

John Diamantis is director of engineering for WGMS-FM, WBIG-FM and WTEM (AM) in Washington, D.C.



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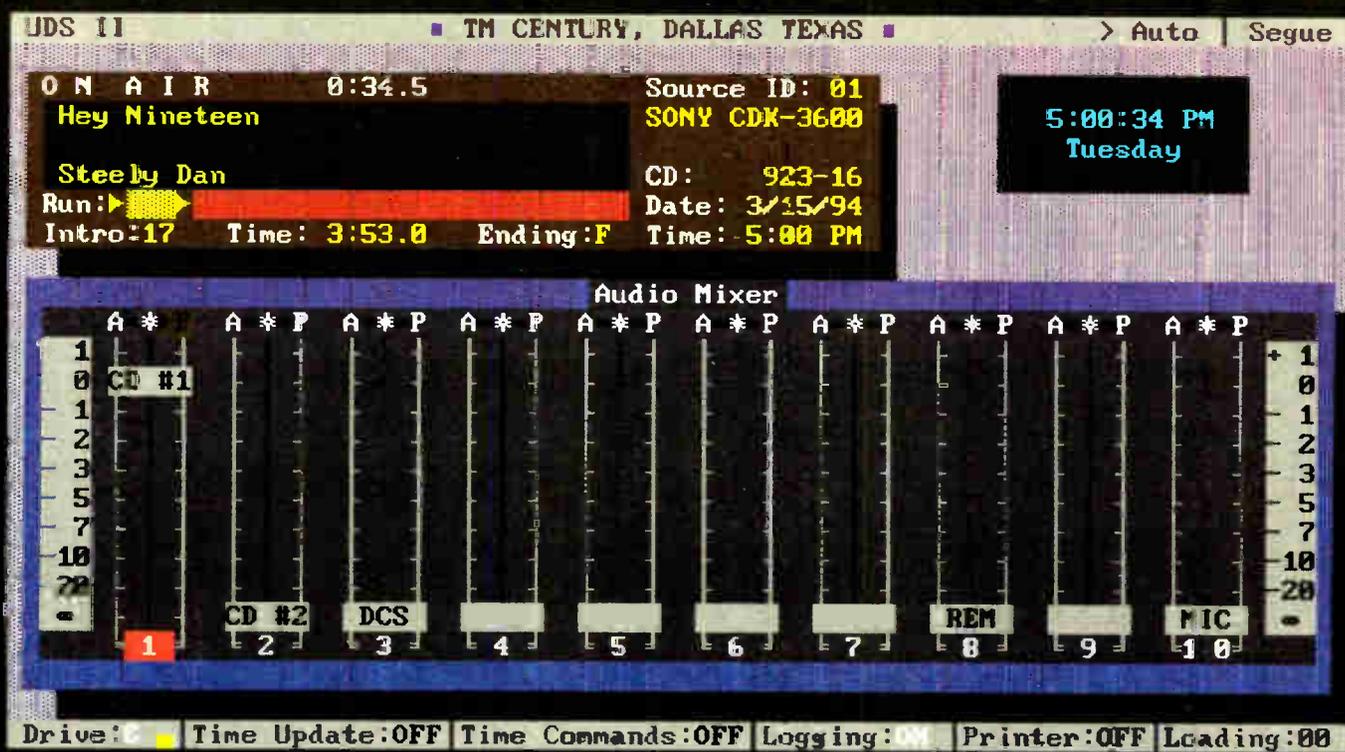
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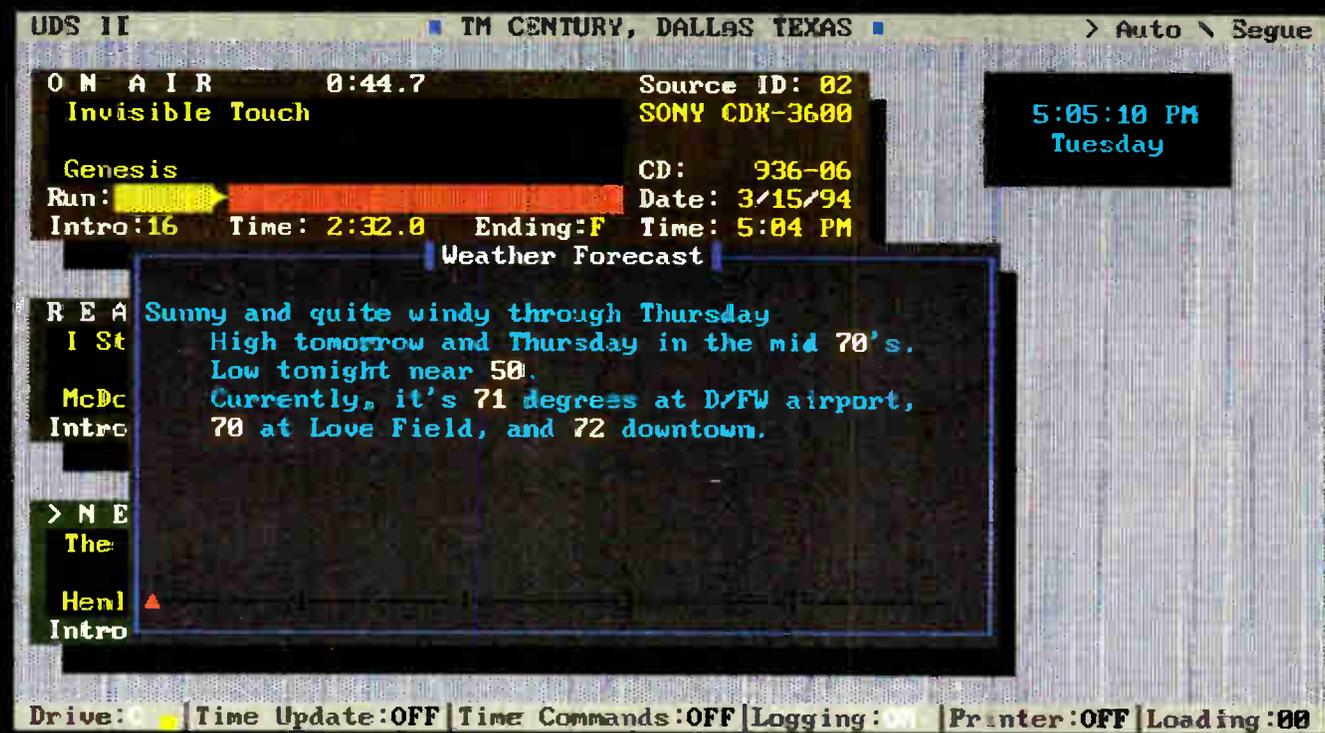


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ANSI RFR Standard Exceeded

► continued from page 8

to levels complying with the ANSI standard, it is therefore necessary 1) to reduce the magnitude of the power densities in those areas, 2) to restrict human access to those areas, or 3) to implement some combination of these two factors."

The report recommended that KXTZ-FM's transmitting antenna be moved away from Tower 2 "to reduce the fields in that area to levels below the ANSI Standard. Because KXTZ-FM alone is calculated to contribute about 99 percent of the ANSI guideline, it is believed that its relocation should, by itself, reduce RF power densities to levels meeting the guidelines.

Moving the antenna

"If, however, subsequent measurements show that power densities in that area still exceed ANSI, then we recommend that the transmitting antenna for KMZQ-FM also be relocated."

Additionally, the report outlined steps to be taken in an effort to restrict access to the "areas exceeding ANSI," including installation of two raised "speed bumps," the painting of "the road area between the bumps" with 4" international orange diagonal stripes, "about 36 posts 3-4 feet tall made of dielectric material," and two warning signs to be placed next to the speed bumps.

According to a Las Vegas radio engineer, who wished to remain anonymous, AMI took such steps about a year ago. He also said that the radio and television stations on Black Mountain have been working together to insure that, if stations need tower or antenna work done, "nobody is affected for a great length or period at any one time."

The report also noted that "restricting access to the areas exceeding ANSI is difficult, since part of the access road to the site is covered by the high fields and it is practical neither to fence off the road nor to reroute it."

Mark Nolte, chief engineer of KFMS-FM, one of the stations on the Black Mountain site, doesn't think that signs and ground markings are enough. "If they're going to have a hot area on the ground," he said, "it should be totally restricted in any way, and the only way you can get access to that area is to...go through the proper channels."

Is the RF problem encountered at the Black Mountain antenna farm a problem at other multiple sites in the U.S.? "(At) the majority of multiple use sites, the permittees and licensees normally work together," the FCC's Greenberg said. "We have had a few instances at these very large multiple use sites where that always isn't the case, and this is a prime example."

Greenberg said the problem arises "[W]hen leases are signed, not enough information is in the lease for requirements on complying with RF. In other words, there should be a plan at every multiple use site on who should reduce power when access is given to the site, whether...(it's) in compliance with OST Bulletin 65...this is what will happen when people are authorized access to the site, this is what we do to protect the public, this is

what we do when people climb the tower, this is what we have to do when there's an emergency. Everybody should get a copy of that. That is not happening."

What's true?

Radio engineers are sometimes skeptical about the effects of RF. Sands said that he's been working "around this stuff" all his life, "and until a few years ago, nobody ever had any concern whether or not the level was too

high... So I don't know, and I guess only time's gonna tell... whether or not there's really a problem...But the issue is...that there's a standard, and that the broadcasters have to abide by the standard, whether or not they believe it's a hazard or not."

RFR is a problem that is not likely to go away. Bob Weller, a consulting engineer for Hammett & Edison, said the 1992 version of the ANSI standard is five times more restrictive than the 1982 version under certain conditions, such as where the public congregates. That provision would not apply to the Black

Mountain site, which is located away from the general population. Weller also said that the 1992 version of the standard has a broader range than the 1982 rule.

With the efforts being undertaken by AMI, and the company's response to the FCC, it looks as though the RF problem on Black Mountain is on the mend. The anonymous Las Vegas radio engineer said that the steps being taken by AMI to mark the hot spots at the site show are positive. He said that "within the year... the problem will be 99 percent gone."

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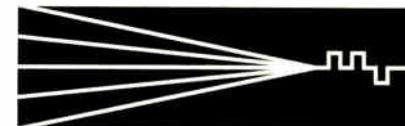
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World Radio History

BOTTOMLINE BROADCASTER

Interface Box a Simple but Important Item

by Jim Murphy

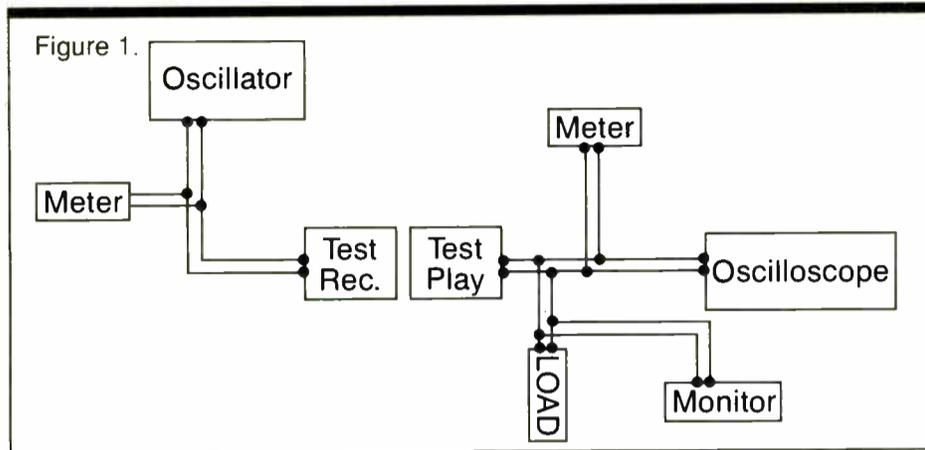
MORGANTOWN, W.Va. This month's project is an interface box, a project whose simplicity is exceeded only by its importance in a well-run, efficient broadcast station workshop.

Baltimore, it is actually not that well organized. In reality, the setup takes a form more closely resembling a bird's nest, with test clips hanging to screws, piggy-backed by alligator clips, and of course the old technique of solder folded and rammed into the ends of an XLR connector.

permits you to plug all your test gear into a central location, switch in your test gear and your loading, and read and listen to the test

connectors your equipment uses.

I used Cinch-Jones six-pin connectors at the box, and I made up cables to fit all my



It is a common piece of equipment on many benches of two-way service shops and in FAA repair stations. Here, elaborate navigation and communications set-ups are reduced to one or two plugs which supply all voltages and signals to the unit under test. In fact, whenever time and money are a prime factor, you'll probably find some type of interface box to expedite setup and repair.

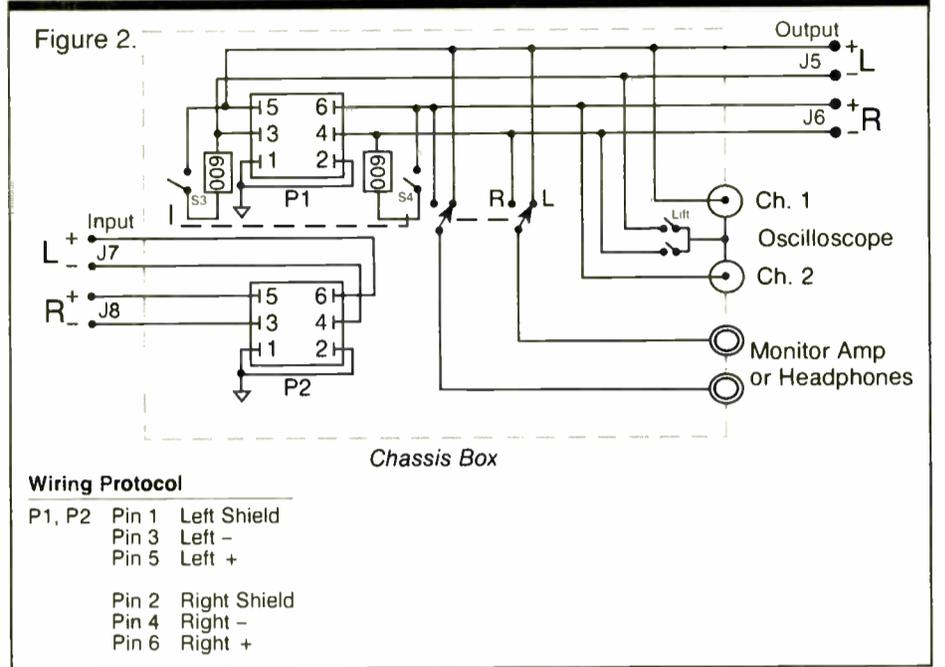
Time-saving as it may be, the interface box has not found its way into the broadcast engineer's workbench, perhaps because it is felt that the time needed to build such a unit is not warranted and that usage would not be that extensive.

Figure 1 shows a typical set-up for checking and aligning a stereo cart machine. Although the block diagram bears a close resemblance to the sewer system of

I also have images of trying to press a headphone jack tightly against alligator clips while trying to identify a tone. Sometimes even two people are needed just to keep the connections solid, and even then, with this type of setup, about the time you are ready to adjust azimuth or equalization just a hair, something goes "bing" and you then begin troubleshooting your hook-up.

This is all a terrible waste of time, not to mention the frustration that comes after you set up a system out of phase or try to adjust the left channel while monitoring the right. Start over, do it all over again, right?

The interface box shown in Figure 2 will help solve these problems and will let you concentrate on the alignment instead of the rig, which will help you do your job in a more efficient manner. The interface simply



data, all without clips and clothespins. And since the system provides good, solid connections, it is only logical that your measurements will be more accurate.

cart and tape machines, labeling and tagging them where necessary. This makes connections fast and easy, with the least margin of error.

This is a very easy project to build, and most parts can be found around the shop. Use at least a 4 x 4 minibox, or equivalent, and bring out your oscilloscope, VM and oscillator cables on one end through grommets. Mount your I/O chassis plugs on the other, and set your switches and banana plugs on the top.

Custom-cut the cables to your oscilloscope, analyzer or VM, and dress them in a neat and orderly fashion. Install the appropriate connectors, and you're almost ready.

Incidentally, if you are

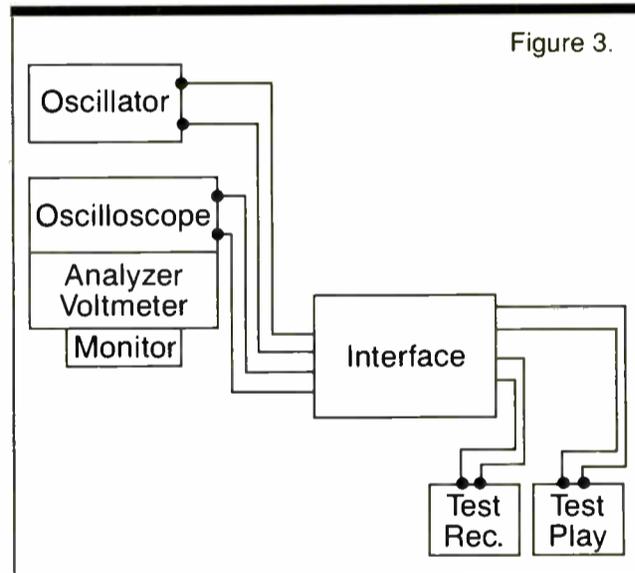


Figure 3 illustrates the setup. Your test equipment plugs directly into the interface. Coaxial cable jumpers are used for oscilloscope connections, and binding posts pro-

viding proof equipment from Potomac Instruments, you can omit the loading switches on the L and R outputs. This equipment has the proper terminations at



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Figure 4. Special Parts for Interface Box

Symbol	Part	Number
J1, J2	BNC Chassis Mount	*
J3, J4	Binding Posts	*
J5, J6	3-Pin DIN 180 Cable	**Switchcraft 05CL3
P1	Cinch-Jones Plug	P306AB
P2	Cinch-Jones Socket	S306AB
	Cable Plug	P306CCT
	Cable Socket	S306CCT
R1, R2	620 OHMS, 1/4 W Resistors	
S1	DPDT Toggle	
S2	DPST Toggle	
S3, S4, S5, S6	SPST Toggle	
	Minibox & Assorted Hardware	

* Depends on manufacturer
 ** For Potomac Instruments equipment

vide a convenient place to connect a monitor or headphone.

Outputs to your AC meter or analyzer and the path to your oscilloscope should be cable and terminated into whatever type of

the oscillator and, providing you have the transformers, on the analyzer/VM.

Your cart machine interface cables should be three or four feet long and six or seven continued on next page ▶

Testing Some New Network Software

by Richard Mertz

FAIRFAX, Va. Some months ago, I wrote about Peer-to-Peer LANS (Local Area Networks). Just to recap, local area networks are computers that are interconnected in such a way as to permit sending of e-mail (electronic mail), sharing of files and programs using a dedicated central computer called a server.

Users on the network use workstations to access the data and programs on the server. Many times, workstations are standalone PCs. Peer-to-Peer LANS are similar except each user (PC) on the network can act as both server and workstation. With Peer-to-Peer LANS, users can share files and printers.

I have discussed the interconnection of

the computers in previous articles. The software used then was Novell's NetWare Lite. NetWare Lite is an offshoot of Novell's NetWare that some regard as the top LAN operating system.

NetWare Lite worked just as advertised and functioned well. Soon after the article appeared, Novell began releasing Personal NetWare. This updated version of NetWare Lite was not only supposed to perform as well as the original software but be able to easily interface with full-blown NetWare.

Armed with two nodes of Personal NetWare software, off I went to update my Peer-to-Peer LAN. I loaded the software on the first machine. All appeared to go as planned. Next, I loaded the second

node in computer number two. The install program asked for "disk 2." When I inserted disk 2, the install program com-

pletely ignored it. Once I am able to get things up and running, I will write about all the gory details.

Well, there I was, expecting to write about a software enhancement but was left with nothing. So off I went to my local computer supermarket to see what they had that was

new and exciting. I picked up Microsoft's upgrade for Windows 3.1. Windows for Workgroups not only is an upgrade for windows but the platform for a Peer-to-Peer LAN. Sounds like a winner to me.

After opening the plastic wrap and tearing open the software package with its plethora

Windows for Workgroups not only is an upgrade for Windows but the platform for a Peer-to-Peer LAN.

of warnings, I found the setup program to be as simple as the original Windows installation. The install software checks your hardware and DOS operating system. The setup software runs under DOS so Windows doesn't need to be already installed.

continued on next page ►

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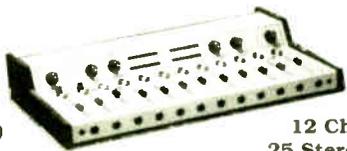
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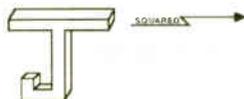
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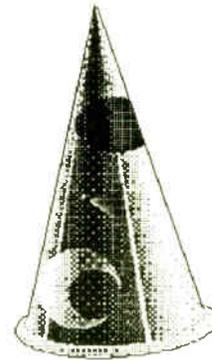
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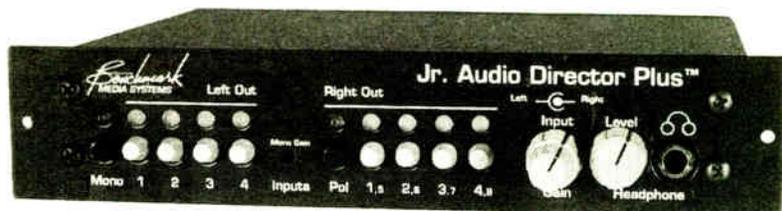
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While the install program is loading the Windows programs, it's a good idea to look through the book. It contains one of the best and simplest descriptions of a Peer-to-Peer LAN I've seen in a long time. Because I already had the network interface cards and cables installed in my computers, I skipped this part. Towards the end of the installation procedure, you are asked if you want your computer to share files and printers. I set my system up to share the printer and files. More on this later.

Just like Windows

Windows 3.1 was already installed on my machine. The upgrade appeared to function just like Windows always did except the opening message indicated the presence of the upgraded software. Except for a new program group labeled "Network," and print manager automatically loading, Windows worked just like it always did down to the screen saver.

I next installed the Windows upgrade on a second machine on my Peer-to-Peer network. Just like the first machine, the software install proceeded uneventfully. Once the Windows for Workgroups was installed on two machines, I attempted to access files through the network. No dice. It appeared that nothing worked. I knew something must be working.

The network card on the second machine has activity LEDs which would periodically flash. Something must be working. I tried everything but nothing worked. Reaching back to that old engineering adage, "When all else fails, read the directions," I put on my glasses and read the book.

Tell it what you want

Now we were getting somewhere. It is necessary to indicate to the Windows network which files you want to share. To do this you need to use the File Cabinet utility. Simply click on the folder for the files or directories you want to share and then click on the share icon. This icon looks like a hand holding folders. For those of you who are not familiar with Windows, a picture of a file folder indicates a directory. After setting up the file sharing on both computers, I was ready to give it a try.

Starting WordPerfect, I attempted to load a file from the other computer. Bingo! It worked like a charm.

Next came the printer test. I tried to print the file from WordPerfect; however, all I got was a message that the printer was not accepting characters. A quick detour through Print Manager fixed the problem. It seems I selected my fax card through the print manager. This one was my fault.

Resetting the print manager for the correct printer cleared up the situation.

There are some other features associated with Windows for Workgroups. Some of the features are electronic mail, fax sharing, if you have a fax modem, and a scheduler. More on these goodies in future articles.

After my experience with Personal NetWare, I found it a pleasure to install and use Workgroups. It is fairly easy to use as well. Some familiarity with Windows is helpful but not really necessary.

More on Peer-to-Peer LANs in future articles.

□ □ □

Richard Mertz is a principal at the consulting engineering firm of Suffa and Cavell, Fairfax, Va. He can be reached at 703-591-0110; through Compuserve, 73020,3026, or on the Internet at rmertz@dgs.dgsys.com.

'Best Buy' Mackie a Workhorse

► continued from page 18

it. This mixer is so clean and quiet that I don't hesitate to use it for my live DAT recordings. In fact, I'd bet that the MS 1202 is quieter than some very expensive radio station consoles on the air today. It's that good.

The Mackie MS 1202 also is extraordinarily useful. I use it for tape dubbing (the EQ is very effective) and to bridge professional components with consumer audio devices. You can jury-rig about anything through it. And I've even used it as a preamp in a home music system and enjoyed listening to CDs through its excellent headphone amp.

The only thing Mackie has not included in the MS 1202 is a provision for battery power. Though Mackie thoughtfully

provided a design that adds no additional "wall warts" in my vast collection, it has not given us a way to work with the MS 1202 away from AC power outlets. Hopefully, in a future version, a battery powering feature will be included.

Summary

I can't say enough good things about the workhorse Mackie MicroSeries 1202. It is an absolutely essential audio tool in my daily work. I would be at a loss without it. The more I think about it, the MS 1202 may just be one of the best audio bargains of all time.

□ □ □

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PRODUCT EVALUATION

DN-650F Offers Professional Features

by John Bisset

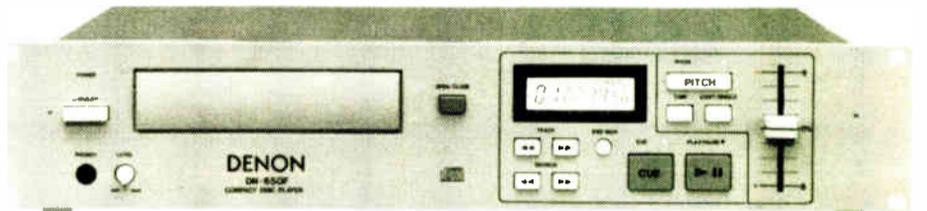
SPRINGFIELD, Va. It is always encouraging when manufacturers listen to customer feedback, which appears to be the case with the Denon DN-650F. This lower-cost CD player incorporates

several production features of more expensive players and adds pitch control, all for a discounted price in the low \$600s. The list price is \$750.00.

Unlike Denon CD cart machines, the DN-650F uses a sliding drawer, similar to consumer machines. And while Denon

included another consumer feature on the DN-650F—a front panel headphone jack

pushbuttons. A separate portion of the panel is used for pitch control. A vertical-fader-type knob permits adjustment of pitch +/-8 percent. This can help create some very interesting production effects, as well as matching tempo or beat when mixing sources. Add an AKG digital editor (or equivalent), as we did, and you really



Denon DN-650F CD player

I COULD HAVE BOUGHT A DIGILINK!

Are you thinking about replacing your old cart machines with 'Digital Carts' such as floppies, flopticals, Bernoullis, or Optical?? Well, think about it a little more! Add up the list price for a digital cartridge recorder, just a single player, AND the floppy disks--- and you will find that you could have bought a Digilink workstation for \$7,995 that gave you 'Live' -AND- 'Automation' capabilities!!!

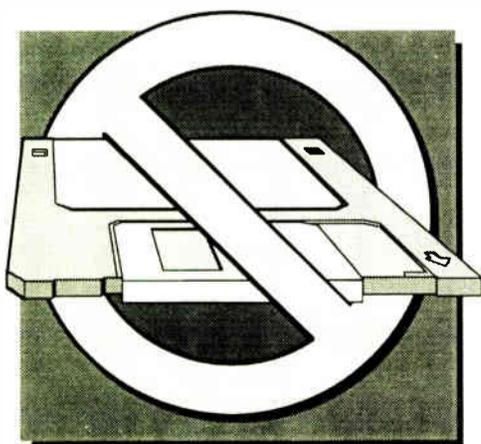
A Digilink workstation stores audio on an internal hard disk and comes out of the box with a capacity of 547 one minute, stereo carts for only \$7,995. Even better, the Digilink hard disk has an average 15 year life. Imagine how many floppies you will break, wear out, lose, and replace over 15 years. That doesn't count all of the floppy disk mechanisms that will jam, break, and simply fail...

Also with a Digilink, you get much more! You can stack up hundreds of 'carts' in the play list and just walk away. You get satellite automation in the Digilink workstation and can optionally add CD players. A digital audio cut and splice editor even comes standard with Digilink. Because Digilink will play and record at the same time, you can play a spot to air while it starts a scheduled network autorecord. You can even network delay with Digilink.

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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with volume control—it is hardly consumer-grade equipment.

Full array

The CD player offers a full array of separate XLR-balanced and RCA-unbalanced outputs, as well as a digital out and a full-function remote connector. The front panel is clean and uncluttered, making it ideal for a fast-paced on-air or production environment.

All the pushbuttons are soft-touch-type switches. The Play and Cue buttons are color coded and large. There is no excuse for hitting the wrong button.

Seldom-used buttons are smaller and located away from the Play and Cue

have some powerful production tools.

Pitch control is selected quickly and easily by simply pushing a button. It can provide a fixed pitch, a preset speed or, by using the fader, variable pitch. Between the addition of pitch control and the lower cost, the DN-650F is well within the reach of clubs and station road shows. The jocks at a local urban station are salivating at the mixing possibilities this new model poses.

Denon applied its typical foresight in designing the DN-650F. LEDs instead of bulbs that burn out are used. With the LEDs, you can program the selection of features, allowing customers to customize

continued on page 38 ►

USER REPORT

Pioneer 300-Disc Changer Boosts Efficiency at KWJJ

by Michael Kelly
General Manager
KWJJ-FM

SALT LAKE CITY At KWJJ-FM, we operate live 24 hours a day, seven days a week. Running this type of country music radio station requires a large staff as well as an extensive CD library. For these reasons, we sought out a cost-effective and efficient system that completely automated cueing, auditioning and playback of a large volume of CDs in our live-assist programs.

Until this time we had used a manual single-play CD deck. It was extremely reliable, but our DJs had to constantly handle the CDs. Every disc was manually placed into the machine for cueing and playback. This causes nicks and scratches on CDs, which in turn leads to continuous replacement of the discs and on-air problems, compromising the reliability of our machines.

Automatically alternates

Initially, we considered buying Pioneer semi-automated six- or eight-packs, but the combined cost of these units made it more cost-effective to consider the Pioneer CAC-V3000, a 300-disc-capacity autochanger that automatically alternates discs between two built-in play heads.

At first, we were skeptical because the station had never relied on a single automated system. However, knowing firsthand about Pioneer's performance and reliability, we forged ahead and purchased the unit.

The CAC-V3000 addressed our needs and solved our existing problems. The autochanger automatically searches and delivers the correct disc quietly, precisely and gently, without leaving fingerprints, dropping discs or mixing up titles. Not only do the DJs have more time to focus on other facets of the show, the CDs last longer too.

The cueing capability was astounding. Using a PC with Mountain Horizons software, a DJ simply selects a song to play on the computer and the Pioneer system cues it up automatically. In fact, the operator can even audition or cue audio beforehand. Unlike some other systems, the CAC-V3000 cues up to the beginning of audio, not to the actual track, so there is no dead air.

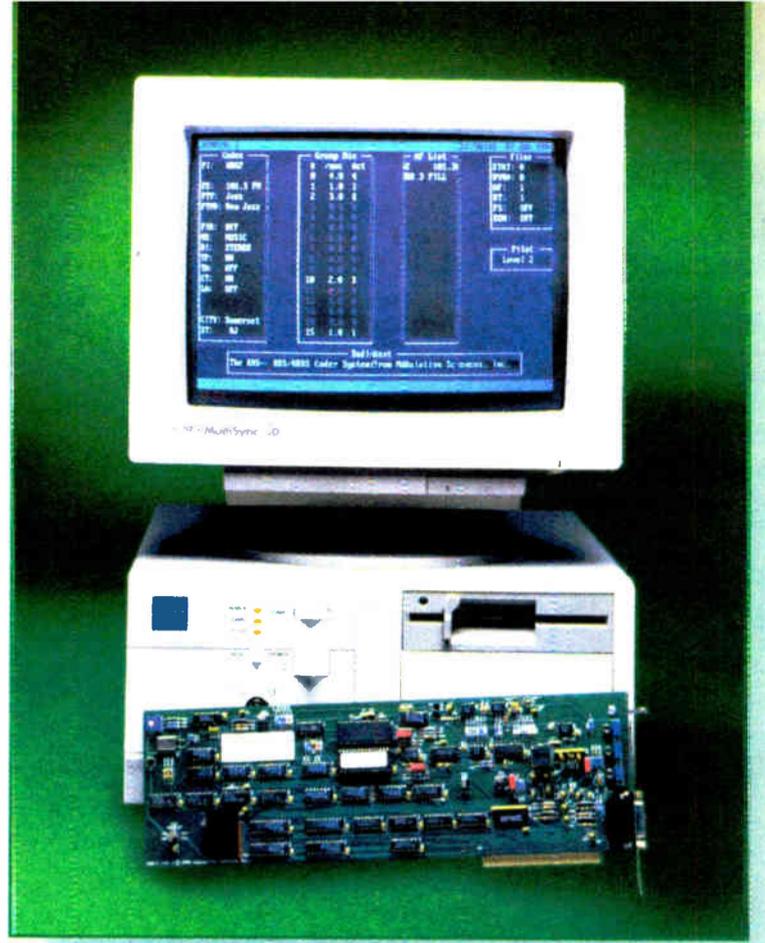
The system is extremely smooth. With two disc players alternating playback, the second player begins playing immediately when the first one is finished. There is no

continued on page 39 ►

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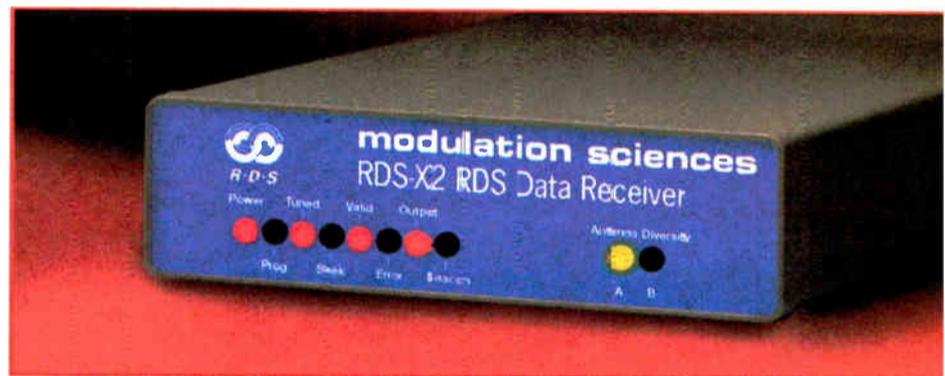


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USER REPORT

Show Banks on Sony MiniDisc

by Craig Crossman
Host
Computer America

WEST PALM BEACH, Fla. One of the first things I wanted for my "Computer America" show was to broadcast in front of a live studio audience. As most radio studios are about the size of a small closet, I convinced the local college to loan me one of its lecture halls, complete with theater-style seats and a stage area. It is a good thing I secured the hall, because the show is now attended by several hundred people each week.

The college insisted on one condition: When the show was over, all the equipment had to be removed for normal class activities. Via the technical talents of my chief engineer, a "studio in a box" was created.

Wonder box

This four-foot-high wonder box contains microphones, headsets, mixers, a Switched 56 digital system, anti-feedback hardware and much more. I also needed a way to generate lots of sound effects and comedy bits, which are sprinkled throughout the broadcast.

Because the network is in Colorado

Springs, Colo., and I have no eye-to-eye contact with the board director, I realized that trying to cue my producer verbally over the phone would be too slow. They say that timing is everything for comedy: That goes double for a radio talkshow. This meant I had to trigger the necessary sounds.

What were my alternatives? Program carts? Those eight-track tape throwbacks?



Sony's MiniDisc essentials

I could just see myself fumbling through dozens of carts in front of hundreds of people and inserting them into a 30-pound cart machine, all the while worrying that one might not be cued up correctly. No thank you. I needed another option.

And I found it. The Sony MiniDisc (MD) platform was perfect. Using a palm-sized MZ-1 solves the weight problem of the bulky cart machine, and a single 74-minute disk holds nearly 200 sound effects and bits. It has random access to any track; it instantly cues up and the display offers peace of mind by confirming the bit that is about to be played. What a godsend.

Easy to operate

And although I am technically oriented, it is really easy to operate. Even my producer can use it (sorry Bill...). If I had one wish for this product, I would insist that the optical cable could transfer both the sound and the track titles. Currently, making a backup copy of a 175-track MD requires a lot of retyping. Hopefully, Sony and other MD manufacturers will see the light and remove this limitation.

I have since purchased the Sony MDS 501 home unit to edit my MDs at the office. One of my talkshow colleagues, Randi Rhodes, visited Computer America to see how I use the MiniDisc. She fell in love with it and has since demanded that a local affiliate station, WJNO(AM), buy her two of the professional MDS B1 models. She uses one at home and the other in the studio.

Because I host a regional version of Computer America called "Sound Bytes" on WJNO as well, I now can use my sound effects MDs on Sound Bytes too. The station's chief engineer plans to buy two more professional MDS B1 models to replace the control room's bulky 10-inch reel tape recorders. As the reel decks tape at 15 ips, each reel holds only an hour. The tiny PRMD-74 holds 74 minutes and sounds a lot better too.

Bottom line is that I can and do use three different, yet totally compatible, Sony MD models. As each model offers unique capabilities, the MD platform provides a total solution to my recording and playback broadcasting needs.

□ □ □

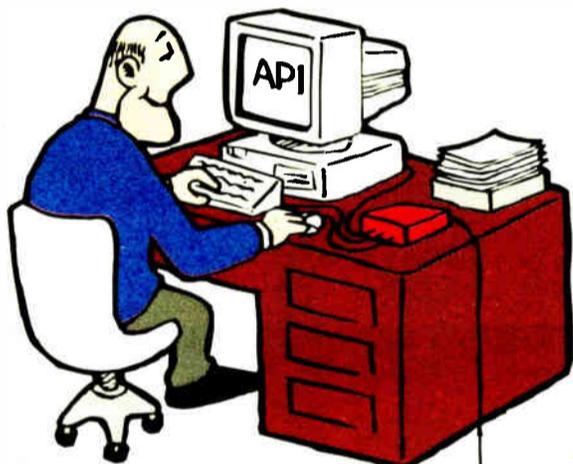
For information on MiniDisc, contact Sony in New Jersey at 1-800-635-SONY; or circle Reader Service 58.

Craig Crossman is a nationally syndicated newspaper computer columnist whose weekly column appears in hundreds of papers including The Miami Herald and The Washington Post. He also hosts "Computer America," which airs live from 3 to 6 p.m. Sunday afternoons on the Business Radio Network. He can be contacted at 407-640-4228.

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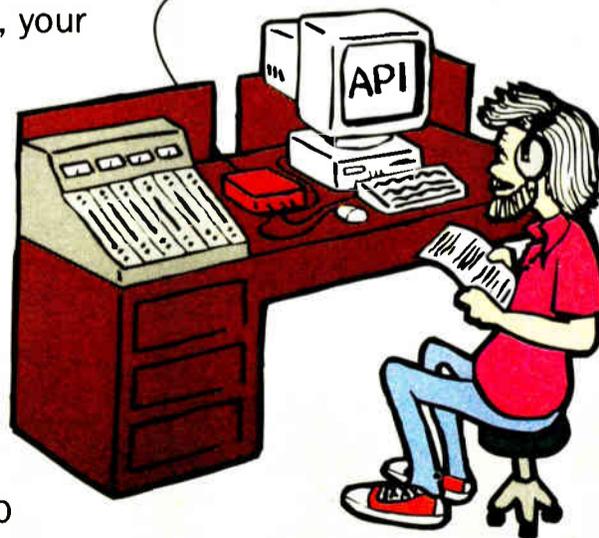


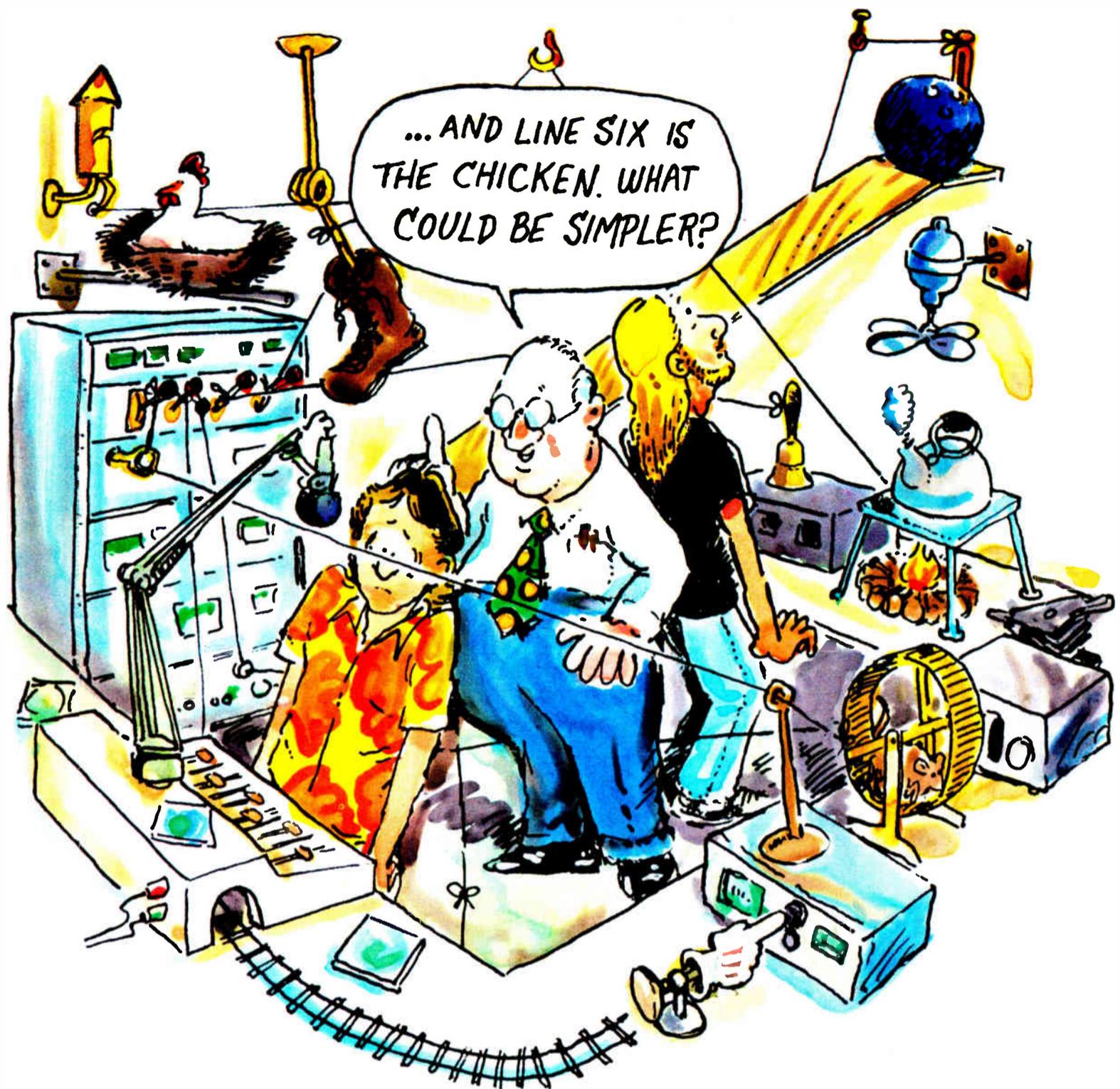
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USER REPORT

WACO Enters Digital Era with Scott Studios

by John Elliott
Production Manager
WACO-AM-FM

WACO, Texas Since switching from analog to digital production some eight months ago, the CompuCart Production Bank System from Scott Studios has been the real workhorse for airing and storing our commercials, promos, PSAs, sweepers and IDs.

Selecting a digital on-air playback system was very difficult and at times frustrating—all these technical terms that only engineers can understand. Then there was the question of overlapping.

Clear choice

Would the system overlap the commercials or would there be a slight pause between spots? Last but not least, there was the cost. After months of research, meetings and demos, the CompuCarts Production Bank System from Scott Studios stood out as the clear choice.

After years of working with carts and cart machines, the CompuCart system was a welcome sight. Not only did it bring our production into the digital age, it did so with simplicity. The system is functionally the same as a cart machine, but with CD-quality audio and the ability to provide audio to multiple studios simultaneously.

There are at least two computers in the system: the Production Bank, a digital audio recorder/player in the production room, and the CompuCart, a dedicated computer in the on-air studio.

All commercials, PSAs, promos, sweepers and IDs originate from the Production Bank hard disk and can be played instantly from either studio computer without interfering with the other. This lets you record into the production room computer while the on-air computer accesses recorded material from the same hard disk at a 44.1 MHz sampling rate (faster or slower, if you prefer).

Many features

The Scott Studios system includes a number of valuable features. For example, if an advertiser wants to rotate more than one commercial, it is no problem. When one commercial is played, the next immediately becomes ready, and you have the ability to rotate up to 26 spots. The best part is, if the advertiser wants to pull a spot from rotation, it can be done without redubbing the other spots again.

In the on-air studio, the CompuCart computer displays six virtual cart players on a touchscreen. Once a spot is loaded, all of the information about the commercial is displayed on the front of the virtual machine into which it is loaded.

When you are ready, you can start the first commercial by touching the screen or by using the keyboard. You also have the option of manual or automatic playback from ten "Hot Buttons" for unscheduled jingles, sounders and voiceovers.

Finally, the CompuCart computer interfaces with our commercial log scheduler via local area network (LAN) cards and wires from the on-air studio to the traffic office. It seamlessly imports traffic logs to the on-air studio.

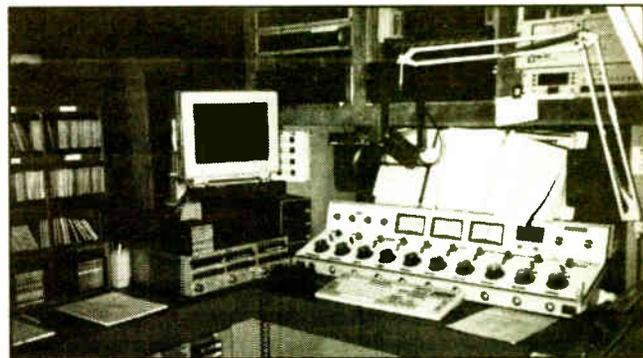
Minor problems

We have encountered some minor problems. The computers sometimes do funny things at the most unfunny times. If you choose to link the CompuCarts system with a traffic computer via LAN and the computer in the traffic office crashes, you have no access to all the commercials, PSAs, promos, jingles and whatever else you put into the computer.

Also, all the on-air material is accessed from the Production Bank Computer in the production studio. Therefore, the production room computer can never be turned off.

There is a weather factor too. Lightning and computers simply do not mix. We have taken every known precaution to protect our equipment from this villain. We have

installed surge and spike protectors, along with other protective devices, but hopefully we will not need them.



Scott Studios' CompuCart sits unobtrusively in the corner.

For information from Scott Studios, contact David Gerety, director of sales, in Texas at 800-330-3004; fax: 214-620-2707; or circle Reader Service 108.

Denon DN-650F Packed with Features

► continued from page 34

the player to their unique requirements.

There is even an "END MON" pushbutton, which plays the last few seconds of a selected track. Using the customized programming feature, END MON can be set to play from five to 35 seconds of the end of each cut, programmable in five-second increments.

Standard features

The DN-650F also incorporates the standard professional CD player features, including automatic cueing, instant or delayed start, end-of-message (EOM) indication, and single-cut or continuous playback.

The DN-650F is the ideal next step up from consumer models, and its added features make the player a good investment for either on-air or production use. Given its discounted price, particularly when you compare this model's cost to that of a consumer player and a line level matching device, you will be hard pressed not to buy it.

It is hard to think of what else Denon could offer in this model, because they seem to have thought of everything. I did come up with one idea that I hope will set their engineers thinking. At both of our test stations, DN-950/951 series CD cart machines are in use. These machines use a plastic cartridge or jacket

to hold the CD—helping to keep fingers off the disc and to reduce scratches and breakage.

We tested the DN-650F in each station's production room. The most frustrating thing was removing the CD from the plastic jacket in order to play it in the DN-650F. Although most production effects were played back on an old Studer and did not use the sleeves, any current music that we want to dub into a spot or promo had to be removed from its cart shell.

If Denon can develop a CD slot or tray that accepts both naked CDs and CDs already in the plastic cart shell, versatility would be greatly improved. The higher-priced and more versatile CD cart machines could stay in the control room, and a more production-oriented DN-650F could be used in the production room. If such development were incorporated in a model priced comparably to the DN-650F, I think Denon would quickly sew up the market.

Until such a feature becomes available, if you do not use jacketed CDs, consider the DN-650F as a quality, lower-cost CD player with a number of features not found elsewhere.

□ □ □

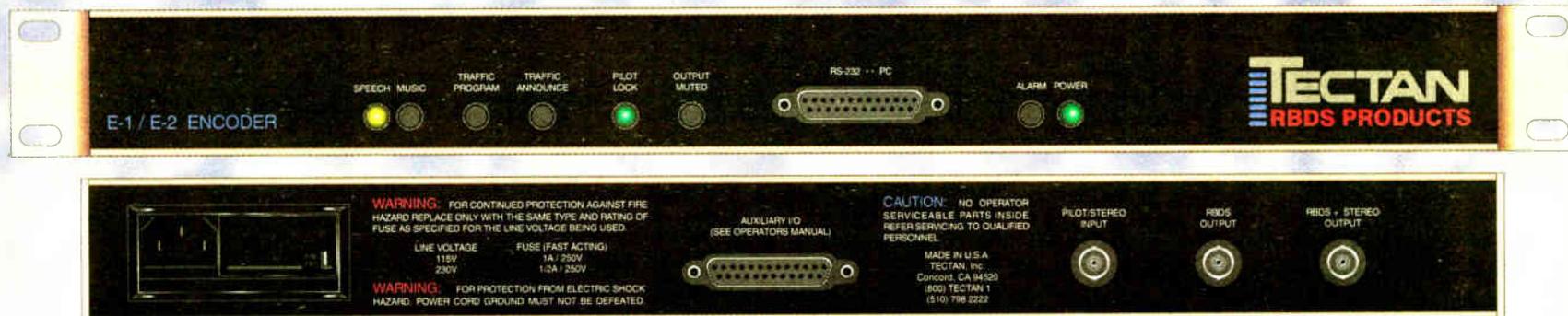
For information from Denon, contact Mike Stelts in New Jersey at 201-575-7810; fax: 201-808-1608; or circle Reader Service 101.

John Bisset is a principal of Multiphase Consulting, based in Springfield, Va.

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INDUSTRY ROUNDUP

Cart Replacement Debate Continues

by Whitney Pinion

WASHINGTON The replacement of cart machines with digital alternatives is not a new topic. In fact, each year for the past four or five years, industry players are asked the same questions: How much life is left in the NAB cart machine, and what are broadcasters actually doing with the digital technology available to them?

"In terms of measurable numbers, someone will probably always have a cart machine and cartridges," says Charlie Bates, vice president of marketing, ITC. "We've got over 120,000 machines out there." He says that with an estimate based on the total number of cart machines in use, ITC delivered \$6 billion worth of commercials last year.

However, Bates says, the company's sales of new cart machines are declining each year at a measurable, predictable rate. In fact, a large share of ITC's business comes from refurbishing its existing

machines rather than constructing brand new ones.

Radio Systems realized too late that analog cart machines would not be fast-moving, money-making products. The company entered the analog realm four years ago with the creation of the RS2000. "We thought there was plenty of market and plenty of time left for analog cart machines," says Dan Braverman, president. "We were wrong."

Braverman says that he still considers cart machines to be a very appropriate, dependable medium, but "we obviously believe strongly that digital is now."

Declining cart machine sales are no surprise to Dave Scott, president of Scott Studios. "I don't hear people saying, 'Ok, we're building a new radio station, so I need 15 cart machines,'" he says. Stations do not abandon existing equipment just because there's something new, he says, but if a station moves to a new facility or if stations combine, as in the case of a duopoly, then

converting to digital equipment makes sense.

Scott favors upgrading to a hard disk digital audio system, explaining that both acquisition and maintenance costs are considerably lower than those of cart machines. Other benefits of a hard disk system include improved audio quality, automation and the ability to pre-record tracks and log advertising spots.

Another argument for a hard disk system is increased efficiency. "With hard drive, everything is available at every desk," Scott says.

And therein lies the problem, according to Barry Klane, national sales manager for Denon. With any PC-based system, broadcasters face the risk of the system crashing at some critical moment. This is not the case, he says, with a removable medium like minidisc. "With removable media, you pull it out of one machine, put it into another and, boom, you're back on-line," he adds.

"Of all the systems I've seen in the past 18 years, minidisc shows the greatest promise because of its editing capability, its alpha-numeric storage and its standardization," Klane says.

Scott calls the minidisc "a nostalgic effort that really doesn't have any sense in a radio station."

"There's no question that it is nostalgic," Klane says, but, at the same time, minidisc perhaps encourages those broadcasters who are a little more resistant to new technology to venture into the digital domain.

And there is still hesitation. "We've had people come to us with their fingers burned really badly from buying digital systems that just didn't work," Bates says.

These bad experiences, Braverman says, are most likely the result of using digital systems that were not sophisticated enough to meet stations' needs. Today's digital systems began as automation systems that were not originally intended to replace cart machines, he says, although that's how they were being promoted and used.

But you don't regress after an experience like that; you try a better system. "In the second round," Braverman adds, "maybe people will start realizing they can't buy toys to do this difficult job."

Pioneer Gives KWJJ a Boost

► continued from page 34

lag time between songs, assuring full system productivity. With our old system, the operator had to shuffle through stacks of discs, as well as be concerned about accidental coffee stains, scratches or fingerprints on tracks.

Saves time

The Pioneer CAC-V3000 also gives our staff time to concentrate on producing a live show rather than handling the mechanics. In smaller radio markets, the CAC-V3000 also might be used to run all night unattended. During the day DJs can pre-record the news and announcements using the computer's hard drive and CAC-V3000.

Measuring only a little over 23 inches high and fitting in a 14-inch-square footprint, the CAC-V3000 takes up very little space. It fits easily into our control room. Connected to a 486DX66 IBM PC-compatible computer running Mountain Horizons software, everything is contained in one box.

As far as maintenance goes, the unit has operated flawlessly 24 hours a day, for more than eight months. It is smooth and fast, which in itself is a testament to the machine's reliability.

The autochanger has become the heart of our radio station. The technology incorporated into the Pioneer CAC-V3000 even lets us automate certain dayparts.

Finally, technology has caught up with the radio industry.

□□□

For information from Pioneer, contact Lynn Regino in New Jersey at 201-236-4152; fax: 201-327-9379; or circle Reader Service 211.

People, Promotions and Appointments

USA Radio Network appointed **David F. Reeder** vice president and general manager of network operations.

James R. Cote joined **UNR-Rohn** as vice president of marketing and sales.

Brad Lunde joined **Aphex Systems** as director of sales and marketing.

ASC Audio Video Corp. expanded its sales staff for the Virtual Recorder digital random access storage and retrieval system with the addition

of **Sharon Bell** as district sales manager for Southern California.

Primestar Partners, the direct broadcast satellite service, named **Donald Herr** senior vice president and **Marcus Evans** senior vice president and general counsel.

Radio Design Labs Inc. (RDL) appointed **Hugh Wilcox** vice president and general manager of the company. Wilcox oversees all aspects of RDL day-to-day operations.

Bill Reich was promoted to the manager of sales administration for **Narda**.

Andrew Corp. named **Floyd English** chairman of its board of directors. He also serves as president and chief executive officer.

Company News

E-mu Systems Inc. announced a joint sponsorship of the **Bay Area Audio Manufacturers (BAAM)** and **AES** party to have been held at San Francisco's Exploratorium on Nov. 10. It will coincide with the 1994 San

Francisco AES Convention.

For information and tickets, contact **Donna Vivero** at AES at 212-682-0477.

A number of software manufacturers have agreed to create software to help enhance the functions of **Yamaha's** new **ProMix 01** programmable digital mixer. Among the companies already on board are **Mark of the Unicorn**, **Opcode Systems**, **Lone Wolf**, **Emagic**, **Steinberg** and **Voyager Sound**.

QMI continues to expand the range of products it distributes with the addition of the French company **Nexo's** sound reinforcement loudspeakers.

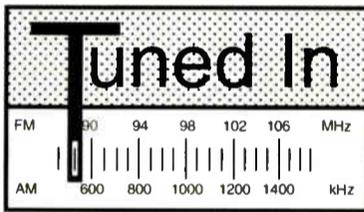
To better serve its customers in Latin America, **Crouse-Kimzey Co.** of Fort Worth, Texas, supplier of professional audio and broadcast equipment, opened a satellite office in Laredo, Texas.

The office is headed by **Eloy Guajardo** of Monterrey, Mexico, and is located at 215 West Mayberry Street, Laredo, Texas 78041; telephone: 210-727-7434.

Tittle & Associates of Anchorage, Alaska, were appointed exclusive sales representative for **Panduit** products in Alaska.

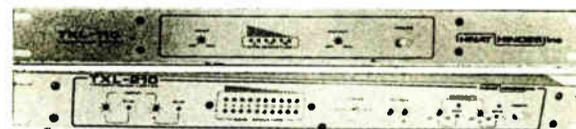
Jampro Antennas Inc. opened a new East Coast sales office in Fort Lauderdale, Fla. This office provides direct sales and customer service to Jampro customers east of the Mississippi River. The phone number for the new office is 305-771-7180.

Italian transmitter manufacturer **Iteco** recently reorganized its forces to better serve customers. For information on Iteco products in the U.S., contact **Alberto Giorgini** in Iteco's Miami office at 305-715-9410; or fax: 305-715-9494.



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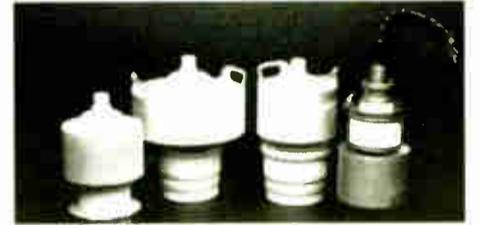
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READER SERVICE NO. 13

Excalibur Electronics CDA-1

Composite Distribution Amplifier



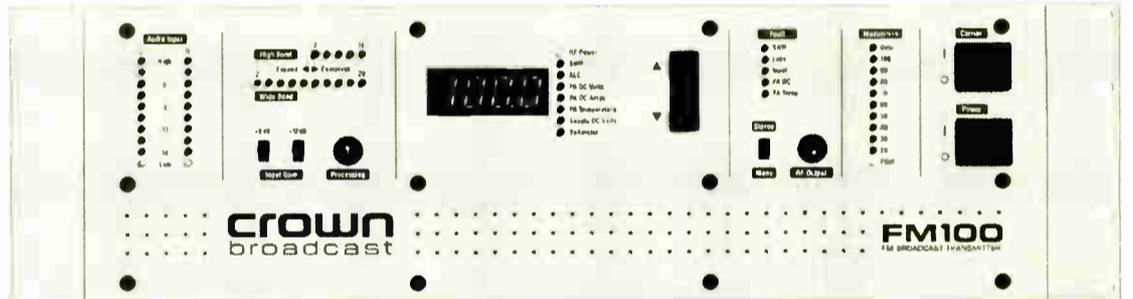
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TECHNOLOGY UPDATES

TASCAM

Tascam CD-601 Loaded with Features in Half-Rack Case Unit Fully Programmable

MONTEBELLO, Calif. Housed in a half-rack casing, the Tascam CD-601 CD player incorporates frame-accurate search capability, auto-cueing, "preview" monitoring, single and continuous play modes and instant start capability with the optional BU-2 RAM buffer.

The auto cue function includes four user-selectable sensitivity levels and also offers two means of locating program material.

The CD-601 can be programmed to play continuously or stop at the end of a selected track. Additionally, the unit can display elapsed or remaining time, show the track number, index number and the pitch control value, which can range +/- 9.9 percent in 0.1 percent increments.

The rear panel of the CD-601 provides balanced +4dBm XLR connectors as well as unbalanced -10 dB RCA jacks for analog outputs. There is also an XLR con-

FIDELIPAC

Fidelipac's Dynamax DCR-1000 Series Offers MO Disk Drive Option

MOORESTOWN, N.J. The Dynamax DCR1000 series digital recorder/reproducer from Fidelipac is now available with an optional 230MB magneto-optical (MO) disk drive. Each removable 3.5-inch diskette stores two hours of stereo audio at 15 kHz bandwidth, or nearly six hours of mono at 10 kHz.

A remote-control device provides immediate random access to any of the 99 separate cuts that may be recorded to a single diskette. Header information is displayed simultaneously on the LCD screen of the unit during operation.

A satellite automation mode for unattended operation is possible with the extended storage times available with the MO disk. The DCR1000/MO can operate in a live-assist mode during the day and then operate unattended at nights with a satellite feed under RS-232 control.

For information, contact Bob McNeill in New Jersey at 609-235-3900; fax: 609-235-7779; or circle Reader Service 170.



nect for digital output to feed external D-to-A converters (optional IF-601 for AES/EBU digital output) and a 9-pin serial control port for fader start or cascading multiple CD-601s via Link Play. For connecting the RC-601 remote control, a 15-pin D-sub connector is also provided.

For information, contact Tascam in California at 213-726-0303; fax: 213-727-7656; or circle Reader Service 95.

HARRIS ALLIED



Harris Allied's Audio-Metrics CD-10 Controls Designed to Resemble NAB Cart

RICHMOND, Ind. The Audio-Metrics CD 10 cartridge machine from Harris Allied is sized so that three units can be mounted side by side in a rack. CD titles are clearly visible from the front of the unit, and an autolock feature makes it virtually impossible for a jock to accidentally

eject a cartridge during playback.

CD 10 controls are designed to resemble those on NAB cart machines. A jog/shuttle wheel on the front panel performs search-and-locate functions and permits a user to search forward into the next track or reverse into the last track.

A large flashing indicator on the front panel displays end-of-message (EOM) data; the front display also shows remaining or elapsed time.

The CD 10 features Sony three-beam optics, a one-bit A/D converter with eight-times oversampling and an FDNR analog filter.

A heavy aluminum deck panel provides shock isolation from the chassis, and low-heat generation and ventilation provide for a cool-running machine. Vertically-slotted plug-in cards afford easy access and service.

With the CD 10's IEC II output, direct digital dubbing is as easy as running a cable with appropriate connectors from the CD 10 to a DAT machine.

For information, contact Harris Allied in Indiana at 800-622-0022; fax: 317-962-8961; or circle Reader Service 63.

NSM

NSM CD Autochanger Features 50-Disc Magazine System, Two-Year Warranty, Modular Construction

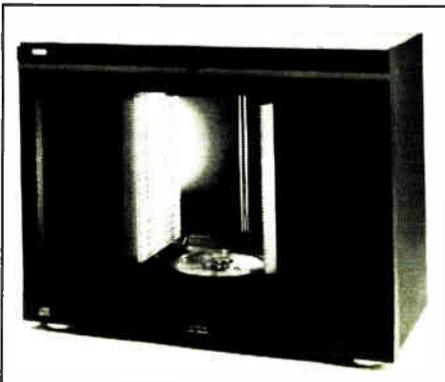
BRENTWOOD, N.Y. Manufactured by NSM A/S of Germany, the 3101AC 100-disc CD autochanger features an interchangeable 50-disc magazine system and individual disc carrier trays that ensure wear-free disc handling. Average disc change time is under 5 seconds. Employing the Philips CDM-4 drive with an industrial laser and Philips bitstream decoders, the system delivers a high-quality audio signal.

The 3101AC offers an average mean time between failures (MTBF) of 40,000 hours and a fully modular construction. The jukebox is backed by a two-year parts-and-labor warranty.

Automation systems from Broadcast Electronics, Sentry Systems, The Management, TM Century, ITC, Scott Studios and other manufacturers provide control interfaces to the 3101AC. Arrakis Systems is currently developing an interface that should be available shortly.

Software to facilitate operation of up to 16 NSM autochangers is now available. The software packages provide for complete cataloging of the disc library and compilation of custom playlists. Some programs offer enhanced features such as automatic time scheduling of playlists and automatic random list generation. Software is available for Windows, DOS and Macintosh platforms.

For information, contact Jon Taylor at Euroson America in New York state at 516-273-4200; fax: 516-273-4240; or circle Reader Service 203.



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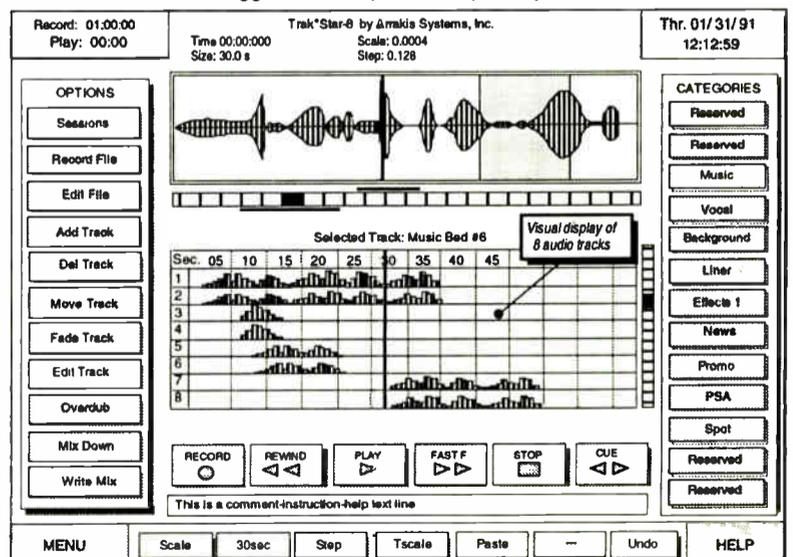
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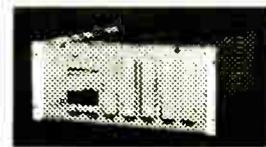
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PANASONIC

Panasonic Pro-DAT Offers Instant Start, External Sync

CYPRESS, Calif. The SV-4100, a new Pro-DAT machine from Panasonic, offers instant start and external sync capability. The SV-4100 features a software-enhanced digital interface, accurate PNO/cue assignment and programmable output level control.

A remote controller, which plugs into the unit's parallel control port, enables the operator to select a target PNO; the SV-4100 then automatically cues to that location.

Various sync modes can be selected from the front panel of the SV-4100, including internal sync clock, external 25 Hz PAL video, external 30.0 Hz NTSC video/film and external digital I/O, either AES/EBU-type or consumer format.

Analog and digital output levels can be continuously adjusted between 0 dB and -14 dB or selected between four preset values, 0 dB, -2 dB, -4 dB and -6 dB.

For information, contact Lynn Thompson in California at 714-373-7277; fax: 714-373-7903; or circle Reader Service 76.

BE

AVAir Increases Flexibility, Creativity of BE Digital System

QUINCY, Ill. Broadcast Electronics added a new live radio screen and control interface to its AudioVAULT Digital Studio System. Called AVAir, the new system advances the functionality of digital hard-disk audio in the live control room.

Using the AudioVAULT system's Windows interface, AVAir allows on-screen access to the entire digital audio inventory of a station, including commercials and hard-drive-based music. All lists of stored audio cuts can be brought up with a single action of touch-screen, mouse, trackball or keyboard.

The operator can "drag-and-drop" selected audio "cuts" into on-screen "decks" to build a sequence of events. The AudioVAULT system allows the announcer to start up to 16 events simultaneously—manually or automated—sending them through separate console faders or ganging them on one or two.

In addition to the increased flexibility and creativity provided by AVAir, the system fully integrates AudioVAULT with other control room equipment, allowing the station to control audio processors, routing switchers, phone systems or consoles, using the same drag-and-drop technology.

For example, starting a network recording or switching to a news studio for a newscast can be dragged from an AudioVAULT log and dropped into an on-screen deck. It then can be executed with a touch-screen command. AudioVAULT and AVAir make complex broadcast operations simple and invisible to the operator.

For information, contact Dave Newton in Illinois at 217-224-9600; fax: 217-224-9607; or circle Reader Service 53.

ITC

ITC Turns Out, Refurbishes Time-tested Cart Machines

BLOOMINGTON, Ill. For more than 25 years, International Tapetronics Corp. (ITC) has manufactured cart machines. In 1969, ITC created the Premium Line cart machine. More recently, ITC produced the Series 99B cart machine. The Series 99B features a bullet-proof design and contains ELSA, ITC's cartridge eraser/splice locator/auto azimuth feature.

The Delta Series, the company's mid-priced mono or stereo cart machine, comes in single- and triple-deck versions. Products in the ITC Series I and II use advanced technology in servo-control and microprocessor-based diagnostics.

In addition to producing new cart machines, ITC refurbishes used cart machines and accepts trade-ins of its equipment toward the purchase of its digital system, the ITC DigiCenter.

For information, contact Charlie Bates in Illinois at 309-828-1381; fax: 309-828-1386; or circle Reader Service 143.

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HHB

HHB Offers Compact, Rugged, Portable DAT Recorder

PORTLAND, Maine The PDR1000 professional portable DAT recorder from HHB Communications Ltd. is based around a rugged, direct drive transport derived from DDS technology with four heads for confidence monitoring. Weighing less than 4.5 pounds, the PDR1000 can go anywhere the news is.

High-quality A-to-D/D-to-A converters ensure the PortaDAT's sonic superiority, and a comprehensive list of facilities includes phantom powering, balanced XLR analog inputs, selectable 32/44.1/48 kHz sample rates, SPDIF and AES/EBU digital I/O, a built-in limiter, internal monitor speaker and a full range of indexing facilities.

A nickel metal hydride rechargeable battery is included standard with the PDR1000. It can power the unit for up to two hours and totally recharges in the same amount of time.

A time-code-equipped model, the PDR1000TC, is also available from HHB. The PDR1000TC includes all the features of the PDR1000 and is capable of recording, generating and referencing to time code in all existing international standards.

For information, contact Fraizer Jones in Maine at 207-773-2424; fax: 207-773-2422; or circle Reader Service 159.

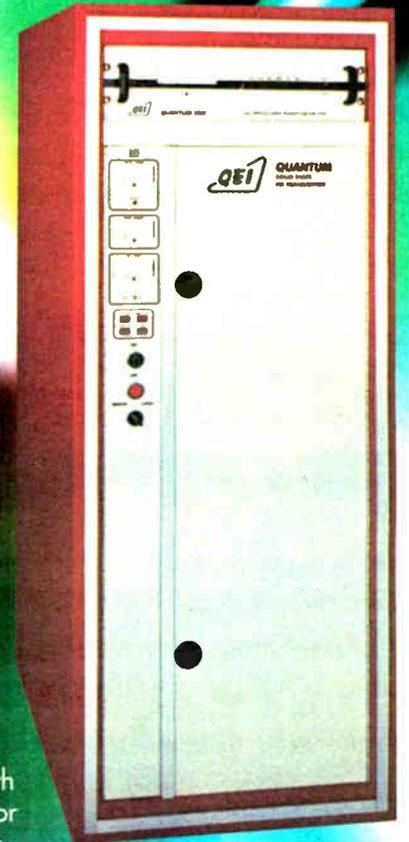
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FOSTEX

Fostex Integrates the D-10 Recorder into Its Line of Professional Studio DAT Recorders

NORWALK, Calif. The D-10 is the latest addition to Fostex's line of professional DAT recorders. With 8MB of RAM, the D-10 offers instant start, as well as high-quality stereo scrubbing with an easily accessible jog/shuttle wheel.

An infra-red remote controller comes standard. The D-10 also has an expansion slot for an optional 8333 board, which adds time code capabilities and an RS-424 port to the unit. Other features include program numbers, start ID, skip programming and 100 memory locations.

Transport time on the D-10 is quick. A user can search a DAT tape at 0.5, 1, 2, 3, 5, 9, 11, 15 or 250 times normal speed. Fast wind time for a 120-minute tape is approximately 50 seconds.

The Auto Cue function provides automatic locating to the start of audio modulation during ID search and tape loading. One hundred cue points can be stored and recalled with the D-10 ten-key pad.

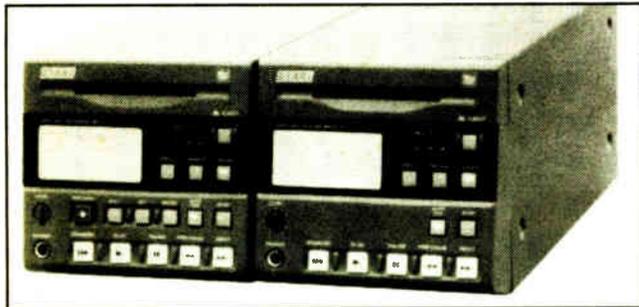
The D-10 features both XLR/RCA selectable analog I/O and AES/EBU digital I/O. A universal GPI I/O enables rapid assembly editing based on A-time with a pair of D-10s.

For information, contact Bud Johnson in California at 310-921-1112; fax: 310-802-1964; or circle Reader Service 10.

OTARI

MR-10 Recorder/Player from Otari Fully Compatible With Any MiniDisc-Format System

FOSTER CITY, Calif. The MR-10 MiniDisc recorder/player from Otari is ideal for the radio market. It provides rapid access, as well as reliable storage and playback.



The MiniDisc (MD) format allows up to 74 minutes of randomly accessible audio to be stored in up to 99 tracks per disc. Other professional features include table-of-contents (TOC) editing; memory start, stop/standby and single/repeat play

function modes; a selectable EOM detector; front-panel headphone output with level control; and audible cue mode.

The lighted front panel includes enhanced MD information readout capabilities, including a minute-second-frame timer, track number indication, title read-out and mode indication.

The MR-10 is fully compatible with any MD-format system. It features +4 dBu active balanced I/O with XL-style connectors that can select between 600-ohm and 10,000-ohm input impedance. An IEC Type-2 (S/PDIF) digital I/O is standard on the receiver.

Each machine is equipped with a wired remote controller and an Otari standard 37-pin parallel remote connector. Options include I/O transformers and an RS-

422 or RS-232C serial remote control interface.

For information, contact James Goodman in California at 415-341-5900; fax: 415-341-7200; or circle Reader Service 217.

RADIO SYSTEMS

DDS from Radio Systems Looks Like Cart Machine, Acts Like a Digital System

BRIDGEPORT, N.J. The main interface of the Radio Systems DDS (Digital Delivery System) looks like, operates like and fits in the space of a traditional cart machine. When a DDS is integrated into a traditional studio, the learning curve is virtually non-existent and resistance to this new technology minimal.

DDS performs simultaneously in multiple studios because it is built on a UNIX-style, multi-user, multitasking, real-time operating system. Unlike systems that use DOS and rely on multiple CPUs and networks to grow, each DDS server can support multiple users, multiple studios and up to 16 simultaneous audio channels.

The system provides complete automation and live assist, as well as support for other user interfaces, such as the company's Sound-Slate instant access controller. Peripherals can be added at any time using long-distance RS-485 serial lines. Because DDS is a universal control system, it also can control CD jukeboxes, audio switchers and satellite decoders.

For information, contact Dan Braverman in New Jersey at 609-467-8000; fax: 609-467-3044; or circle Reader Service 71.

MARKETPLACE

Recently Introduced Products for the Radio Broadcast Professional

Vanguard Console Line

The Vanguard Series of consoles from Audio Technologies Inc. (ATI) is available in six-mixer/10-input, eight-mixer/12-input and 12-mixer/24-input models. All models feature dual stereo and dual mono-sum program outputs with four line input selectors for both headphone muted monitor outputs.

Available options include bright LED bar graph output displays with simultaneous VU and PPM peak readout, a two channel mix-minus telephone adapter, start-stop switches, additional microphone preamps and a dual, five-line, stereo input expander.

ATI's approach to console design allows it to produce full-function on-air boards in the \$3,000 to \$5000 range. It also yields many benefits in terms of ease of installation, longevity and performance.

For information, contact Ed Mullin at 800-959-0307; fax: 215-443-0394; or circle Reader Service 6.

beyerdynamic))))

SPL Signal Processor

beyerdynamic distributes the Optimizer, a signal processor by SPL that offers four high-quality parametric equalizers, each individually assignable to ranges from 10 Hz to 23 Hz. The unit also uses a "proportional-Q" equalization technique for precise equalization.

The variable "roll-off" response feature of the Optimizer varies the slope characteristics around the center frequency from "gentle" to "steep." Each band has an output control with a range of -60 dB to +5 dB.

For information, contact the company in New York state at 516-293-3200; fax: 516-293-3288; or circle Reader Service 118.

Custom-designed Knobs

Selco/Sifam offers custom-designed knobs for consoles, panels and control boards in an assortment of colors. The company can work with a product

designer from the initial consulting phase to the finished knobs.

Selco also offers a line of collet knobs with caps, nut covers and pointers. All are manufactured in nylon for a finely textured finish. Collets, housing and nuts fitted into the knobs are made of brass and can accommodate a wide range of shaft and bush lengths. Again, custom colors are available.

For information, contact Andrea Armenta in California at 800-229-2332; fax: 714-739-1507; or circle Reader Service 38.

FURMAN

Power Conditioner/Monitor

Furman offers the PM-8 power conditioner/monitor, which provides the power conditioning protection of the company's PL-PLUS for applications where PL-PLUS pull-out lights are not needed.

The PM-8 assists in monitoring AC line status by including an AC voltmeter (90-135V) and an RMS-reading AC ammeter (0-20A). Eight widely spaced rear outlets can accommodate bulky plug-mounted power supplies. These outlets are controlled by a lighted front panel master switch; there is one front-panel unswitched outlet as well. A 10-foot power cord is supplied.

For information, contact Joe Desmond in California at 415-927-1225; fax: 415-927-4548; or circle Reader Service 134.

Fiber-free Acoustical Panels

illbruck Inc. offers Fabrix, acoustical panels for applications that require maximum noise control. Fabrix is made of a non-woven, fire-resistant fabric backed by a porous melamine foam designed to absorb and dissipate extraneous noise. All materials are fiber-free and meet Class 1 building codes.

Fabrix panels come in a variety of colors and can be used in offices, hallways, meeting areas, etc.

For information, contact Russ Leighton in Minnesota at 612-521-3555; fax: 612-521-1010; or circle Reader Service 163.

TECHNICS



Technics Improves Its SL-1200 Turntable With Introduction Of the SL-1200MK2

CYPRESS, Calif. The SL-1200MK2 direct-drive turntable from Technics, the successor of the SL-1200, incorporates numerous improvements over the original. In addition to being

quartz-locked direct drive, it permits continuous speed adjustment under quartz control. Its starting torque is 1.5 kg/cm, with the platter reaching rated speed within 0.7 seconds from standstill.

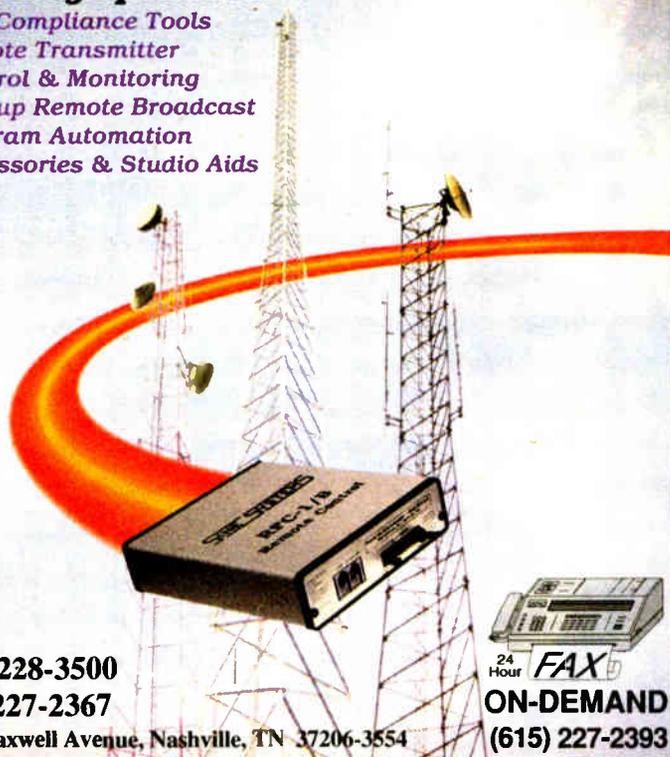
The SL-1200MK2 is housed in an aluminum diecast cabinet with heavy rubber base material for acoustic isolation. It also features a stylus illuminator for low light conditions and a high sensitivity, low-mass gimbal-suspension tone arm.

For information, contact Technics Consumer Information in New Jersey at 201-348-9090; or circle Reader Service 126.

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LPB DA-116, never used. J Gelo, J&H Music, POB 1697, Marco Isl FL 33937. 813-642-6899.

Tepeco RF amp J-319-10 3 outputs, tuned to 99.3 MHz, \$1750. Call 602-234-6355.

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McIntosh Mc60 pwr amps; KT88 or 6550 tubes, US or British only. R Glenn, WJGR, 1718 Shenandoah Dr, Wimauma FL 33598. 813-634-1940.

McIntosh MI-200 rackmount tube amp. 212-343-0265.

Record Cutting Lathes, amplifiers, records, related. 612-869-4963.

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Want To Sell

Andrew A10R 50507 1 5/8" coax with connectors, 275' rolls (6), \$1100/roll. S Ross, Quinn Broadcasting, 733 N Green St, Brownsburg IN 46112. 317-852-9119.

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805-922-7775 fax 925-6663

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FM on 104.3; also FM broadband that will operate on 95.7 and 99.7. B Lacy, KFMA, 2025 N Hwy A1A, Indialantic FL 32903. 407-773-1962.

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AUDIO PRODUCTION

Want To Sell

Eventide H949 Harmonizer; Eventide FL 201 (2) instant flangers. R Schuh, KSMG, 210-646-0105.

UREI 530 graphic EQ, 9 band stereo, barrier strip input/output, exc cond, \$200. W Feinberg, Totalltape Pub, 9417 Princess Down, Tampa FL 33619. 813-621-6200.

ADC 1/4" patchbays & cords, new, under half price; ADC TT patchbays \$149 up, new cords \$9.95. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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Good used studio tape 1/2" \$15, 1" \$30, 2" \$55. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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BE Control 16, complete or separately, IGM Go-Carts (6), Otari ARS-1000 (2), BE 2100 cart deck, more, priced to sell. M Young, WJON, Box 220, St Cloud MN 56302. 612-251-4422.

Cetec 7000 system with terminal encoder & cables, ITC PB reels (3) with racks, IGM 42 tray Go-Carts with racks, 3" disk drive, case of paper, printer, all, cables, switchers and more, all machines factory rebuilt, will deliver with in reasonable distance, BO. T Yarbrough, WCDT, 1201 College St, Winchester TN 37398. 615-967-2201.

Harris 9000, mono with power sup with new capacitors, TI Omni 800 model 840 printer, TEC 70X video screen with keyboard, Micropolis disk storage, dual drive, \$1000. Larry, WJLP, 1229 Brady St, Davenport IA 52803. 319-326-2541.

Printed circuit boards for SMC DS-20 switcher and 452 bi-directional Carousels. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

SMC Automation System with SSP 3060 stepper, AS-10 switcher, time clock, 700 series single play cart decks (2), Carousels with RAC-50 random access controllers, Scully 270 with outboard tone sensors (4) and one for parts, \$1000/BO. B Williams, KQLL, 5314 S Yale, Tulsa OK 74135. 918-455-9522.

SMC DX-20 switcher, brain, RAC31 remote control, power supply, PDC clock, encoder with video terminal, sell as package or by piece. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

SMC Carousels 250 series and 350 series with 50 step RAC controller, good condition, \$200/Best Offer. B Williams, KQLL, 5314 S Yale, Tulsa OK 74135. 918-455-9522.

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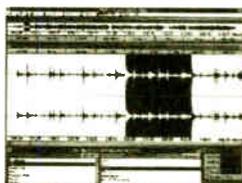
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Audix CD-11 PMD222

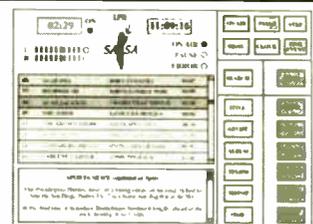
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Want To Sell

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ITC 750 R-R, R-P, gd cond, \$450. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

Ampex 350 mono with Inovonics electronics, solid state, rack mount, \$300; Ampex AG 350, mono, solid state, rack mount, \$500. A Baker, Broadcast Productions, 804 E 38th St, Indianapolis IN 46205. 317-925-7371.

MCI JH110B 2 track, roll around, good condition. J Gelo, J&H Music, POB 1697, Marco Isl FL 33937. 813-642-6899.

Ampex 350, 3 motors, 2 spd, all cables, \$495, with new Inovonics electronics, elect never used, \$1495. WBXK, POB 398, York SC 29745.

MCI JH-100 (2). M Young, WJON, Box 220, St Cloud MN 56302. 612-251-4422.

Otari MX-70 with CB-117 remote control and CV-119 autolocator, dbx-180A NR system, UREI 535 EQ, Eventide H949 Harmonizer, Crown D-75 speaker amp, JBL 4408 spkrs (2). J Book, WOC, 3505 E Kimberly Rd, Davenport IA 52807. 319-344-7000.

REVOX PARTS/SERVICE

Cassette-CD-Open reel
Rebuilt A77s, \$850.⁰⁰
Capstan resurfacing, ALL BRANDS.
JM TECHNICAL ARTS
30 Music Sq. W. #156
Nashville, TN 37203 (615) 244-6892

Otari ARS 1000 R-R, PB only (3); \$350 ea/\$900 all. R Statham, WSTU/WHLG, 100 Alice Ave, Stuart FL 34994. 407-692-1000.

Otari MX5050, 2 channel R-R. Jerry, WGER, 6165 Bay Road, Saginaw MI 48604. 517-792-1063.

Pentagon CP-4010 sequential 4 deck player, new; Pentagon CP-4010 (4) sequential 4 deck player; Teac X300R stereo reversing rcdrs. R Schuh, KSMG, 210-646-0105.

Recordex CS-2500 1 master, 5 slave, recorder cassette duplicator, 15:1 dup speed, \$1000 + freight. W Feinberg, Totallape Pub, 9417 Princess Down, Tampa FL 33619. 813-621-6200.

Revox PR99 (4) rolling cases with wired remote, excellent condition, 2 track with 7 1/2 and 15 ips, \$2000 + shipping. W Feinberg, Totallape Pub, 9417 Princess Down, Tampa FL 33619. 813-621-6200.

Teac A-3300-SX 3.75 and 7.5 ips, 7" & 10 1/2" reel modes, 1/4 track stereo, excellent condition, \$450. KAK Productions, 928 Hyland Dr, Santa Rosa, CA 95404.

Otari Mark II-IV 1/2" 4-track, multi-track, mint, less than 50 hours, Best Offer. R Kaufman, Pams Productions, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

NORTRONICS REPLACEMENT TAPE HEADS
Test Tapes, Degaussers, Gauges, Cleaners, Swabs, Lepping Films, Splice Bars/Tabs, and Demagnetizers

SEQUOIA ELECTRONICS
(408) 363-1646
FAX (408) 363-0957

Scully '100' recorders, record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 4646 Houndshaven Way, San Jose CA 95111. 408-363-1646.

Scully 270 (4) need some adjustments, also one for parts, \$150. B Williams, KQLL, 5314 S Yale, Tulsa OK 74135. 918-455-9522.

Studer B67 with manual, \$1650; Studer A67 in wood case, \$600. India Navigation, 177 Franklin St, NY NY 10013. 212-219-3670.

Tascam 34 R/P 10.5 reels, 1/4 4 trk w/all new heads. Larry, WXP, 1229 Brady St, Davenport IA 52803. 319-326-2541.

HEAD RELAPPING/REPLACEMENT
All tape and film formats
30 years experience

iem

350 N. Eric Drive
Palatine, IL 60067
708-358-4622

Ampex ATR800 mono, Tascam 25-2, Tascam 7300, Ampex ATR700, \$695 ea, Scully 16 track 2" \$3450, Tascam 52 top of line, \$1150, Ampex AG350 electronics \$75, 3M M56 16 track \$5500, M79-24 fully rebuilt \$11500, Tascam locator for 85-16 \$495. Sony TCD-5 & Marantz stereo 3 head portable cassettes both \$475, Fostex E22 1/2" center track time-code deck \$1800, Fostex A80 8 track & 450 mixer \$1950, Tascam 80-8 & M5 \$1950, Nagra 10" reel adaptor \$1400, Nagra 4.2 sync mono, Haliburton case, Tote, AC ps \$2500, Tascam 38 8 track with dbx \$1650. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Otari 5050-SHD 8 track 1/2" newly rebuilt, heads have full, life left, \$1800. W Gunn 619-320-0728.

Telex CD1 duplicator, 1:3, \$750 + shipping. W. Feinberg, Totallape Pub, 9417 Princess Down, Tampa FL 33619. 813-621-6200.

Ampex 601 portable tape recorders (3) & Ampex 620 portable speaker/amps (3). Working when retired, BO + shipping. Mel Crosby, 408-363-1646.

Ampex ATR 100 (2) 4 track \$3500 ea, 2 trk 1/2" \$4000, (2) 2 track 1/4" \$2500 ea. 212-343-0265.

UHER 4400 report monitor, \$650; UHER 4400IC stereo, \$125. S&G Electronic, 215-474-7663.

Want To Buy

Ampex ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

Nagra 4S, crystal sync not necessary. Reasonable price. Noel 215-474-7663.

COMMUNICATION SITES

Want To Sell

COMMUNICATION SITE

DIXON, CALIFORNIA—2 noncontiguous parcels. 631 acres improved with buildings, antennas, security fence and parking area. 156 acres unimproved. Off Interstate 80, 20 miles southwest of Sacramento, 65 miles northeast of San Francisco. Inspection date Dec. 1 10am to 2 pm. 7514 Radio Station Road. Auction by mail begins January 18, 1995. Call 1-800-421-7848 for more information.

COMPUTERS

Want To Sell

Compuadd AM/FM stereo, new computer card (3), 8 bit, Windows only software, graphical tuner, \$50 each. Brian, CDJ, 1861 Brown Blvd, Arlington TX 76006. 214-364-4523.

Many computer items. Call for info or to be faxed a current list. Some store demos from closed computer store, some gently used. Call Eric at 1-800-95-WEDGE.

EMPLOYMENT

To place ads in this section, use the ActionGram form. To respond to box numbers write Radio World, PO Box 1214, Falls Church, VA 22041. Attn: _____

HELP WANTED

TECHNICIAN SENIOR: Argonne National Laboratory, one of the nation's premier energy research and development organizations, is currently seeking a Technician Senior for the Advanced Photon Source (APS)—the nation's largest synchrotron radiation facility. You will assist engineers and physicists in the development, improvement, and construction of RF electronics and amplifiers. This will involve assembly, testing and debugging, installation, operation, and maintenance of high power RF amplifiers. This position requires an Associate's degree or equivalent along with 5+ years of experience building, testing, and maintaining high power RF amplifiers and related power equipment. We also require extensive knowledge of RF construction and testing techniques, and familiarity with low-level equipment. At Argonne, you'll find an environment that encourages both personal and professional career growth, as well as excellent compensation and benefits. We welcome applications from candidates who can contribute to our EEO/Affirmative Action goals. For confidential consideration, please send a resume and salary history to: Sheila R. Heath, Employment and Placement, Box APS-114665-85, Argonne National Laboratory, 9700 S Cass Ave, Argonne IL 60493. Telecommunication Device for the Deaf - (708) 252-7722. An equal opportunity/affirmative action employer.

Chief Engineer. Northeast market seeks qualified broadcast engineer for 1 AM/FM high power combos. Applicant must possess experience with transmitter and studio equipment. A working knowledge of computers is also helpful. Please send resume and salary requirements to Radio World, POB 1214, Falls Church VA 22041. Attn: Box # 94-11-30-1RW.

POSITIONS WANTED

20 yrs exp, bdct school grad, AM/FM, any format, FCC 1st class/Gen/Radar, Marine, rest, ham, SBE cert. C Hamlin, 509 W 4th St, Corbin KY 40701. 606-528-5460.

7 year radio pro interested in doing voice overs for any format, reasonable rates. John, 302-475-0814.

Bright, friendly, ambitious and creative, seeks position using writing, vocal and prod skills. Lynn, 405-628-3707.

Genuine warmth, up & bright, talk or music, 25 yrs exp, in Seattle, but wants to move east. Tom, 206-217-9241.

Graduate, loves country/easy listening, sharp on-air, production, OKC or Tulsa pref, also relocate to Nashville or Colorado. Andrew, 918-425-2120.

Ohio air-talent seeks FT hot AC or classic rock midday gig. Rick, 216-773-1549.

Positive attitude, just out of school seeks on-air, production, sales, ready for broadcasting. Brian, 405-372-2364.

Someone gave you a chance, now take that chance on Airel Foxx, on-air, prod, news. 405-677-1698.

HELP WANTED

RF ENGINEER (Maine)

THE POSITION: Engineer for the company's Shively Labs division, a leading manufacturer of FM and TV broadcast antenna systems and related equipment. Principal responsibility will be R & D of new products. Significant opportunity for relations with the marketplace.

THE COMPANY: A small company participating in growth markets by using its creativity and technical excellence in competition with major corporations. Competitive salary and broad company benefits. Initiative and ideas are recognized in our participatory environment. Company located in a four-season resort area in the mountains of western Maine and convenient to Portland.

REQUIREMENTS: A BSEE and significant design and test experience in antennas and RF components. MSEE a plus. Solid grounding in both theory and practice. Commitment to high quality product and engineering excellence.

Interviews will be scheduled with selected applicants. No phone calls please.

Send application letter, salary history and resume to:

Howell Laboratories, Inc.
Personnel Department
P.O. Box 389
Bridgton, ME 04009

ABOUT OUR EMPLOYMENT SECTION

HELP WANTED

Any company or station can run "Help Wanted" ads for \$1.50/word or buy a display box for \$60/column inch. Payment must accompany insert, use your MasterCard or VISA; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$10. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for details.

POSITIONS WANTED

Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 2 issues of Radio World. Contact information will be provided, but if a blind box number is required, there is a \$10 fee which must be paid with the listing (there will be no invoicing). Responses will be forwarded to the listee, unopened.

Mail to: **BROADCAST EQUIPMENT EXCHANGE**
PO Box 1214, Falls Church, VA 22041 Attn: Simone Mullins

CONSOLES

Want To Sell

Auditronics 310, 8 track with cabinets, furniture, Yamaha DX-7 keyboard, Yamaha RX-21 drum box, pre-wired Gentner patch panels (9), much more, BO. J Book, WOC, 3505 E Kimberly Rd, Davenport IA 52807. 319-344-7000.

Autogram IC-10 10 chnl stereo, gd cond, \$2300. S Cilurzo, San Diego Digital, 9853 Pacific Heights Blvd, San Diego CA 92121. 619-452-9000.

Collins 808A-1 portable, w/dual TT, mono, \$400. Larry, WXL, 1229 Brady St, Davenport IA 52803. 319-326-2541.

Gately 16 x 8 with EQ 4 effects buss quad monitoring, Cannon connectors for line & mic inputs and Cannon connectors for outputs, \$850. A Baker, Broadcast Productions, 804 E 38th St, Indianapolis IN 46205. 317-925-7371.

Harris Stereo 80, \$500 + shipping; Collins production board, \$150/BO. B Pitts, WJBV, POB 930, Gadsden AL 35902. 205-442-1222.

Ramsa 8615 never used, in org factory cartons, 7 mono, 4 stereo modules, BO. R Baur, KUTT, 414 4th St, Fairbury NE 68352. 402-729-3382.

Ramsa 8616, never used, 7 mono & 4 stereo modules, BO. R Baur, KUTT, 414 4th St, Fairbury NE 68352. 402-729-3382.

RCA BC308S 8 input stereo, never used, spare cards, timer, manual, transformer in out, step attenuators, \$1000. D. Brassell, Aldon Video, 424-S Commerce Ln, Berlin NJ 08009. 609-768-2439

Ramko DC5AR 5 channel mixers, vgc, \$175 each. 916-725-2434.

Ramko Model D-C 5RA mixer, good working condition, \$150. R.G. Stair. 803-538-3892.

RCA BC-14 rack mount console, good condition, \$100 + shipping; Monsanto 105-A frequency counter, mint condition, \$200 + shpg; Audio patch bay, \$35 + shpg. W Tinsley, AirChecks USA, 1123 Holcomb St, Water-town NY 13601. 315-788-0914.

MCI 528 was \$82,000 new, excellent condition \$16500, Quantum 32x16x24 as used by LA Philharmonic \$4950, Auditronics 501 \$3500. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Want To Buy

Neve consoles: any condition or parts Also: UA, UREI, Teletronics, Fairchild, RCA, Puhe, API, any TUBE GEAR or COMPRESSORS Call 201-798-2745 or fax 201-963-4764

Neve console, any type and parts. 212-343-0265.

DISCO-PRO SOUND EQUIPMENT

Want To Sell

Community CB 594 fiberglass bass horns, uses 15 or 18" driver, with EV 15DLX drivers \$225; without drivers \$100. D Brassell, Aldon Video, 424-S Commerce Ln, Berlin NJ 08009. 609-768-2439

dbx 118 compressor/expander, exc cond w/box, \$125. R Glenn, WJGR, 1718 Shenandoah Dr, Wimauma FL 33598. 813-634-1940.

Lights Fantastic 10 x 1200 16 chnl light chaser, \$200. W Feinberg, Totaltape Pub, 9417 Princess Down, Tampa FL 33619. 813-621-6200.

LinnDrum classic drum machine with MIDI update, \$250. Mark, Production Block Studios, 906 E 5th St, Austin TX 78702. 512-472-8975.

Sequential Circuits Tom 9 keyboard style programmable, MIDI compatible, 2 removable carts w/sound effects, \$200. W Feinberg, Totaltape Pub, 9417 Princess Down, Tampa FL 33619. 813-621-6200.

Want To Buy

JBL 4343 studio monitors, any cond. R Glenn, WJGR, 1718 Shenandoah Dr, Wimauma FL 33598. 813-634-1940.

FINANCIAL SERVICES

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ON ALL RADIO EQUIPMENT

- Easy to qualify
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- 100% financing, no down payment
- No financials required under \$50,000
- Refinancing existing equipment

ENF EXCHANGE NATIONAL FUNDING

Call Mark Wilson (800) 275-0185

LIMITERS

Want To Sell

CBS Volumax stereo FM, slimline version. B Caithmer, WMBI, 820 N LaSalle Drive, Chicago IL 60619. 312-329-4304.

dbx 140A new, dbx type III w/r input video mixer, \$200. W Feinberg, Totaltape Pub, 9417 Princess Down, Tampa FL 33619. 813-621-6200.

Want To Buy

903 (4) and **905 (2)**, want modules only. R Streicher, Pacific Audio-Visual, 545 Cloverleaf Way, Monrovia CA 91016. 818-359-8012.

Orban Optimod 8000 and **8100**, in good out of service or non working condition. Emie, CBP Productions, Box 411, Alexandria KY 41076. 800-526-5450 ext 308.

Orban 424 or equiv, must be in gd cond. J Moser, J & N Rec, 520 Roebling Ave, Trenton NJ 08611. 609-695-3418.

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

AKG C422EB, large diaphragm stereo, phantom power, remote pattern selector, 20-meter cable, windscreens and shockmount, excellent condition, \$1850; **AKG D-140** cardioid, \$225/pr. R Streicher, Pacific Audio-Visual, 545 Cloverleaf Way, Monrovia CA 91016. 818-359-8012.

Altec coke bottle tube mic, original power supply, case, \$350. Bob, Clockwork Sound, 606 Mamaroneck Ave, Mamaroneck NY 10543. 914-381-0661.

Ampex PR 10 2 channel tube mic pers, vintage 1950s, with mic transformers, \$425. Bob, Clockwork Sound, 606 Mamaroneck Ave, Mamaroneck NY 10543. 914-381-0661.

API 512B mic pre/direct box, 48V, phantom power, 20 dB pad, mint cond, \$375; **API HPR** horizontal 500 rack, holds 2 units, self powered, excellent condition, \$375. Bob, Clockwork Sound, 606 Mamaroneck Ave, Mamaroneck NY 10543. 914-381-0661.

Sony ECM377 large dia cond mics (2) \$495 ea, **RCA 77DX** \$950, 44BX matched set of 3 \$3950, **Shure SM5** \$325, **SM7** \$295, **AKG D12** \$195, **Crown GLM200** lavalier like new \$125. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Telex Sports Caster mic/headsets (2), almost new, \$100 for both. R.G. Stair, 803-538-3892.

Want To Buy

Electro-Voice 309 Gray, shock mts in gd cond, for RE-20. H Cotterill, WZAD, POB 978137, Wurtsboro NY 12790. 914-888-0077.

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.

RCA ribbons, **AKG 451's**, **Neumann KM84's**, **EV 635A**. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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.

MISCELLANEOUS

Want To Sell

26 Foot Boom Box, new aircon speakers, both sides new audio equip, \$20,000. D Bryan, POB 485, Carthage IL 62321. 217-357-6610.

ABC radio network printed matter from 50's - 80's, cue sheets, promo kits, program schedules, affiliate lists, also airchecks. H Cotterill, WZAD, POB 978137, Wurtsboro NY 12790. 914-888-0077.

Comdial Executech 8 line phone system w/13 phone, \$700. Larry, WXL, 1229 Brady St, Davenport IA 52803. 319-326-2541.

Switchcraft patch panels wired to punch blocks. M Young, WJON, Box 220, St Cloud MN 56302. 612-251-4422.

Retron Blowers for Elcom, Harris, CCA, CSI, McMartin, rebuilt & new. Goodrich Enterprises Inc. 11435 Manderson St, Omaha, NE 68164 402 493 1886 FAX 402 493 6821

Teletypewriter receive/send, stored for years, cond unk, on stand, \$165. WBXK, POB 398, York SC 29745.

XLR connectors, male & female, 1/4", \$2/ea or \$3/set. W Feinberg, Totaltape Pub, 9417 Princess Down, Tampa FL 33619. 813-621-6200.

Power Packs: 6V, 14AH Nicad battery in compact carrying case, \$40; Lithium: 12V, 15AH light weight! Great Power! Only \$12.50 pack. S&G Electronic, 215-474-7663.

Want To Buy

Jazz record collections, 10" LP/12" LP be-bop, swing, dixie, highest prices paid. B Rose, Program Recdgs, 228 East 10th, NINY 10003. 212-674-3060.

Radio Transcriptions. Any year. Send description. Andy Lanset, 328 West 101 St, NYC, 10025. 212-662-6540.

ADVERTISE!

CALL

1-800-336-3045

MONITORS

Want To Sell

TFT 730A SCA monitor. Very little use. Excellent condition, \$850. Wayne L. 615-251-3003.

Repco SCA port radio, \$20. E Mitchell, KSNM, 214-495-8122.

Want To Buy

McCurdy tube consoles wanted, AU-300 line modules power supply, monitor amps, card cages etc. Also interested in RCA, Collins, Langevin tube modules. Wayne L. 615-251-3003

RECEIVERS & TRANSCEIVERS

Want To Sell

AM STEREO RECEIVERS
Portable - Home/Studio, Auto
RRADCO GROUP
708-513-1386

Sony ST555ES stereo FM tuner, 8 presets, 2 antenna inputs, \$125. R Streicher, Pacific Audio-Visual, 545 Cloverleaf Way, Monrovia CA 91016. 818-359-8012.

GE Superadio III, custom modified w/noise free SCA w/improved selectivity & sensitivity, \$95. Other modifications avail. Performance guaranteed. **800-944-0630**.

Standard GX 3000 mobile 800 MHz 2 way radios (2) and Astron SL-11A pwr supplies for base; Standard HX-400 (2) handheld 800 MHz 2-way (2); Standard CSA-400 (2) rapid chargers for handhelds. R Schuh, KSMG, 210-646-0105.

SCA RECEIVERS—ALL TYPES

Reading Service / Ethnic / Data
Professional / Table
Will work to meet your receiver needs

DAYTON INDUSTRIAL CORP.
(Manufacturer)
2237 Industrial Boulevard
Sarasota, FL 34234
Tel: 813 351 4454 FAX: 6081

Want To Buy

Sony SRF A100 multi mode AM stereo rcvr. Also AM stereo boom box, portable, table top, tuner and/or rcvr. Looking for all types of AM stereo receivers, no automobile units. Ken, 215-536-5921.

PHONE: 703-998-7600 FAX: 703-998-2966



Call Simone Mullins, Classified Ad Manager, to reserve space in the next issue. Use your credit card to pay, we now accept VISA and MASTERCARD.

Radio World

5827 Columbia Pike, 3rd Floor
Falls Church, VA 22041

Select from these categories for best ad positioning:

Acoustics	Consoles	Software
Amplifiers	Disco-Pro Sound Equip.	Stations
Antennas & Towers & Cables	Financial Services	Stereo Generators
Audio Production (Other)	Leasing	Tapes, Carts & Reels
Brokers	Limiters	Tax Deductable Equipment
Business Opportunities	Microphones	Test Equipment
Cart Machines	Miscellaneous	Transmitter/Exciters
Cassette & R-R Recorders	Monitors	Tubes
CD Players	Receivers & Transceivers	Turntables
Computers	Remote & Microwave Equip.	Positions Wanted
	Satellite Equipment	Help Wanted

Classified Advertising Rates Effective January 1, 1994

	1x	3x	6x	12x
1-9 col inch (per inch)	\$60	58	54	49
10-19 col inch (per inch)	55	52	49	44
Distributor Directory	100	95	90	85
Professional Card	65	60	55	50
Classified Line Ad		\$1.50 per word		
Blind Box Ad		\$10 additional		

To compute ad costs: Multiply the number of ad inches (columns x inches) by the desired rate schedule for your per unit cost. Example: a 3" ad at the 1x rate is \$180, at the 3x rate \$174, at the 6x rate \$162, at the 12x rate \$147, etc.

DISTRIBUTOR DIRECTORY

The following distributors serving the broadcast industry would be glad to help you with any of your requirements.

...country, top 40, news, urban, talk, jazz, the classics, mixed bag...

CROUSE-KIMZEY OF ANNAPOLIS

tops in broadcast equipment
1-800-955-6800
ask for Kathleen

CORNELL-DUBILIER MICA CAPACITORS

FROM STOCK

JENNINGS VACUUM CAPACITORS

FROM STOCK

JENNINGS VACUUM RELAYS

SURCOM ASSOCIATES, INC.

2215 Faraday Ave., Suite A
Carlsbad, California 92008
(619) 438-4420 Fax: (619) 438-4759

REMOTE & MICROWAVE EQUIPMENT

Want To Sell

Marti RMC2-AXT(A), RMC2-AXT(10) needs repair, will supply new stepper, \$325. WBXK, POB 398, York SC 29745.

SATELLITE EQUIPMENT

Want To Sell

Zephyrus SCPC-700, 2 Channels, 2:1 and 3:1 companding, 950-1450 L Band. Cost \$1900, Sell \$1150 plus S/H. Other SCPC receivers for sale. Call for list Universal Electronics, Inc. 614-866-4605.

SOFTWARE/ DATABASES

Want To Sell

PC SOFTWARE for Broadcasters. Traffic, Billing, & Accounting. Powerful, inexpensive. Works with automated, satellite or live operations. INTERFACES with popular DIGITAL AUTOMATION SYSTEMS. Try it for 90 days, no obligation. **Absolute Broadcast Automation** Naples, Florida (813) 643-3689

Profitable small market AM daytimer in SW Virginia. Excellent owner operator opportunity. Market at two times billing, with or without, \$160,000.00 in real estate. Currently family operation with principals planning retirement. Contact: JCS, POB 354, Wytheville, Virginia 24382.

Want To Buy

Lease manage AM or FM in NE, Boston/Providence pref. new format needs home. B Alley, RLM, 272 Union St, New Bedford MA 02740. 508-991-2007.

Small AM & FM combo, cash. J Latino, 718-893-4328.

100's of reels of 1/4" .5 mil tape on 10.5" plastic reels, \$1/reel or Best Offer. B Williams, KQLL, 5314 S Yale, Tulsa OK 74135. 918-455-9522.

7 1/2 & 10 1/2" reels, thousands in boxes, 7" 50c/ea + shipping; 10 1/2" \$1/ea + shipping. W Feinberg, Totaltape Pub, 9417 Princess Down, Tampa FL 33619. 813-621-6200.

Scotch/3M carts, various lengths, some Audiomax and Dynamax over 100, buyer takes all, \$100 + shipping. C Rogers, KXAX, Hwy 4, St James MN 56001. 507-375-3386.

Scotchcart (184), loaded with oldies, \$200 including shipping. T Devine, WVVK, 300 W Vine St, Lexington KY 40507. 606-253-5900.

RENT IT HERE! Call Steve Kirsch for Details

COMREX 1, 2, & 3-Line Extenders Switched 56/ISDN Systems

TELOS Zephyr Digital Phone Hybrids

GENTNER EFT 3100 3-Line Extenders

SHURE FP410 Automatic Mixers

REMOTE AUDIO PACKAGES

SILVER LAKE AUDIO • 516-623-6114 • FAX: 516-377-4423

Moseley TRC-15 \$900 + shipping. R Petersen, KDMO, 221 E 4th, Carthage MO 64836. 417-358-6054.

Moseley TRC-15 15 channel remote control systems, good condition, \$500. S Cilurzo, San Diego Digital, 9853 Pacific Heights Blvd, San Diego CA 92121. 619-452-9000.

WE RENT

TELOS ZEPHYR

QEI QUICK-LINK Stereo RPU, NO license

COMREX 3 line extender

Frank Grundstein Audio/Video Consultants 610-642-0978

Moseley MRC-2 remote cntrl sys, loaded; Moseley TRL-1 TSL sys, 1 W. R Schuh, KSMG, 210-646-0105.

TRC-15 16 channel remote control switch; Gates FT-80 modulation monitor and stereo monitor. Jerry, WGER, 6165 Bay Rd, Saginaw MI 48604. 517-792-1063.

360 System Bernoulli Drive with 11 - 44 MB disks, all for \$300, little use. R.G. Stair, 803-538-3892.

Ariel

Proven in more than 150 Installations!

The world's most capable Digital Satellite receiver at an affordable price!

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All Westwood One Formats!

Zephyrus for JSA

Zephyrus 700 SCPC

We Repair & Rebuild all Popular Receivers Quick Service!

Satellite Systems (719) 634-6319

Ron Balonis' Broadcast Engineer's Computer Toolbox makes a computer a technical assistant for an engineer. For details, write **Computer Toolboxes**, 118 Rice St., Trucksville, PA 18708 or call 1-717-696-1490 300/1200/8/N/1.

STATIONS

FT 1 kW AM w/real estate, for listing of equipment: R Hobbs, WMLR, 2009 Cromwell Dr, Nashville TN 37215. 615-373-2351.

Historic East TN town with retirement village, only station in town, 1 kW, excellent equipment and offices, low overhead, with or without real estate, will consider some financing. Mr Lowe, 615-458-9563 after 3 pm EDT.

LPTV permit, ready to build, Chnl 26, Santa Barbara/Goleta CA. G Erway, 3450 SE Martinique, Stuart FL 34997. 407-283-6871.

2.5 kW AM in S.E. Georgia, \$150,000. CMM, POB 1951, Waycross GA 31502.

MUST SELL: FM radio station in Marshall, Illinois. 2-story building with 17 acres property. Studio and all transmitting equipment. \$55,000 cash. 1-800-231-5171 ext 102.

PROFITABLE HI POWERED LOW DIAL AM AND UPGRADABLE FM. 501-470-1525.

STUDIOS

Syndicator selling all production equipment, supplies and 40 year collection of music: equipment including board, CD players, EQ, DA, cart mach. TT, R-R, much more, one price for all. American Music Formats, 4545 Nicholas Ct, Brookfield WI 53045. 414-783-5551.

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Page No.	Advertiser	Reader Service No.	Page No.	Advertiser	Reader Service No.
7	ATI	73	22	Halland Broadcast	105
11	Arrakis	146	31	Harris Allied	209
24	Arrakis	156	28	Harris Allied	175
34	Arrakis	60	39	Hnat-Hindes	183
41	Arrakis	149	22	IFR Systems, Inc.	114
3	Audi-Cord	14	13	Inovonics	80
40	Audio Broadcast Group	75	32	J Squared Technical Service	106
51	Auditronics	161	14	Korg	191
32	Autogram	99	18	Lectrosonics	214
20,21	BSW	86	22	Logitek	37
6	BSW	26	48	Marathon Products	30
30	Belar	196	35	Modulation Sciences	220
32	Benchmark Media	153	42	Myat Inc.	216
7	Bext	50	29	NSN (National Supervisory Network)	91
42	Broadcast Devices, Inc.	62	16	Neumann USA/Sennheiser	41
4	Burk Technology	47	17	Pacific Recorders	120
50	C&N Electronics	147	22	Phasetek	177
1	CCA Electronics	132	9	Pioneer	34
15	CRL	172	42	Pristine Systems	19
40	Cellcast Communications	112	32	Prophet Systems	3
40	Comrex	72	43	QEI	65
3	Continental Electronics	115	2	Register Data Systems	122
22	Cortana	45	42	Satellite Systems	59
40	Crown Broadcast	17	22	Shively Laboratories	12
25	Cutting Edge	25	22	Silicon Valley Power	78
36	Cybox	136	44	Sine Systems	16
23	Dataworld	165	49	Sveltana Electron Devices	195
8	Dolby	56	26,27	TM Century	21
49	Econco	22	38	Tectan	179
40	Econco	13	33	Telos Systems	124
15	Enco Systems	97	37	Telos Systems	188
49	Energy-Onix	74	42	The Management	150
40	Excalibur	158	49	Transcom Corp.	218
10	Fidelipac	103	45	USAfoam	7
19	Ghostwriters	128	52	Wheatstone	89
42	Gorman Redlich	201			
45	Hall Electronics	100			

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002	024	046	068	090	112	134	156	178	200
003	025	047	069	091	113	135	157	179	201
004	026	048	070	092	114	136	158	180	202
005	027	049	071	093	115	137	159	181	203
006	028	050	072	094	116	138	160	182	204
007	029	051	073	095	117	139	161	183	205
008	030	052	074	096	118	140	162	184	206
009	031	053	075	097	119	141	163	185	207
010	032	054	076	098	120	142	164	186	208
011	033	055	077	099	121	143	165	187	209
012	034	056	078	100	122	144	166	188	210
013	035	057	079	101	123	145	167	189	211
014	036	058	080	102	124	146	168	190	212
015	037	059	081	103	125	147	169	191	213
016	038	060	082	104	126	148	170	192	214
017	039	061	083	105	127	149	171	193	215
018	040	062	084	106	128	150	172	194	216
019	041	063	085	107	129	151	173	195	217
020	042	064	086	108	130	152	174	196	218
021	043	065	087	109	131	153	175	197	219
022	044	066	088	110	132	154	176	198	220

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